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### CCR-2

#### Hallucinations due to therapeutic doses of ertapenem

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**Introduction** Ertapenem is a broad-spectrum beta lactam antibiotic that differs from other penems by inactivity on *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. Consequently, it can't be used as empirical treatment of nosocomial septic shock. Its administration once daily is helpful, however, in the treatment of digestive infections, deep wounds and multiresistant urinary tract infections. Since its marketing in 2002, neurological adverse events have been reported.

**Materials & Methods** We present two cases of patients who experienced visual hallucinations following a course of ertapenem at therapeutic doses (1 gram per day).

**Results** First case: Mr V is a 78-year-old man who was prescribed a 3-week course of ertapenem for management of a prostatitis caused by multidrug-resistant extended-spectrum- $\beta$ -lactamase-producing *Escherichia coli*. At day 6, he came to the emergency department with delusions, hallucinations and blurred vision. The therapy by ertapenem was interrupted at day 9 and the disorders resolved in 48–72 h.

**Second case:** Mr M is a 89-year-old man treated with ertapenem for management of a cellulitis. At day 4, he presented an alteration of consciousness with confusion and hallucinations. No symptomatic improvement was observed despite treatment with levomepromazine. Ertapenem was stopped at day 6 and, within three days, the hallucinations resolved and he returned to his baseline mental status.

**Discussion & Conclusion** A review of the literature on the subject showed that three similar cases were published: each time, patients were treated with neuroleptics (haloperidol or risperidone) without efficacy, and mental status returned to its base in 72 h after stopping ertapenem. In all cases, patients had no psychiatric history. Hallucination is a rare adverse event estimated at a frequency less than 1/10,000, therefore, classified as very rare. However, ertapenem is a recent antibiotic and pharmacovigilance data are scanty. In the same family of antibiotics, cases of hallucinations are mentioned in the summary of product characteristics (SPC) of imipenem-cilastatin,

primarily through overdoses, less often at therapeutic doses. In our two cases, patients had normal renal clearances.

The increasing number of urinary tract infections caused by multiresistant bacteria, the limited number of treatments available to manage these infections and the ease of use of ertapenem (single dose daily) encourage practitioners to prescribe this antibiotic more and more. Notified in the SPC and described in the literature, neurological disorders are rare but important adverse effects which can be difficult and frightening experiences for the patient and its family. Given the positive developments in 48–72 h after cessation of treatment, these disorders should be known by clinicians as they can lead to inappropriate management and iatrogenic drug events.

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**Keywords** Ertapenem, Hallucinations, Iatrogenic drug event

### CCR-3

#### Impact of regional sympathetic blockades with guanethidine in complex regional pain syndrome type I

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**Introduction** Complex regional pain syndrome type I (CRPS I) or reflex sympathetic dystrophy syndrome is characterized by persistent pain in a limb segment, secondary to trauma or tissue damage and associated with a sympathetic dysregulation. The troubles encountered are numerous and varied and the disease represents a real handicap for the patient. What is the impact of intravenous sympathetic blockades with guanethidine?

**Materials & Methods** We followed seven patients with CRPS I:

Five patients (2 females: 27 and 72 years and 3 men: 33, 34 and 47 years) received guanethidine blockades. A patient receiving clopidogrel and lysine acetylsalicylate cannot receive this type of

treatment performed under witheres has been a mobilization under ketamine. The last patient was referred to physiotherapy specific syndrome thoracic outlet. Guanethidine acts by inhibiting the sympathetic nervous system by selective blockade of noradrenergic neurons (depletion of storage vesicles of noradrenaline). Patients received 1–2 blockades per week of 10 to 30 mg of guanethidine. During each blockade, we estimated pain evolution, functional impairment (stiffness degree) and impact on patient life quality (return to work or previous activities).

**Results** The results are very encouraging as we have noted an improvement in all patients. The lady of 27 years (15 blocks) and the gentleman of 33 years (8 blocks), quickly returned to work (respectively after 6 months and 1 month old). The lady of 72 years has benefited from 9 blocks with disappearance of hyperalgesia and increased knee flexion angle of 80–130°. The gentleman of 47 years showed a CRPS I after surgery for comminuted fracture of the femur. He received 12 blocks that led to the sharp decline of pain and local signs. With this improvement, at the lack of consolidation reoperation could be programmed. Finally the gentleman of 34 years (6 blocks) has been a marked improvement (reduction in pain at night which were constant) but stopped for personal reasons.

**Discussion & Conclusion:** In view of these results, guanethidine blockades seem to be effective on pain and mobility of the limb. However you must keep our long-term observatory and a larger cohort of patients.

**Keywords** guanethidine, intravenous sympathetic blockades, reflex sympathetic dystrophy syndrome

## CCR-4

### Carboplatin dosage in overweight patient: case report

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**Introduction** Carboplatin is frequently used as active antitumor agent and recommended to be administered according to the Calvert formula: dose = target AUC  $\times$  (GFR+25). Our aim was to determine the potential utility of glomerular filtration rate (GFR) in overweight patients in the Cockcroft-Gault equation (CG), abbreviated Modification of Diet in Renal Disease formula (aMDRD) and 24-h creatinine clearance (24CrCl).

**Materials & Methods** A 60-years old man with a body mass index of 32.5 kg/m<sup>2</sup>, arterial hypertension, type II diabetes and dyslipidemia, was admitted in our hospital because of right cruralgia and left sciatica. He was a heavy smoker (60-pack-year). The lung tumour was diagnosed as non-small cell lung cancer cT<sub>2</sub>N<sub>2</sub>M<sub>1</sub> with bone and brain metastasis. He benefited a right hip prosthesis associated with curettage, vertebroplasty and radiotherapy. The patient underwent chemotherapy consisting of paclitaxel 200 mg/m<sup>2</sup> and carboplatin at AUC of 6 mg.min/ml (area under the plasma concentration-time curve) day 1 every 3 weeks.

**Results** The first course, serum creatinine (Scr) was 55  $\mu$ mol/l and GFR calculated by CG and aMDRD were respectively 184.3 ml/min and 140.3 ml/min. Carboplatin dose (CD) were 1300 mg and 990 mg, it's a high doses unusually prescribed. The oncologist in charge of the patient decided to reduce the dose by 50% (600 mg). To maximize the safety and efficacy of CD, the pharmacist advised to carry out 24CrCl. The second course, Scr was 48  $\mu$ mol/l. Using CG, aMDRD and 24CrCl, the GFR and CD were 204.5; 164.2 and 151.5 ml/min and 1,380, 1,140 and 1,060 mg, respectively. The third course, Scr was 54  $\mu$ mol/l, GFR and CD were 174.9; 143.3 and 87.5  $\mu$ mol/l and 1200; 1000 and 680 mg respectively. Because of performance status that was not good, the patient received only 650 and 570 mg at the second and third course. After three courses, the overall tumoral-control

showed progression disease, erlotinib was chosen as second-line chemotherapy.

**Discussion & Conclusion** CG has been shown to be biased and inaccurate in some specific patient groups: obese, cachexia, elderly patients and pregnancy. In comparison to 24CrCl, the influence of body weight in CG tended to overpredict GFR. An excess of fat mass provokes a reduction in daily creatinine urine excretion per body kilo weight and is responsible for overestimated renal function. Consequently, CD calculated by Calvert is overestimated. On the other hand, aMDRD does not include weight and is more accurate than CG in patient with obesity. However, the accuracy of 24CrCl should be used in hospitalized patients with obesity. The prescription of CD in obese patient should be approved by oncologist, nephrologist and pharmacist together.

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**Keywords** 24CrCl, aMDRD, carboplatin, Cockcroft-Gault, overweight

## CCR-5

### Clozapine-induced neutropenia managed with lithium carbonate: a case report

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**Introduction** Clozapine, an atypical antipsychotic drug, is the most effective medication for treatment-resistant schizophrenia. It is also useful for patients with severe side effects with others antipsychotics drugs. Its use is however limited by the high risk of neutropenia and agranulocytosis and requires regular and strict white blood count (WBC). Lithium carbonate, used in first line treatment in bipolar disorder, has an opposite side effect: leukocytosis. Several studies show encouraging results about the use of the combination of clozapine and lithium carbonate to prevent the risk of agranulocytosis. However, could premature discontinuation of lithium increase this risk?

**Materials & Methods** Our presence in a psychiatry unit has resulted in the retrospective study of a case of agranulocytosis with clozapine following the discontinuation of lithium.

**Results** Mrs. R., 35, suffered from bipolar disorder. After the inefficiency of various neuroleptic drugs (lozapine, olanzapine, amisulpride) and mood stabilizers including lithium, clozapine treatment was initiated. The dose was increased until reaching an efficient dose of 600 mg/day in 7 weeks.

Lithium was gradually stopped two months after initiation of clozapine. At the end of these two months, the granulocyte rate of the patient was normal. Less than 15 days later, WBC was 1.6 G/L and neutrophils count was 0.33 G/L. Treatment with filgrastim was initiated immediately and a prophylactic antibiotherapy continued until neutrophil recovery. The patient has not developed infection. Lithium was finally reintroduced as monotherapy and the patient returned at home 15 days later.

**Discussion & Conclusion** Lithium may be used for treatment of some diseases such as neutropenia of Felty syndrome. Several studies on the coadministration of lithium and clozapine have demonstrated a significant reduction of the risk of iatrogenic neutropenia. This case could be an additional argument to the value of this combination in this indication and brings a new element: the increased risk of

agranulocytosis if discontinuation of lithium is too premature. Yet we cannot be certain about the causal relationship between the two. The coadministration of lithium and clozapine seems particularly interesting when reintroducing clozapine after neutropenia. However, associations that increase the risk of agranulocytosis as carbamazepine, valproate, or risperidone must be avoided and the increased risk of neuroleptic malignant syndrome must be taken into account. Further studies are needed to confirm the interest and safety of this association and the potential risk of stopping lithium associated with clozapine.

**Keywords** clozapine, lithium, neutropenia, prevention

## CCR-6

### Methoxy polyethylene glycol-epoetin beta in the treatment of a patient with chronic renal disease and delayed hypersensitivity to other epoetins

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**Introduction** The methoxy polyethylene glycol-epoetin  $\beta$  (Mircera<sup>®</sup>) is a recombinant erythropoietin, which stimulates production of red blood cells and increases the blood hemoglobin level.

We present a patient with chronic kidney disease (CKD) stage 5 with appearance of delayed hypersensitivity reaction in relation to two recombinant erythropoietin

**Materials & Methods** In August 2004, patient began to be treated with epoetin beta (Neorecormon<sup>®</sup>) subcutaneously (sc) but suffered an episode of pruritus, and generalized microhabonosas injuries directly related to the weekly administration of anti-anemic. Then she was treated with darbepoetin alfa (Aranesp<sup>®</sup>) sc, showing a similar skin reaction, which was suspended the prescription. In April 2006 started intravenous administration of darbepoetin alfa was well tolerated over several administrations. But the appearance of pruritus twice palmoplantar lesions and urticaria, forced the withdrawal of the drug and she required monthly red cell transfusions. In this situation it was decided to test pegylated epoetin  $\beta$  (Mircera<sup>®</sup>), and monitor the effectiveness and tolerance of it. The administration was made in increasing doses (12.5 mg, 25 mg and 37.5 mg)  $\beta$  pegylated epoetin subcutaneously at intervals of seven days to reach the final dose of 50 micrograms (0.6 mg/kg), without observing any adverse reaction. It continued to administer pegylated epoetin  $\beta$  50 mg dose but divided into two injections (25 mg) in the first 3 doses.

**Results** After eight fortnightly intravenous dose pegylated epoetin  $\beta$ , we confirm that the patient tolerates this treatment, maintaining a sustained hemoglobin levels and hematocrit within the recommended range for CKD stage 5 on hemodialysis. In this case, intravenous administration of pegylated epoetin  $\beta$  did not affect the appearance of any cross-reactions arising from the patient's intolerance to epoetin beta and darbepoetin alfa

**Discussion & Conclusion** Thus we suggest that the pegylated epoetin  $\beta$  can be a good alternative to treat chronic anemia in patients with CKD and intolerance to epoetin beta and darbepoetin alfa.

**Keywords** epoetin, chronic kidney disease (CKD), anemia

## CCR-7

### Pharmacokinetics of Oseltamivir Carboxylate in a patient treated by extracorporeal Membrane Oxygenation

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**Introduction** The recommended dose of Oseltamivir (OT), neuraminidase inhibitor licensed for treatment of influenza A and B, is 75 mg twice a day during 5 days. This dose can be increased to 150 mg twice a day during 10 days in complicated infections but has to be reduced to 75 mg three-time a week in patient undergoing a course of dialysis. Loss of antibacterial's concentration has already been reported in patients treated by Extracorporeal Membrane Oxygenation (ECMO), a rescue therapy for critically ill patients with medically refractory acute cardiopulmonary failure. We report the case of a 24 year old patient who received veno-venous ECMO and who exhibited very high plasma levels of oseltamivir carboxylate (OC) while being on continuous hemodiafiltration.

**Materials & Methods** A 24 year old woman was admitted in our intensive care unit for acute respiratory distress syndrome (ARDS) related to influenza A/H1N1 virus infection. On her arrival a 150 mg dose of OT BID treatment was started and an ECMO treatment was initiated on day 1. While the patient was anuric, continuous veno-venous haemodiafiltration was also started on day 1.

OC blood levels were measured on the 4th day of treatment. Blood samples were taken before and 1, 2, 3, 4, 5, 6, 8, 10 and 12 h after OT administration. OT was quantified using an LC-MS/MS method adapted from previously reported methods.

**Results** We found high-level of OC in plasma samples reaching, at Tmax, ten-folds the concentrations reported in healthy volunteers and in patients suffering from non-complicated influenza A/H1N1 (13, 14). Tmax (2h) was consistent with literature data while Cmax (3900 ng/mL) and half-life (15h) reached high values suggestive of an accumulation mechanism. Apparent clearance was also decreased (Cl/F = 25 mL/mn).

**Discussion & Conclusion** This case-report shows that even in patient under continuous haemodiafiltration and ECMO, OC accumulation can occur. The high concentration level found in this patient shows that it is probably unnecessary to increase OT dosage in patients with acute renal failure. As IC50s are very low for OT, usual dosage might be sufficient for these patients. Nevertheless, the impact of renal insufficiency on OC plasma concentrations needs to be further explored, in particular in patients simultaneously treated with continuous hemofiltration and ECMO.

**Keywords** Drug monitoring, Extracorporeal Membrane Oxygenation, haemodiafiltration, Intensive care, Oseltamivir

## CCR-8

### Aprepitant in sodium thiosulfate-induced vomiting

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**Introduction** Sodium thiosulfate is an expanded access program-available drug, effective in calciphylaxis refractory to a standard treatment including cinacalcet and corticosteroids for seven days. The usual treatment administration regimen consists in a 25 g-infusion three times a week for several months. However, this drug can cause severe vomiting, that could call adherence to treatment into question, lead to a major loss in quality of life and disrupt electrolyte balance. Classical antiemetic treatment may fail to succeed in reducing vomiting. New drugs such as aprepitant can be proposed to improve tolerance to the treatment.

**Materials & Methods** We report the case of a kidney-grafted female patient, aged 46, with a recent history of chemotherapy and radiotherapy for a Hodgkin's lymphoma, presenting with calciphylaxis treated with sodium thiosulfate and presenting risk factors for vomiting: opioid treatment due to the pain induced by calciphylaxis lesions. The patient experienced severe vomiting questioning adherence and therefore compromising the success of the medical treatment. Calciphylaxis lesions were particularly painful and incapacitating.

**Results** Vomiting were initially treated using antidopaminergic drugs from the first session on (metoclopramide at first, associated with daily domperidone at the second session), with moderate efficacy. Vomiting repeated led to choose ondansetron after two weeks of treatment (4 mg at first, then 8 mg after five months). Each time, there was an initial improvement followed by a resumption of vomiting, and it was difficult to increase ondansetron dose much more, due to its adverse effects. After 6 months of sodium thiosulfate treatment, it was chosen to use aprepitant, which affects another target of the central trigger zone, using an original drug regimen: 125 mg aprepitant with 8 mg ondansetron for the first session, followed by 80 mg aprepitant 1 h before each session for the rest of the course of treatment. Aprepitant is a substance P neurokinine NK-type 1 receptor antagonist indicated in anticancer-induced nausea and vomiting. Its mechanism of action is selective of acute and retarded vomiting.

**Discussion & Conclusion** Vomiting have stopped during all the time that aprepitant was used, which was well tolerated. Sodium thiosulfate has been continued all the way through, with total treatment duration of 8 months, allowing complete regression of the calciphylaxis lesions and opioid withdrawal, without any relapse 4 months after the end of the treatment.

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**Keywords** Hospital pharmacy, Sodium thiosulfate, vomiting, Calciphylaxis, Aprepitant

#### CCR-9

##### Metabolic radiotherapy of bone metastases: how to deal with cumulative myelotoxicity?

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**Introduction** A 64 year old patient, with prostatic adenocarcinoma, was addressed in the Nuclear Medecine Department for antalgic treatment of bone metastases by metabolic radiotherapy. The patient was initially treated by hormonotherapy with lack of efficacy. Then a palliative chemotherapy was chosen including docetaxel 75 mg/m<sup>2</sup> and zoledronic acid. 3 sessions of antalgic external radiatiotherapy were delivered on the right pelvis (8–6–6 Gy for a total of 20 Gy). It was essential, for this patient treated by chemotherapy and myelotoxic external beam radiations, to minimize the toxicity of metabolic radiotherapy and to choose the most appropriate radiopharmaceutical drug.

**Materials & Methods** Two radiopharmaceutical drugs are approved in France for the treatment of painful bone metastases. A strontium 89

chloride (Sr89), only authorized in prostatic tumor metastases and a Samarium 153 radiolabelled bisphosphonate (Sm153-lexidronam), authorized in all kinds of tumor. There is no study proving any difference in term of pain reduction efficiency between these 2 drugs.

Sm153-lexidronam advantage is to have a shorter radioactive and biological half-life (46.3 h vs 50.5 days for Sr89). This induces a lower haematological toxicity (bone marrow absorbed dose of 1.54 mGy/MBq vs 11 mGy/MBq for Sr89). The time of haematological recovery is thus divided by 3 with Sm153-lexidronam (8 weeks vs. 6 months for Sr89). No interference was reported between Sm153-lexidronam and a bisphosphonate drug nor with docetaxel in the literature and no haematological toxicity increase was proven in such association.

**Results** When the patient was addressed, his antalgic treatment associated transdermic fentanyl (125 µg/h) and a short acting opioid: oral morphine (10 mg, 6 time a day). However, the patient remained in a state of serious pain, (VAS 9/10). Bone scintigraphy showed multiple metastases. Platelet count was 198/mm<sup>3</sup>.

We decided to administer 2500 MBq of Sm153-lexidronam 3 weeks after the latest injection of docetaxel.

The injection of Sm153-lexidronam was well tolerated by the patient. Haematological monitoring was made using weekly blood counting during 2 months. No haematological toxicity was observed but the patient did not notice any pain reduction and the opioid treatment could not be decreased. The patient died 2 months later.

**Discussion & Conclusion** Despite having good tolerance, the Sm153-lexidronam treatment showed no efficacy for our patient. This can be explained by the very advanced stage of the cancer. Usually, metabolic radiotherapy is used as the last solution for the treatment of painful bone metastases. Haematological toxicity should be taken into account for those patients who underwent previous and/or concomitant myelotoxic treatments. Unfortunately, there is no published data available about the tolerance of metabolic radiotherapy after multiple myelotoxic treatments such as external radiotherapy and chemotherapy.

**Keywords** Antalgic treatment, Bone metastases, Metabolic radiotherapy

#### CCR-12

##### Jaw Osteonecrosis with oral biphosphonates: a little-known side effect?

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**Introduction** The first series of jaw osteonecrosis (ON) with intravenous (IV) bisphosphonates (BP) was published in 2003. Jaw ON is the first long-term complication of BP treatment, it is the growth of the necrotic bone outside the oral cavity of patients who are receiving or have received BP treatment. Since then, multiple cases were published for IV BP treatment but very little with oral BP treatment for osteoporosis patients or patients with Paget's disease.

**Materials & Methods** During the last three months, in our Hospital, 3 cases of ON with BP have been reported to the National Adverse Event Reporting System. A retrospective study of these three cases and a literature review were conducted in order to compare patients' data with the data presented in the different published studies.

**Results** Among these 3 patients, 2 have received oral BP treatment (ibandronate and alendronate) for osteoporosis, and 1 has received oral BP treatment (zoledronate) for malignant hypercalcemia due to thyroid cancer. This patient's case matches the literature data, she had two major risk factors: an IV BP treatment and a pathology with cancer. On the other hand, only one risk factor was found for one of the two patients treated with oral BP: taking steroids for polyarthrit



treatment. Maxillary ON appeared after dental surgery in the 3 cases and were followed by persistent bacterial infections which required antibiotics treatment. The 3 patients underwent a surgical treatment with sequestrectomy in order to control ON. However, oral BP treatment was not immediately suspected and re-evaluated, for the 2 patients concerned, BP treatments were stopped during their hospitalization within the internal medicine department in order to manage infectious complications.

**Discussion & Conclusion** The prevalence of maxillary ON with BP could be contained between 1% and 10%<sup>1</sup>, mainly with IV BP, only a few cases with oral BP were reported in the literature. This low prevalence could be due to underestimated cases, explained by a low rate of reports by physicians who are still unaware of the risk of ON with oral BP. Regarding these 3 patients, the suspicion of BP responsibility and thus the re-evaluation of the relevance to continue the treatment was slow in coming. The presence of clinical pharmacists within medical care units could enable physicians to be alerted on this risk of adverse effect and thus to be encouraged to report them. The occurrence of ON of the jaw with BP is uncommon, but it is a potentially serious complication which involves multidisciplinary care and which could be avoided with precautionary measures especially during dental surgery in patients with oral or IV BP.

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**Keywords** bisphosphonates, osteonecrosis

#### CCR-13

##### Severe hypokalemia associated with flucloxacillin

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**Introduction** A 75-year old woman was admitted complaining from severe interscapular back pain and loss of strength in both legs. Spondylodiscitis was confirmed on MRI. Methicillin-susceptible *S. aureus* was identified as causative organism. High-dose intravenous flucloxacillin (6 × 2g) therapy was initiated. Five days later severe hypokalemia [ $K^+$  = 2.59 mmol/L] was observed. The aim of this report was to discuss the role of flucloxacillin as a “non-reabsorbable anion” in inducing and protracting severe hypokalemia.

**Materials & Methods** Case report, based on clinical data and literature review. Traumatology ward at the University Hospitals Leuven, Belgium. The pharmacological evaluation was carried out by the clinical pharmacist.

**Results** Hypokalemia is a common clinical problem. Decreased intake of potassium, increased translocation into the cells, or increased loss in the urine or GI tract can lead to potassium depletion. During admission, dietary intake in our patient was normal and no indication of a shift of potassium into the cell (e.g. alkalosis or insulin) or its loss from the GI tract (e.g. diarrhea, vomiting) were present. Other known causes for increased urinary potassium loss such as diuretics, hypomagnesaemia, corticosteroid therapy, bicarbonaturia, hyperaldosteronism, or renal tubular acidosis, were absent. Increased urinary loss is frequently drug-related, e.g. by the use of acetazolamide, loop-diuretics, thiazide diuretics and penicillin derivatives [1–4].

Penicillin derivatives, in patients receiving high-dose penicillin therapy, can act as non-reabsorbable anions on distal tubular cation

transport and lead to hypokalemia. Like most  $\beta$ -lactams, flucloxacillin is eliminated by glomerular filtration and tubular secretion. Flucloxacillin is a highly water soluble molecule, with low molecular size (453 kDa), which implies high permeability through renal tubular walls. Furthermore, flucloxacillin is a rather strong organic acid with a pKa value of 2.7, thus is ionized at physiological pH. Once flucloxacillin has reached the tubular fluid by filtration, it will act as a non-reabsorbable anion and result in more sodium reabsorption in exchange for potassium.

In our patient oral potassium supplementation was initiated at 3x20 mEq/day, augmented to 26 mEq tid on day 3 and, as hypokalemia persisted, intravenous treatment was started at 40 mEq q24h 5 days later. Moxifloxacin 400 mg o.d. was substituted for flucloxacillin, based on confirmed susceptibility of the identified organism, as moxifloxacin does not induce hypokalemia. The plasma potassium concentration normalized 2 days after flucloxacillin cessation.

**Discussion & Conclusion** Hypokalemia was rapidly induced in our patient after starting high-dose flucloxacillin (6x2g), confirming that penicillin derivatives can cause and protract urinary potassium loss. Plasma potassium concentration normalized rapidly after cessation of high-dose flucloxacillin therapy.

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**Keywords** adverse drug reaction, flucloxacillin, hypokalemia, non-reabsorbable anion

#### CCR-14

##### Bigeminism due to an interaction between voriconazole, esomeprazole and methadone

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**Introduction** Arrhythmia is an infrequent severe cardiac toxicity of methadone. This side effect may occur in patients receiving higher dose of methadone or concomitant agents delaying its elimination. We report a case of bigeminism associated with concomitant administration of methadone, the antifungal drug voriconazole and the proton pump inhibitor esomeprazole.

**Materials & Methods** A caucasian woman aged 26 with acute lymphoblastic leukaemia in relapse and who had an history of drug abuse was treated with intravenous voriconazole (300 mg twice a day) for an invasive aspergillosis. The patient had normal renal and liver functions and no cardiac medical history. She also received levofloxacin, amikacin, imipenem, vancomycin, esomeprazole and methadone (15 mg twice a day orally). At day 4, she presented supraventricular bigeminism without QT interval prolongation. Methadone, voriconazole, esomeprazole, amikacin and levofloxacin were stopped. Blood samples were collected for determination of voriconazole and methadone levels.

**Results** Trough serum concentration of voriconazole and plasma concentration of methadone were high: 9.5 mg/L (target level: 1–4 mg/L) and 1.5 mg/L (expected level: 0.2–0.4 mg/L), respectively. The electrocardiogram normalized 14 h later. Voriconazole (300 mg twice a day) and methadone at a lower dose (10 mg twice a day) were restarted. No other episode of cardiac arrhythmia occurred and 8 days after the reintroduction of both drugs, methadone plasma concentration was 0.57 mg/L while voriconazole serum concentration was 5.5 mg/L.

**Discussion & Conclusion** Voriconazole is extensively metabolized mainly by the polymorphically expressed CYP2C19 isoenzyme and to a lesser extent by CYP2C9 and CYP3A4. Voriconazole is also an inhibitor of CYP2B6, CYP2C9, CYP2C19 and CYP3A4. Esomeprazole is an inhibitor of CYP2C19 and substrate of 3A4 and 2C9. Co-administration of voriconazole and esomeprazole leads to a two-way interaction which results in an increase of levels of both drugs. Metabolism and clearance of racemic methadone are stereoselective, highly variable and has been attributed to CYP3A4, CYP2C19 and more recently also to CYP1A2 and CYP2B6. Therefore, co-administration of methadone and voriconazole may result in a considerable increase of methadone plasma concentrations and related toxicity. Physicians should be aware of the interaction between voriconazole, esomeprazole and methadone leading potentially to severe arrhythmia. Careful drug monitoring should be performed when co-administration of these drugs cannot be avoided.

**Keywords** antifungal medication, arrhythmia, bigeminy, invasive aspergillosis

## CCR-15

### Venlafaxin and/or clindamycin induced agranulocytosis: a case report

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**Introduction** Agranulocytosis is a life-threatening disorder that frequently occurs as an adverse reaction to drugs. Drug-induced agranulocytosis is characterized by a neutrophil number decrease under  $0.5 \times 10^9/l$ , and in serious forms under  $0.1 \times 10^9/l$ , which mostly occurs in patients treated with antibiotics, antithyroid and antiplatelet agents. Here we report a case of drug-induced agranulocytosis caused by venlafaxin and/or clindamycin.

**Materials & Methods** An 88-year-old woman was hospitalized in an orthopedic surgery unit for a streptococcal acute arthritis on her total knee prosthesis, associated with bacteraemia. Oral clindamycin was started on January, 3rd 2010, in replacement of the intravenous antibiotics treatment with cefepime and teicoplanin. She presented an episode of major depression and on January, 13th 2010, venlafaxin was introduced at 37.5 mg/day, then increased to 75 mg/day sixteen days later. On February 7th 2010, eight days later, the patient presented fever and shiver. A blood study was conducted in which neutrophil disappearance and positive bacteraemia, identified as *Staphylococcus epidermidis*, were detected. Clindamycin and venlafaxin were stopped immediately (hematological adverse events are known for both these drugs). Other treatments that were taken since a long time ago were continued.

**Results** Bone marrow examination confirmed the hypothesis of toxic agranulocytosis because of a “myeloid blocking” at the stage of promyelocyte. Treatment with hematopoietic growth factor (lenograstim), one injection/day, associated with a new antibiotic therapy (linezolid, ceftriaxone and ciprofloxacin), was started. The patient’s granulocytes number increased quickly after the hematopoietic growth factor treatment during 3 days, and the removal of both

above-mentioned drugs. Blood cell counts were completely normal on February, 12th 2010.

**Discussion & Conclusion** The woman without previous hematological diseases presented agranulocytosis less than three weeks after venlafaxin and clindamycin administration. Drug-induced agranulocytosis is mediated either by a direct toxicity with destruction of myeloid cells (dose dependent of the drug or the metabolite) which appears during treatment (low doses are sometimes tolerated), or by an immune/allergic reaction (dose independent) requiring a first contact. To explain this toxicity, we deeply suspect a direct toxicity of venlafaxin, whose dose was increased few days before agranulocytosis occurrence. Literature review showed a similar case reported in 2000 [1]. We can although suspect toxicity of clindamycin because several cases are found in the literature. Clinical evolution of agranulocytosis was favorable with treatment. Lenograstim was found to be useful to shorten the duration to standard blood count recovery without major toxicity. This agranulocytosis case has been reported to the drug-monitoring center.

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**Keywords** clindamycin, Drug-induced agranulocytosis, venlafaxin

## CCR-16

### A case report of paroxysmal nocturnal haemoglobinuria after one year of treatment with Eculizumab

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**Introduction** Eculizumab (E) was approved to reduce haemolysis and improve quality of life in patients with paroxysmal nocturnal haemoglobinuria (PNH). E is a new, biological and expensive drug with a high budget impact. The experience in clinical practice with E is limited. We describe the efficacy and adverse events of eculizumab in a case of PNH after 1 year of treatment.

**Materials & Methods** Medical chart review focused on laboratory findings, pharmaco-therapeutic profile and clinical evolution was in a University Hospital. Clinical data included: blood counts lactate dehydrogenase (LDH) level, transfusions requirements as well as symptoms of nocturnal haemoglobinuria, asthenia, fatigue, dysphagia, abdominal pain and erectile dysfunction. Pharmaceutical data included: number of doses and direct costs. Data record included patient’s demographics characteristics and adverse events.

**Results** A 41 years old white man was diagnosed with PNH on 2003 without transfusions requirements. He started treatment with corticoids, iron and folic acid. He refused treatment with oral anticoagulant. On 2006 he suffered an ictus stroke and then he initiated treatment with acenocumarol. The patient continued with active haemolysis and other symptoms as: fatigue, asthenia and severe haemoglobinuria. For this reason, the haematologist applied for Therapeutic and Pharmacy Committee and Medical Direction consent to apply E treatment on December 2008. Finally patient initiated treatment with eculizumab in March 2009 and received meningococcal vaccine previously. Their clinical and analytical parameters were at baseline: LDH 5430 UI/L, Haemoglobin 10 g/dL, platelet count  $132 \times 10^9/L$ , total bilirubine 2, 3 mg/dL, direct bilirubine 0, 25 mg/dL, and severe haemoglobinuria. This chronic treatment was administrated 900 mg weekly for two weeks and 600 mg weekly

thereafter. After one week of treatment, LDH decreased to 500 UI/L (normal range) and others parameters remained on similar range. Actually, patient maintains his transfusions independence, his LDH is in range and he doesn't have fatigue or haemoglobinuria. However haemolysis parameters continue without changes. The patient has suffered only mild adverse events: headache (after two administrations) and lumbar pain. Direct cost of treatment with E has been 409.400 € during this year.

**Discussion & Conclusion** In our patient, E has been well tolerated and has controlled symptoms of PNH for first year of treatment. Due to high cost of E, it is very important that pharmacist and haematologist evaluate together the cost-efficacy of this type of drugs. Pharmacists should get involved in the individualised monitoring of these new expensive biological therapies

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**Keywords** Eculizumab, haemoglobinuria, pharmaceutical monitoring

#### CCR-17

##### Impact of clinical pharmacist to set up a compassionate program during pandemic influenza A

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**Introduction** Bichat Claude Bernard Hospital (Paris, France), specializing in disease infections, was one of the adult reference centers during 2009 pandemic influenza A (H1N1). Antiviral treatment with oral oseltamivir or inhaled zanamivir was recommended for patients who were at risk of complications. Some critically ill patients were not responding to conventional treatment because they required another route of administration or a resistance to treatment was suspected. With the help of clinical pharmacist these patients were eligible for enrollment in a French compassionate program to receive intravenous (IV) zanamivir provided on French temporary authorization of use.

**Materials & Methods** Retrospective data analysis of patients treated with IV zanamivir (medical record) and description of the pharmaceutical care and monitoring: demographic data, risk factors, severity of illness, oseltamivir and IV zanamivir doses, treatment duration, clinical and viral responses assessment, antiviral therapy safety.

**Results** Between April and December 2009, 52 patients were hospitalized in intensive care unit with acute respiratory distress syndrome due to influenza A virus, 5 patients (9.6%) were included in the compassionate program for 10 days of treatment. One patient presented no risk factor for severe influenza A virus, 2 patients (40%) had one and 2 others patients 2 risk factors (chronic pulmonary disease, immunocompromised status, obesity, diabetes mellitus). All patients required mechanical ventilation. Patients were all first treated with oseltamivir within 24 h after the beginning of symptoms according recommendations. When the IV zanamivir was initiate, the median of oseltamivir treatment duration was 6 days [3–10] and a persistent virological failure was observed for all patients. They received 600 mg of IV zanamivir twice a day except 1 pt who benefited of a dose adaptation on pharmaceutical advice because of severe renal failure. Two more critically patients (40%) received simultaneously oseltamivir and IV zanamivir. At the end of the antiviral treatment, 4 patients (80%) had a virological cure. The median treatment duration to obtain viral reversion was 8 days [6–12].

Any adverse event attributable to IV zanamivir was notified. Three patients (60%) were cured and 2 patients died. Deaths were attributed by clinicians to the H1N1 infection and its complications.

**Discussion & Conclusion** Clinical pharmacist in collaboration with clinicians allowed the more severe patients of influenza A to benefit of an unlicensed treatment. In this cohort of critically ill patients treatment with IV zanamivir (following or in combination with oseltamivir) led recovery in 60% of cases. Clinical pharmacist in concert with clinicians has a role in new therapeutic implementation.

**Keywords** influenza A virus, acute respiratory distress syndrome, compassionate program, intravenous zanamivir, oseltamivir

#### CCR-18

##### Negative pressure therapy: a case report of Hemorrhagic Shock after the treatment of a Pressure Ulcer

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**Introduction** Negative Pressure Therapy (NPT) is more and more used in hospitals. This medical device is applied to create subatmospheric pressure in the local wound environment. NPT may increase healing capacity, accelerating granulation properties and reducing wound surface. NPT is commonly used with burns, flaps, ulcers and grafts, but it is contraindicated for several types of injuries, including wounds with bleeding. This clinical case report describes a severe injury occurred with NPT in a medical intensive-care unit of an 814-beds hospital. The aim is to highlight potential risks of this technique.

**Materials & Methods** The medical devices vigilance system of our hospital reported a severe case of adverse incident involving the use of NPT. A multidisciplinary group was created to analyse this adverse event and to take appropriate corrective measures.

**Results** A 61-year-old man with a myocardiopathy for which he was treated with Vitamin K antagonists (VKA) was hospitalized for a Fever of Unknown Origin. The patient developed a decubitus ulcer after several days in the clinical department. This pressure ulcer could not be cured by surgical intervention and the medical staff decided to manage the wound with NPT. Two days after application, the patient was sent to Medical Intensive-Care Unit to manage the massive bleeding of the pressure ulcer, hypotension (BP: 74/56) and deglobulinization. The diagnosis established was a hypovolemic shock due to a massive bleeding associated with curative anticoagulation during the NPT. Packed red blood cells (PRBC) were used to restore intravascular volume and adrenalin was introduced to correct hypotension. The NPT and the VKA treatment were stopped. In the following 24 h, the patient's state remained stable and the outcome was good.

**Discussion & Conclusion** The French National Authority for Health has recently published recommendations relative to the good use of NPT [1]. This case-report highlights the lack of instructions for use and the need of a specific formation for caregivers. There is an opportunity for hospital pharmacists to control the prescription of NPT and reserve it to target indications in order to prevent its use on active bleeding. The multidisciplinary group formed after the incident decided to measure clinical practices through a professional practice assessment. The purpose of this work is to make sure that caregivers know how to use these systems, how to recognize potential problems, and what to do in case of complication.

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1. French National Authority for Health. Recommendations for Negative Pressure Therapy. 27<sup>th</sup> January 2010.

**Keywords** case report, medical device use, Negative Pressure Therapy, wound care

## CCR-19

### Role of pharmacist in the management of ceftazidime overdose

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**Introduction** Mr A, renal transplanted, was treated by ceftazidime 10 g/j, meropenem and colistine on intravenous continuous infusion since March 2010, for an osteitis due to a co-infection with *P. aeruginosa* multi-R and *S. aureus*. The patient was admitted in the Bichat Hospital on day 60 for dyspnea and renal failure. Considering dose and background, a therapeutic drug monitoring (TDM) was advised by the clinical pharmacist and ceftazidime blood determinations have been processed since day 28.

**Materials & Methods** Ceftazidime blood determinations have been processed on high performance liquid chromatography. Case report and bibliography analysis (PubMed, pharmaceutical company and regional centre of pharmacovigilance).

**Results** The results were as follows [usual concentrations on osteitis for a 10/g dose are 70–100 mg/L]: on day 28, 83 mg/L; on day 45, 77.4 mg/L. On day 66, delirium with flapping justified his transfer to the Intensive Care Department. Neurological examination has been processed and showed a conscious but confused patient, symmetric tendon reflexes, flapping and hallucinations. Blood samples were realized and facing the results (380 mg/L), the treatment was stopped after pharmacist advisory until normalized concentration. A favorable status was noticed. The treatment was reinitiated at half doses and with a twice weekly TDM. A notification to the Regional Centre of Pharmacovigilance has been performed.

**Discussion & Conclusion** Few case reports described the occurrence of neurotoxicity imputable to ceftazidime but some cases linked to beta-lactamines have been related particularly with acute renal failure. Occurrence of rare neurological side effects shouldn't prevent clinicians from performing a therapeutic drug monitoring and this should highlight the importance of the clinical pharmacist in the medical staff. Furthermore, the importance of drug monitoring should be noticed under underlying diseases and risk factors unlike other antibiotics which are routinely monitored as aminoglycosides. The interaction between health professionals and especially the key role of the clinical pharmacist is essential in improving the patient's healthcare efficiency

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**Keywords** Ceftazidime, Drug-related problems, therapeutic drug monitoring

## CCR-20

### Anticoagulant activity potentiation with miconazole bioadhesive tablet treatment (LORAMYC®): About three cases

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**Introduction** Miconazole can potentiate the anticoagulant effect of vitamin K antagonists by inhibiting their hepatic metabolism. Bioadhesive slow release tablets of miconazole (LORAMYC®) generate interest for the treatment of oral candidiasis improving compliance and offering better salivary pharmacokinetic parameters and less frequent plasmatic concentration detection compared with miconazole oral gel. As systemic absorption after topical application is low, drug interactions remain weakly described in the literature.

**Materials & Methods** We expose anticoagulant activity potentiation in three patients during miconazole bioadhesive tablet treatment for oral candidiasis.

**Results** Case-patient 1: Warfarin was started in a 96-year-old woman for bilateral pulmonary embolism. Her treatment also included paracetamol, calcium and D3-vitamin. INR was stabilized with 2 mg warfarin even during six days of LORAMYC® treatment. INR 8 was registered seven days after LORAMYC® was stopped.

Case-patient 2: A 87-year-old woman was on fluidione for atrial fibrillation. She was also taking digoxin, amiodarone, oxazepam and sertraline. Five days after starting LORAMYC®, INR value was 4.1, fluidione was reduced, and a second peak with INR 4.5 was found six days after LORAMYC® was stopped.

Case-patient 3: Warfarine was started in a 92-year-old woman for bilateral deep venous thrombosis. Her treatment included furosemide, ramipril, acebutolol, aspirin and L-Dopa/carbidopa. LORAMYC® has been prescribed for seven days and INR 6.8 was observed seven days after LORAMYC® was stopped.

An extensive search excluded other explanations for INR rising (other medications, compliance).

**Discussion & Conclusion** INR elevations occurred about 10 to 15 days after miconazole treatment was initiated. This time lag agrees with cases described in the literature for miconazole oral gel, but continues rather late compared to classic enzymatic inhibition interactions. A large number of tablets were swallowed among patients. It would be thus interesting to study potentially induced modifications of miconazole pharmacokinetic parameters that could explain lasting anticoagulant effect. Despite promising data about low systemic absorption, clinicians should be aware of possible drug interactions with LORAMYC®.

**Keywords** Anticoagulants, bioadhesive tablet, drug interactions, miconazole, oral candidiasis

## CCR-21

### Lethal toxicity after a single dose of pemetrexed

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**Introduction** Pemetrexed is a multi-targeted antifolate agent that exerts its action by disrupting crucial folate-dependent metabolic processes, essential for cell replication. Pemetrexed is used in combination with platinum salts in the treatment of locally advanced or metastatic non-small cell lung cancer and mesothelioma. Very common ( $\geq 1/10$ ) adverse events of all grades toxicity are described, including blood system, gastrointestinal and skin tissue disorders. Pre-treatments with corticosteroid, folic acid and vitamin B12 reduce the incidence and the severity of skin reactions, myelosuppression and diarrhea. The aim of this case report is to make health professionals aware of lethal toxicity of pemetrexed. This case report highlight new aspects of knowledge about the adverse drug reaction of pemetrexed.



**Materials & Methods** We performed a serious adverse drug reaction reporting to the Regional Pharmacovigilance Centre by the pharmacists' team. The patient was followed by pneumologists. The clinical case has occurred in the Intensive Care Department of a teaching hospital.

**Results** We report a case of a 66-years-old who showed a severe adverse drug reaction to pemetrexed/carboplatin. This treatment was used for a lung adenocarcinoma. Ten days after administration of the first cycle of chemotherapy, the patient was hospitalized with a diffuse abdominal pain and diarrhea associated with deterioration of his general condition. Cutaneous lesions including erythema and desquamation were described. Cutaneous biopsy was evidence of drug induced vasculitis. Analysis revealed a pancytopenia (leukopenia of  $0.11 \times 10^9/L$ , haemoglobin decreased to 89 g/L, thrombocytopenia of  $10 \times 10^9/L$ ), acute renal failure and lactic acidosis. A *E. Coli septicaemia* was underlined. An endoscopic documented colitis was shown to be the cause for sepsis. Despite full supportive therapy, pancytopenia persisted; septic shock with multiple organ failure remained unsolved. The patient died, 18 days later to the hospitalisation.

**Discussion & Conclusion** To our knowledge, it is the first case of a severe cutaneous, hematological and digestive toxicity occurring after only one dose of pemetrexed reported in the literature. We suggest that hypothetical role of individual toxicity susceptibility to pemetrexed should be subjected to further investigation.

**Keywords** Adverse drug reactions, Pemetrexed

## CCR-22

### Imiglucerase supplying failure: impact of treatment withdrawal in patients

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**Introduction** Gaucher disease is a lysosomal storage disorder. It is due to a glucocerebrosidase deficiency that leads to an accumulation of its substrate, glucocerebroside in macrophages. This accumulation produces systemic disorders such as hepatomegalia, splenomegalia, bone complications, neurological problems, anemia and thrombopenia. Two drugs are used to treat patients. Miglustat that decreases glucocerebroside rates and mainly imiglucerase that constitutes an enzyme replacement therapy. Imiglucerase is given by infusion every two weeks in advanced forms of the disease. Its efficacy is objectivised by a decrease in chitotriosidase blood rates. From July 2009 to January 2010 an imiglucerase shortage in supply occurred because of a viral contamination in the production plant. The aim of this study is to assess consequences of treatment withdrawal in our patients during this period.

**Materials & Methods** Biological and clinical datas (haemoglobin rate, platelet count, ferritin and chitotriosidase rates) of five patients with Gaucher disease type I (most frequent) were collected.

**Results** Four men and one female, with a median age of 52 years [46–63] were followed. There was no significant change in platelet count, haemoglobin and ferritin rates in our patients. Chitotriosidase rate increased in three patients (30% to 80% according patient). Clinical signs worsening was not observed except for one patient who presented asthenia. During the imiglucerase supplying failure, none of our patients have been treated by miglustat as rescue medication.

**Discussion & Conclusion** The increase in chitotriosidase rate is consistent with the imiglucerase administration arrest. Neither other biological disturbance nor clinical aggravation was observed. Our results confirm data recently reported by Zimran et al who concluded that a short-term drug interruption is not likely to lead to irreversible

complications or return to baseline values of critical clinical parameters. To conclude, in spite of these results, there is no doubt that this crisis induced velaglucirase and taliglucirase—two new enzyme replacement drugs—marketing for compassionate use in Gaucher disease.

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**Keywords** Gaucher disease, imiglucerase, treatment withdrawal

## CCR-24

### Allopurinol induced hypersensitivity syndrome: case report and a literature review

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**Introduction** Allopurinol induced hypersensitivity syndrome (AHS) may occur rarely, however, renal impairment may increase the risk of AHS.

**Materials & Methods** We report a case of AHS in a 38 year old, male patient with CKD. The patient was admitted with a 30-days history of tibia rash, slight increase in serum transaminase and mild fever. He had received allopurinol 200 mg daily for 5 months for asymptomatic hyperuricaemia.

**Results** His laboratory data showed mild leukopenia, thrombocytopenia, marked increase in alanine aminotransferase (ALT) and alkaline phosphatase (ALKP) and serum creatinine concentration. Hepatitis B and C, and autoimmune hepatitis were ruled out. Abdominal ultrasound and scans were normal. Bone marrow aspiration showed hypocellular pancytopenia without any finding compatible with malignancy. Allopurinol was stopped and he was started on prednisolone and hemodialysis due to the progression of renal dysfunction. The consultant dermatologist suspected Varicella Zoster Virose and the patient was treated with acyclovir 200 mg twice daily. The skin rash, serum transaminases, and bone marrow suppression improved gradually and the patient became afebrile. At this time, allopurinol was restarted with a dose of 50 mg every other day by another physician and 2 days the same clinical and laboratory changes occurred again. All these findings improved again upon allopurinol discontinuation by clinical pharmacist.

**Discussion & Conclusion** Renal impairment, diuretic use, male sex, and some opportunistic viral infections such as herpes viruses have been proposed as risk factors to induce AHS. Our patient had at least three risk factors including male sex, taking high dose allopurinol in the presence of renal impairment and concomitantly HSV- infection. To date, there are some cases of AHS characterized by raise of transeaminase with leukocytosis and eosinophilia. Leukopenia and/or thrombocytopenia were infrequently attributed to allopurinol therapy. Our patient showed bone marrow depression without the presence of any other justifiable cause and his bicytopenia improved upon allopurinol discontinuation. Allopurinol withdrawal play major role in controlling AHS. Management consists of supportive care. Corticosteroids have been used controversially. Allopurinol administration

just for accepted indications and adjusting its dose according to renal function may be the ways to decrease the incidence of the toxic effects of this drug.

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**Keywords** Clinical Pharmacy, Drug-related problem, Allopurinol induced hypersensitivity syndrome (AHS)

## CCR-25

### Congenital Thrombotic Thrombocytopenic Purpura treatment in a preterm neonate

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**Introduction** Congenital Thrombotic Thrombocytopenic Purpura (CTTP) is a rare, inherited disease characterized by thrombocytopenia, microangiopathic hemolytic anemia, and kidney disorders. Severe ADAMTS13 deficiency (A Disintegrin And Metalloprotease with ThromboSpondin type 1 repeats) causes thrombotic occlusion in microcirculation. The urgent and chronic treatment is Fresh-Frozen Plasma (FFP) transfusion. For premature babies affected by CTTP, only few studies have been made and limited data about treatment is available. This report presents an effective treatment possible.

**Materials & Methods** At birth (day 0), a premature baby presents a rapidly worsening severe hemolytic anemia and thrombopenia. To correct thrombopenia (day 1), the first line therapy is platelet and Ig (1g/kg) and for anemia, globular sediment. The efficiency of therapy is monitored by hemoglobinemia (N:14–19.5 g/dL), platelet count (N:150–400 G/L). After 24 h, thrombopenia and anemia reduce. After 2 weeks, the patient presents a sepsis and hemogram decreasing. The same treatment plus antibiotics is then prescribed. Her hemoglobin level and platelet count mildly increase. Given the ineffectiveness of treatment, a dosage of ADAMTS13 is made. An important decrease in ADAMTS13 activity (<5%) confirms the diagnosis of CTTP. Prophylactic treatment by Fresh Frozen Plasma is started.

**Results** At admission, platelet count is 39g/L and hemoglobin level is 15,3 g/dL. At Day 1, platelet count and hemoglobin levels fall to 15 g/l and 12 g/dL respectively. After the first course of platelet, globular sediment and Ig administration, platelet count raises to 343 g/L while hemoglobin level continues to fall (10 g/dL at end of Day 1). At Day 15, the patient develops a sepsis. At Day 18, both platelet count and hemoglobin level drop to 22 g/L and 14,4 g/dL respectively. The same day, a second course of platelet and globular sediment transfusion are administered. At Day 26, platelet count is 477 g/L and hemoglobin level is 7,7 g/dL. At Day 27, FFP (10 mL/kg) is administered. Platelet count normalizes (439 g/L at Day 32), and hemoglobin level stabilizes (11,5 g/dL). Prophylactic FFP therapy (10 mL/kg every 3 weeks) is started. Her general health improves.

**Discussion & Conclusion** In case of thrombocytopenia and hemolytic anemia for a premature baby, the classical treatment is Ig and platelet drug administration to correct thrombocytopenia and presume Idiopathic Thrombocytopenic Purpura or Evans Syndrome. This case report illustrates this treatment is relatively ineffective whereas FFP is effective. It proves that Ig cannot be a sustainable alternative to FFP. It may be explained by the fact that FFP contains more plasma proteins such as ADAMTS 13 than Ig. Yet, FFP poses a sizeable risk

for premature babies. Thus, a recombinant ADAMTS 13 could be a promising new therapeutic option for management of CTTP.

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**Keywords** Fresh Frozen Plasma, Neonate, Congenital Thrombotic Thrombocytopenic Purpura (CTTP)

## CCR-26

### Impact of lidocaine as adulterant in cocaine user

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**Introduction** In April 2010, the French Health Department reported the death of a drug user after cocaine abuse with clinical presentation of a lidocaine overdose; toxicological screening showed a 94% lidocaine rate in powder. Lidocaine is an amide local anesthetic that exerts its effects on nerve axon sodium channels which leads to antiarrhythmic effect, sedation, and neural blockade. Given this high toxic risk of lidocaine, we decided to investigate the frequency of lidocaine in cocaine-positive urine samples.

**Materials & Methods** A retrospective single center study was conducted on patients with urine test cocaine positive, from January 2009 to January 2010. The screening assay performed for cocaine detection in urine was a semi-quantitative fluorescence polarization immunoassay (FPIA). Cocaine-positive urine were stored at –80°C and then explored by gas chromatography-mass spectrometry (GC-MS) to overcome cross reaction and identify other drugs like lidocaine.

**Results** Of 433 cocaine urine screening during the study period, 45 were tested as positive for cocaine. Among cocaine positive urines, 8 (18%) samples also contained lidocaine on GC-MS with a significant higher proportion compared to cocaine. The patients with positive lidocaine urine were all hospitalized in emergency room or intensive care unit.

**Discussion & Conclusion** In illicit powder cocaine, the proportion of the adulterants has increased of 50% in 10 years. Different adulterants could be found as sugars (mannitol), inert compounds (inositol, talc), stimulants (caffeine), toxins (quinine) or local anaesthetics such as lidocaine. Our study shows that nearly one fifth of urine samples positive for cocaine also contain lidocaine which is consistent with previous studies.

By its action on the GABAergic system, lidocaine in excessive quantity leads to cardiovascular disorders and central nervous system overstimulation with the appearance of tremors, agitation, or seizures. Regarding cardiac side effects and the severity of lidocaine overdose, a rapid screening of lidocaine associated with cocaine need to be done. The urine test concomitant with cocaine detection is difficult to construe given the lack of pharmacokinetics information (intranasal bioavailability) and strong inter-individual variability. A blood assay for lidocaine rapid and quantitative technique (EMIT or FPIA) is the solution and can be discussed with clinicians.

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**Keywords** adulterant, cocaine, GC-MS, lidocaine

## CCR-27

### Side effect related with unapproved route of administration of amifostine: a case report

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**Introduction** Radiation therapy is commonly used to treat patients with head and neck cancers, and xerostomia is a frequent side effect. Amifostine is a radioprotective agent which the intravenous administration is the approved route. In our clinical experience, amifostine intravenous administration was never tolerated given toxicities such as hypotension, nausea and vomiting.

**Materials & Methods** Clinical studies (phase II trials) have evaluated the feasibility and tolerance of the subcutaneous (SC) administration route and advantages in terms of administration regimen and toxicities' reduction have been reported. We report a case of a 63 year-old man with epidermoid carcinoma of right tonsil (T1 N2 M0) treated by chemoradiotherapy. In order to protect salivary glands which are often affected by curative radiotherapy and to avoid side effects related to amifostine intravenous administration, the SC route of administration was used.

**Results** The patient received amifostine as two 250 mg SC injection (3 ml total volume) 30 min before every radiotherapy fraction. Injection sites were rotated daily and blood pressure were monitoring before and five minutes after the injection. SC amifostine injections were immediately well tolerated. One week after the end of treatment, the patient was admitted because of infiltrated pruritic erythemas occurred around the 6 sites of injection. Six month later, the patient still has purple lesions extending up to 8 cm despite an antihistaminic treatment (desloratadine) and betamethasone cream's application.

**Discussion & Conclusion** This case reminds us that the pharmacist's role is to participate actively in the collection of adverse events and ensure their return to the institutions of vigilance in order to enrich the database and inform health professionals.

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**Keywords** amifostine, radiotherapy, route of administration, side effect

## CET-1

### Analysis of an internet observatory of pharmacists' interventions practices: a 30-month analysis of Act-IP

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**Introduction** The special interest group "Standardizing and Demonstrating the Value of Clinical Pharmacy Activities" was initiated by the French Society of Clinical Pharmacy in 2003. First, we developed a manual codification form of pharmacist's interventions (PI) [1] for daily routine documentation of PIs proposed by pharmacists during medication order review. Second, we developed Act-IP<sup>®</sup>, a website version of this manual form freely accessible for every French speaking hospital pharmacist in order to promote documentation and research in the area of clinical pharmacy activities at <http://sfpc.adiph.asso.fr/admin> [2,3]. This study proposes to describe the PIs documented in Act-IP<sup>®</sup> and to assess factors associated with physicians' acceptance of PIs.

### Materials & Methods

**Design** We performed an analysis of the PIs documented into Act-IP<sup>®</sup> from September 2006 to March 2009 by 201 pharmacists. Data included patient demographic characteristics, name and class of drug involved, pharmacist grade, ward characteristics, type of intervention (drug related problem and PI), and acceptance by physicians. Independent predictors of physicians' acceptance were assessed using multiple logistic regression.

**Setting** 59 French speaking hospitals.

**Main Outcome Measures** Description of PIs, rate of physicians' acceptance of PIs and independent factors associated with physicians' acceptance.

**Results** 34,522 PIs were analyzed. PIs were mostly related to "dose adjustment" (25%), "drug discontinuation" (20%) and "drug switch" (19%). Of the 43,415 medications involved, 28% targeted central nervous system drugs, 17% anti-infective drugs and 16% cardiovascular drugs. 23,413 (68%) PIs were accepted by physicians (15% refusals, 17% non assessable). In multivariate analysis, physicians' acceptance was significantly associated with 1/ drug group: antineoplastics and immunomodulators (OR = 2.29, CI95[1.94–2.69]), anti-infectives (OR = 1.19, CI95[1.11–1.28]); 2/ type of intervention: drug switch (OR = 1.54, CI95[1.43–1.65]), drug discontinuation (OR=1.38, CI95[1.29–1.48]), administration modalities optimization (OR = 1.19, CI95[1.11–1.29]), addition of new drug (OR = 1.12, CI95[1.00–1.24]); 3/ ward specialty: pediatrics (OR=1.83, CI95[1.24–2.70]) and intensive care (OR = 1.34, CI95 [1.10–1.64]); 4/ level of pharmacist integration to the ward: higher when pharmacist is regularly integrated into the ward compared to occasionally (OR = 0.74, CI95[0.70–0.79]) or never (OR = 1.34, CI95[1.10–1.64]) integrated.

**Discussion & Conclusion** These results show that physician's acceptance of PIs was improved for specific drugs, wards, pharmacist's recommendations and when pharmacist performing medication order reviewing was regularly integrated on ward.

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**Keywords** clinical pharmacy, drug-related problems, pharmacist interventions, physicians' acceptance

## CET-2

### Evaluation of drugs' administration practices via feeding tube in an intensive care unit of a tunisian hospital

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**Introduction** Drug administration via feeding tubes is a potential source of iatrogenic events for intensive care patients because of the problem of not adapted galenic forms. We analysed the prescriptions of patients with enteral feedings to determine if the galenic forms were compatible with administration via feeding tubes. We also observed and evaluated the methods of drugs passage by nurses.

**Materials & Methods** We analysed 30 prescriptions of patients with enteral feedings hospitalised in the intensive care unit of Habib Bourguiba Sfax Hospital between April and May 2010, by a prospective study. We also, observed and evaluated the practices of preparation and administration of drugs to these patients via feeding tube by ten nurses.

**Results** Only 12% of drugs were liquids. Eighty-eight percent of the drugs were pulverised or capsule open, then dissolved in water before administration. The galenic form was not in conformity for 20% of drugs because of the prohibition to crushing tablet or opening capsule (gastroresistant form were dissolved...), or because of the administration of a parenteral form (risk of irritation). Among 78 drugs administered by 10 different nurses, the time between passage of the drug and enteral nutrition were not respected for 56% of the observations. The drugs were dissolved in water and managed in mixture for 90% of the observations. The gloves were not worn in 80% of observations and the mask in 90%. No rinsing is made between consecutive administrations and before administration.

**Discussion & Conclusion** This study shows that it is possible to reduce risk of administration errors in the intensive care unit and to facilitate the administration of drug via feeding tube by prescribing liquid oral form or soluble solid oral form. It also shows the need for a cooperation with the pharmacist in order to adapt the galenic forms and to redact protocol of administration.

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**Keywords** drug administration, evaluation, feeding tube

## CET-4

### Impact of a pharmaceutical consultation on the adherence to osteoporosis treatment in post menopausal women

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**Introduction** Due to the occurrence of fractures, the development of appropriate care for osteoporosis patients is necessary. Antiresorptive treatments have demonstrated their efficacy by reducing the incidence of fractures. However, this efficacy is greatly hindered by the lack of compliance and only about 50% of osteoporosis patients have been reported to consistently taking their prescribed medications. In the department of rheumatology (CHU Amiens), osteoporosis patients have been proposed to participate to a study comparing the efficacy of

an interview with a pharmacist with no intervention, at the time of the initiation of an antiosteoporotic treatment, in term of adherence to treatment, i.e. both compliance and persistence.

**Materials & Methods** A prospective randomised study (2006–2007) was performed with matching controls. One group consisted of patients that have profited from a pharmaceutical consultation (CP) and the control group, consisted of patients that have not received a CP. The groups were matched on antiosteoporotic treatments, age, geographic origins. One year after inclusion in the study, the patients were contacted by telephone to assess their adherence to treatment.

**Results** The groups (n = 31) were constituted of patients of an average age of 66.1 years. The patients received the following treatments: –supplements of vitamin D and calcium (vitD+Ca) alone (n = 24) – weekly bisphosphonates (+/– vitD+Ca) (n = 16) – SERM (+/– vitD+Ca) (n = 12) – Strontium ranelate (+/– vitD+Ca) (n = 10). Age at menopause, post-menopausal hormonal therapy or the BMD, did not produce a significant difference. The CP increased the persistence, and 83.4% on the group receiving CP continued treatment, compared to 61.3% in the control group (p = 0.05). The CP also improved compliance, as estimated by the Medical Possession Ratio, which was at 91.2% among patients receiving CP, compared to 71.8% in control patients (p = 0.004).

**Discussion & Conclusion** Pharmaceutical consultations in a hospital setting provide an efficient system for improving patient compliance and persistence in the treatment of osteoporosis. The increased adhesion may therefore contribute to decreased occurrence of fractures due to osteoporosis.

**Keywords** adherence, osteoporosis, pharmaceutical consultation

## CET-5

### Exchanges of patient's data between hospital and community pharmacists: impact on admission drugs prescriptions

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**Introduction** Medication errors are common in hospital and can conduct to adverse drug events [1]. One critical step of prescription at hospital is the copying of patient chronic treatment at admission. A pharmaceutical data exchanges network has been developed in our hospital since five years: chronic treatment and orders of discharge are exchanged between hospital pharmacists and community pharmacists. The objective of this study was to evaluate the impact of pharmaceutical information exchange on medication errors at admission at the hospital.

**Materials & Methods** A study was conducted prospectively in orthopedic surgery and gastroenterology units from October 2008 to February 2010. All patients' prescriptions included in the network were compared with drugs history provided by community pharmacists. All discrepancies were analyzed and classified as medication errors (classified according to French Society of Clinical Pharmacy (SFPC) errors classification) or as appropriate. For all errors, we measured if the pharmaceutical intervention was accepted or not by the physician

**Results** Forty three patients were included in gastroenterology and 288 in orthopedic. Errors have concerned 9,2% drugs in orthopedic and 2,6% in gastroenterology unit. For orthopedic surgery units, 95 patients (34,2%) had at least one medication error. The majority of these errors were omissions (70,8%). For patients included in gastroenterology, three patients (6,9%) had at least one medication error classified only as omissions. Thirty three point eight per cent errors were transmitted to



physicians and 70.8% were accepted by physicians. Errors had not been transmitted to physicians (66.2%) because for 36.2% of cases patients were already discharged from hospital at reception of the medication history, for 17.0% of cases nurses had already informed the physician and for 46.8% of cases were not transmitted for another reason (whether the patient managed his treatment by himself, either the error was not prejudicial for the patient).

**Discussion & Conclusion** Our study showed that the network had allowed to identify errors and to correct 70.8% transmitted errors to physicians. Our network is not adapted for patients hospitalized during a too short period because the patient inclusion takes time and for demented patients because they can't give a written consent. The set up of computerized pharmaceutical records would help physicians to know the chronic treatment of patients. These results should be confirmed by the European Union Network for Patient Safety.

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**Keywords** medication errors, pharmaceutical data exchanges

#### CET-6

##### Two-months analysis of discharge prescriptions for patients with a renal insufficiency

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**Introduction** Renal insufficiency is a common problem for hospitalised-patients. In our experience, about 25% of them have an estimation of glomerular filtration rate (eGFR) lower than 90 mL/min/1.73 m<sup>2</sup>. The non adapted drug to kidney has been evaluated at 34% of prescribed drugs [1]. The number of drugs to be adapted to renal function is lower in community, the non adapted drugs to kidney for sheet discharge should be lower. The objective of this study was to evaluate the degree of renal adaptation of drugs to kidney function for patients discharged from a university hospital.

**Materials & Methods** We realised a retrospective study. All prescriptions sheets were collected for patients with a GFR < 90 mL/min/1.73 m<sup>2</sup> from August 2009 to October 2009 in six units: dermatology, cardiology, rheumatology, digestive surgery and urology. Drugs were classified in four categories: contra-indicated, non adaptation to renal function, well adapted to renal function, and non adaptation to renal function required.

**Results** 365 sheets were analyzed corresponding to 2,410 lines of prescription. 444 prescribed drugs [18.4%] had an interaction with renal function. The frequency of misuse was evaluated at 21% (IC 95% [17%; 24%]): 222 [50%] were well adapted, 70 [15.8%] were not adapted and 22 [5%] were contra-indicated. For 130 drugs [29.3%] it was impossible to conclude without an expective of patient file prescribers interview [for example ACE inhibitors for high blood pressure or renal insufficiency]. Focusing in patients with a GFR < 30 mL/min/1.73 m<sup>2</sup>, we evaluated a misuse of 45%.

**Discussion & Conclusion** This study shows that even for discharge prescriptions, drugs are not well adapted to GFR. In fact community pharmacists cannot suggest an adaptation of drugs to renal function to the physicians because they unknown renal status of patients. Mention of the eGFR on prescription discharge should improve drugs adaptation to kidney for patients and able to sensitize community pharmacists and physicians to kidney related problems.

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**Keywords** dosage adjustment, drugs adaptation to renal function, prescription discharge, renal insufficiency

#### CET-8

##### Outcome of clinical pharmacology and pharmacy project in Cairo University Hospitals: the magnitude of drug-related problems in the critical care units

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**Introduction** Clinical Pharmacy has been recently introduced in the curricular content of pharmacy colleges in Egypt. In view of the increased awareness of drug-related problems (DRPs), a project started in Cairo University Hospitals in 2008 with the main objective of short-term training of working pharmacists/clinical pharmacologists on prescription auditing under support of evidence-based Medicine (EBM). The project is a joint work between the College of Pharmacy and Medicine with the ultimate goal of optimizing drug therapy and minimizing DRPs. We started in the Critical Care Departments, where DRPs are usually life-threatening; hence the great impact on the clinical practice of the overloaded physicians. Here, we present the magnitude of the problem as was detected by the newly trained clinical pharmacists and pharmacologists in a 6-month period.

**Materials & Methods** Data were collected from patients' medical files. The DRPs identified in each In-hospital drug chart were written in standardized auditing sheets. A number of EBM resources (e.g. BNF, Micro-medex, Up-to-date, Cochrane) were used to identify DRPs. The process was carried out by the trained demonstrators of pharmacology and the pharmacists of the Critical Care Departments. The notes taken by the team members were discussed instantaneously with the physicians. Frequently encountered and serious DRPs were also discussed at a higher level. The impact of the project on improving clinical practice in critical care units will be further studied and compared with similar studies and projects.<sup>1</sup>

**Results** Out of 800 in-hospital drug charts revised in the initial phase, 40 charts showed at least one DRP (5%). Patients with DRP aged 54.5 ± 17.7 years (14 females, 23 with cardiac disease). The hospital stay ranged from 3–40 days (mean: 9.8 ± 7 days with 50% of the patients stayed for < or = 1 week). The most frequent DRPs were related to drug-drug interaction overlooked by the treating physician (32 out of 40, i.e. 80%). Improper drug doses were noticed in 16 charts (40%), and incomplete instructions in 11 charts (27.5%). Lack of dose adjustment for patients in special situations (renal, liver impairment,...etc) was reported in 12 pts, and lack of required TDM in 15 pts. Unnecessary drugs as well as duplication of therapy were noticed in 10% of pts' cases revised by our team.

**Discussion & Conclusion** Clinical Pharmacists and Pharmacologists can play a major and indispensable role in patient care through detecting and minimizing drug-related problems. Short-term training of working pharmacists and pharmacologists is necessary especially in critical care departments. The impact of the project on improving clinical practice will be studied at a later stage.

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**Keywords** clinical pharmacy, drug-related problems, prescription auditing, critical care, clinical pharmacy training

## CET-9

### Preliminary outcomes of a therapeutic education program for stroke hypertensive patients

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**Introduction** Medication adherence and lifestyle are the main identified contributors of uncontrolled blood pressure (BP) under antihypertensive treatment (AHT). Therapeutic education (TE) of hypertensive stroke patients could be of major importance to prevent cerebrovascular incidence and relapse. A previous survey has been realized in order to develop the most adapted TE program to such patients. Aims of this work are to report stroke hypertensive patients' experience and to highlight the main practical program difficulties, 9 months after the TE program launch.

**Materials & Methods** This preliminary report included hypertensive patients prospectively hospitalized in a stroke unit for an acute cerebral ischemic event and treated for hypertension (HT) before or following stroke. TE program is assessed with four main supports: pre-TE and post-TE questionnaires, patients' satisfaction and educative diagnostic file (EDF). For this report, pre-TE questionnaire and EDF supports were analyzed. Pre-TE questionnaire included 6 short questions about patients' experience of HT, BP measurement devices and AHT adherence. Patients' EDF included demographical data, general knowledge about HT disease, AHT nature and adherence, personal educative objectives and a TE session report which includes patients' behavior and involvement.

**Results** 28 patients were included (15 women, 13 men; age: 65 to 90 years), 19 education sessions have been realized (mean time long: 40 min), 6 patients did not received TE (2 TE ongoing sessions, 2 short time hospitalizations, 2 medical inabilities) and 3 patients retired from the TE program. 31% of patients ignored their HT, 62% declared to have a good AHT adherence although 54% ignored their treatment. Most frequent personal educative objectives admitted with patients dealt with the physiopathological link between HT and stroke, the pharmacological explanation of their AHT and rules to realize correct BP self-measurements. During TE session, 5% of patients seemed to be anxious, 69% of patients were implicated, 20% appeared to be less motivated and 11% unconcerned.

**Discussion & Conclusion** To optimize the efficiency and pluridisciplinary aspect of the program, several solutions have been undergone: reduce patients' questionnaires, establish specific TE time tables within the stroke unit and improve extension of TE program's information to larger hospital staff with creation of specific paramedical staff. This TE program may improve patients' knowledge and cooperation towards their disease which is of major importance to prevent cardio- and cerebrovascular risks of relapse particularly among weak and vulnerable hypertensive stroke patients. Perspective of this TE approach is to include 50 patients to evaluate the TE program efficacy notably thanks to pre-TE and post-TE patients' questionnaires and patients' satisfaction analysis.

**Keywords** Clinical outcomes, hypertension, stroke, therapeutic education program

## CET-10

### How much do the faculty courses contribute to daily pharmacy practice?

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**Introduction** Pharmacists who are willing to provide pharmaceutical care practices in Turkey mostly consider lack of clinical competence and updated knowledge of drugs and disease management as the major obstruct for providing patient-oriented services. Although clinical pharmacy is a component of the curriculum of all pharmacy faculties, the curriculum is still not “clinical (patient-oriented)” enough. This study aims to assess the practicing pharmacists' attitudes about the contribution of the courses taught at the pharmacy faculty to their present daily pharmacy practice.

**Materials & Methods** A questionnaire asking the participants to score the contribution of the courses to their daily practice (from 1 to 5; where 1 corresponds to “never contributes” and 5 corresponds to “very much contributes”) was used as the survey tool. The survey was handed out to 318 pharmacists who attended to continuing education programs at various times between March 2008 and March 2009. All the answers were analyzed under the three main academic sections: Basic Pharmaceutical Sciences, Pharmaceutical Technology and Professional Pharmaceutical Sciences.

**Results** A total of 297 questionnaires were filled out and returned back; thus, further analyzed. Seventy-five percent of the responders were women. Majority (77%) of the pharmacists had  $\leq 20$  years of experience. Of the pharmacists, 75% were practicing at the community pharmacy setting, while 17.5% were practicing at the hospital setting. Most of the respondents were from the geographic regions of Inner Anatolia (33%) and Marmara (29%); while all other regions and the Turkish Rep. Northern Cyprus were represented to some extent. The pharmacists reported that median (SD) contribution score of the Pharmaceutical Technology courses was 3.0 (1.02); while, it was 3.0 (0.67) for the Professional Pharmaceutical Sciences courses, 2.0 (0.69) for the Basic Pharmaceutical Sciences courses, 3.0 (1.11) for Trainings and 5.0 (1.07) for the Clinical Pharmacy courses. When compared with the hospital pharmacist, community pharmacists found the Professional Pharmaceutical Sciences and Clinical Pharmacy courses more beneficial for their daily practices.

**Discussion & Conclusion** The pharmacists pointed out Clinical Pharmacy as the most beneficial course among all other courses for their daily pharmacy practice. This high rating may suggests the revision of the curriculum towards fulfilling the contemporary education needs of the practicing pharmacists.

**Keywords** Community pharmacy, Hospital pharmacy, Pharmacy education, Pharmacy practice

## CET-11

### Lack of institutional clinical trials in the geriatric population

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**Introduction** Geriatric patients are defined as a heterogeneous population and elderly or very elderly (usually older than 75 years). They often have co morbidities and concomitant therapies. Based on the experiment of our Unity, we investigate how geriatric patients are represented in institutional clinical trials.

**Materials & Methods** We reviewed our clinical trials database with the following key-words: age, geriatrics, neurology, oncology. We analyzed the specificities of the trials conducted exclusively on geriatric patients. Trials including both adults and elderly patients were excluded.

**Results** From 1994 to 2009, our unit participated to 710 trials sponsored by Public Assistance of Paris Hospitals. Only 15 included exclusively geriatric people. These 15 trials handled oncology (4), nutrition (4), pharmacokinetics (1), immunology (1), odontology (1), therapeutic education (1), inner medicine (1), ageing (1), or neurology (1). Most of the studies were randomized (14) and multicentric (13). They included up to 800 patients. We did not found any specificity in the methodology or objectives of the studies. The main inclusion criteria were: age-limit (average: 66,7); elderly patients in institution; or patients hospitalized in geriatric units. The trials involved mainly products with marketing authorization (e.g. comparison of therapeutic strategies), but also some borderline products. None of these therapeutic trials was conducted on a specific and adapted pharmaceutical form. Thus, special attention was paid to the pharmaceutical presentation and management of the treatments. An example is presented.

**Discussion & Conclusion** Geriatric patients present multiple challenges to primary care physicians, but also for clinical researchers. Indeed, we have found that the geriatric population is poorly investigated in institutional clinical trials (2% of clinical trials over 15 years). Physicians use to extrapolate results from young or general population studies to the geriatric one, despite their differences. Trials on geriatric patients should be promoted, and should take into account the specific limiting factors: possible cognitive impairment, co morbidities and life expectancy. In fact, due to the expected evolution of elderly people in Europe (from 84 million in 2008 to 141 million by 2050), the specific needs of this population have to be taken into consideration when developing new medicines.

**Keywords** Clinical institutional trial, Elderly patients, Geriatrics

## CET-12

### Valorisation of clinical pharmacy activities in paediatrics

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**Introduction** Since 2005, the prescriptions in a paediatric surgery unit are computerized. The pharmacists validate the prescriptions and, if necessary, express a pharmacists' recommendation (PR) intended to the prescriber.

**Materials & Methods** The pharmacists detail the medication error and also index the PR in several categories. They register if the prescriber is contacted or if the PR is recorded in the prescription software, so that the prescriber and the nurse see the PR in the software. They also record if the PR is accepted or not.

The purpose of this study was to determine the frequency of medication errors in a paediatric surgery unit to evaluate physicians' acceptance of the PR. The PR between 2007 and 2009 were analyzed according to the items of the SFPC (French Society of Clinical Pharmacy) classification: type of medication error, the nature of the pharmacist intervention, the medication class and the impact of the intervention: accepted, unaccepted or not filled.

**Results** In 2007, 558 PR had been registered, 223 in 2008 and 387 in 2009, concerning 13% of the medication orders. The most common errors were overdoses (50,9%), wrong route or wrong administration (20%) and under dosing (11,6%).

Acetaminophen was the drug most frequently found in the PR (23,2% of the PR in 2007; 23,3% in 2008 and 26,7% in 2009) followed by ondansetron: 19,7%, nalbuphin: 15,6%, codeine: 12,8%.

44,8%, 38,1% and 44,4% of the interventions were respectively accepted in 2007, 2008 and 2009, and 44,2%, 48,9% and 40% were not accepted.

However, when the prescriber was directly contacted, 61,9% (2007), 75,9% (2008) and 69,1% (2009) of the PR were accepted. The differences between these percentages and those of the accepted PR when the prescriber was not directly contacted (2007: 42,7%, 2008: 26%, 2009: 39,2%) were significant for the 3 years (2007:  $p < 0,01$ ; 2008 and 2009:  $p < 0,001$ ).

**Discussion & Conclusion** After 3 years collecting data, we can already see the points that could be improved. When the prescriber is directly contacted, we note that the PR is more followed so the prescribers modify the medication order. The results of this work will be presented to the physicians and the caregivers to make them aware with errors of route or administration, and the dosing problems. By reviewing medication orders, pharmacists can improve the support of the hospitalized children. This would contribute to the development of clinical pharmacy.

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**Keywords** Pharmacists' recommendation, SFPC classification

## CET-13

### Clinical pharmacy during night watch: setting up of a booklet

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**Introduction** In our University Hospital (900 beds), before taking night watches, pharmacist residents receive oral training. In September 2009, a booklet of the most susceptible drugs to control was written. An evaluation was conducted on the impact of the booklet during the night watch on the control of the prescription and on the pharmaceutical interventions (PI) with the clinicians.

**Materials & Methods** In November 2009, the training was made orally for around sixty most susceptible drugs without a written base. In November 2010, the training was made with the booklet. The booklet contains for each drug: indication, local recommendations of use, usual dose and dose adjustment, biological elements to control, drug-drug interactions. In May 2010, thanks to the notes written down by the residents during night watch (18p.m–9a.m), we collected and described retrospectively drug dispensations, number and types of PI (with a statistical comparison; khi2 test) between February–March 2009 (period-1) and February–March 2010 (period-2). We excluded the week-end between 9a.m and 19p.m because a senior pharmacist helped for the dispensation.

**Results** During the period-1, 1,600 dispensations were realized and 384 drugs (24%) were controlled. During the period-2, 2470 drugs were dispensed and 366 drugs (14.8%) were controlled. Information about drugs controlled were missing for 55 dispensations (14%) in 2009 (usable data: 329) and for 73 dispensations (20%) in 2010 (usable data: 293).

During the period-1, 20 PI were conducted (6%) by pharmacist residents versus 57 PI during the period-2 (19.4%). The comparison was statistically significant ( $p < 0.05$ ). Most frequent interventions between period-1 and period-2 involved requests for patient information (7; 35% versus 16; 28%); no adequation with guidelines (6; 30% versus 14; 24.5%); dose adjustments (4; 20% versus 8; 14%) and drug administration (14; 24.5% in 2010). Serious side effects have been avoided in 3 (15%) cases during the period-1 and in 5 (9%) cases during the period-2.

**Discussion & Conclusion** The booklet is a real help to control the prescription during night watch and allows the continuity of clinical pharmacy over the duration of the day. It promotes the PI with clinicians and better patient management and safety.

**Keywords** clinicians, drugs, pharmaceutical interventions

## CET-14

### Work Methods of Medication Reconciliation at Admission and Discharge

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**Introduction** Within the European network EUNetPas, Coordinated by French National Authority for Health, the French Hospital Center of Compiègne tested the feasibility of implementing “Medication Reconciliation at admission and discharge”. Results being conclusive it was decided to routinely set up this good practice in the cardiology department. The aim is to secure the therapeutic care of patients.

**Materials & Methods** The optimal way of ensuring implementation of this approach relies on improving the work methods: The medical file: it includes the patient’s personal and medical information

**Data-interviews base:** it traces information about interviews made before the patient’s discharge

**Data-advice-for-patients base** it is structured and allows homogenizing advice to patients. It was validated by a pharmacist. During the hospitalization of the patient it allows finding, with the cooperation of a resident doctor, prescribed drugs indications, and advice for patients.

**PHARMA software:** extracting the discharge prescription which the pharmacist has to confront with the admission prescription

**Personalized comment intended for the patient:** it recapitulates the evolution of the treatment since admission and comments on the discharge prescription by key messages. It is validated by a doctor resident

**Interview with the patient:** the pharmacist comments him discharge prescription, explains possible modifications, and insists on dangerous drugs. At the end, the pharmacist resident makes sure the patient has understood.

**Results** Routine adoption of these work methods has resulted in being able to evolve them to meet up to our expectations: The desire to optimize drug therapy has led us to enrich the data-interview base with more information: motive of hospitalization, evaluation of the patients understanding.

With the aim of widening the use of data-advice-for-patients base, until now limited to cardiology drugs, it has been extended to all drugs able to appear on a discharge prescription. Besides the advice to the patients all the information about the identity of drugs is also communicated. Notes for the pharmacist are added, they inform him about modalities of prescription and incite him to locate and correct he Doctors’ possible errors.

Personalized comments intended for the patient were modified. Before, personal and medical information were written, now they are

accessible only to the pharmacist. Explanations of possible modifications of treatment are now on the document.

**Discussion & Conclusion** The changes we made to our work methods have enabled us to complete the implementation of good practice and monitor them over time. The next phase will be the interview with the patient. Our objective is to improve efficiency by structuring the information given to patients, making it more efficient by organizing (thanks to the experience gained by other teams) a guideline for use by pharmacists who carry out this interview, and by identifying interviewing indicators of quality.

**Keywords** clinical pharmacy, medication reconciliation

## CET-15

### Dosing chemotherapy in patients with a body surface area superior to 2m<sup>2</sup>

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**Introduction** Chemotherapy doses are most commonly calculated using body surface area (BSA). This approach does not take into account either the tallest and fattest population. Hence, patients with the same BSA will receive the same dose, regardless body parameters and obesity. Therefore, as this method may cause toxicity, many oncologists tend to empirically reduce the dose for these patients, “capping” it at a BSA of 2 m<sup>2</sup>. This may result in significant underdosing in obese or tall/fat patients.

Our Hospital Pharmacy and Therapeutic Committee decided to fix the maximum BSA at 2.2 m<sup>2</sup> instead of 2.0 m<sup>2</sup> in the prescription software (CHIMIO®, Computer Engineering). Each time, prescribers are warned when their patient’s BSA is superior to 2.0 m<sup>2</sup>. This defined a particular population: “BSA over 2 m<sup>2</sup>” patients. After one year of opening, the Chemotherapy Preparation Unit (CPU) performed an evaluation of the impact of this limit on this population’s prescriptions.

**Materials & Methods** This prospective study has been conducted over 2 months (April and May 2010) in the CPU, Pharmacy, Hôpital Saint-Louis, Paris, France (AP-HP).

BSA and Body Mass Index (BMI) were analyzed. BSA was calculated with the DuBois and DuBois formula, based on actual height and weight. Obesity was defined with the BMI, which was calculated and categorized using the World Health Organization criteria (healthy weight: 18–25, overweight: 25–30; class I: obesity (>30), class II: severe obesity (35–40), class III: morbid obesity (>40)).

**Results** Among the 607 patients treated during this period (BSA: 1.28–2.67 m<sup>2</sup>), 92 patients (15.6%) had a BSA superior to 2.0 m<sup>2</sup> (92.4% male).

Out of the 92 patients, 23.9% of them (n = 22, all male) had a BSA of at least 2.2 m<sup>2</sup> (max 2.52 m<sup>2</sup>). In this population, 18.5% had a healthy BMI, 46.7% were overweight and 34.8% (n = 32) had a BMI of at least 30: class I (n = 21); class II (n = 9); class III (n = 2). Fifteen patients had both BSA of at least 2.2 m<sup>2</sup> and BMI >30.

219 Prescriptions lines were analyzed: for 185 of them the dose was comprised in the interval of theoretical dose  $\pm 10\%$ . The practice of “capping” dose calculations, after the software alert, at a BSA of 2.0 m<sup>2</sup> was seen in only 7 patients (non prescriber dependant), 57.1% of them obese. However, prescribed dose was mostly found reduced (41.6%) and unchanged (45.2%).

**Discussion & Conclusion** Our findings highlights that patients with a BSA over 2 m<sup>2</sup> constitutes a major group in our patients’ cohort. However, there is a lack of coherence in the prescriptions for this population. Indeed, as BMI is not evaluated, obese population is not



differentiated from healthy or overweight group. BMI is calculated automatically in the patients' parameters, but is not available at the prescription step. A definition of a new alert message on high BSA and BMI population will be proposed. A special development of the software should be asked.

**Keywords** Doctor behaviour, Oncology, Prescription evaluation

## CET-16

### A 10 hours class based on active pedagogy to get start pharmacy students with therapeutic patient education

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**Introduction** Since July 2009, therapeutic patient education (TPE) has been written down in the French law [1]. In particular, it is mentioned that TPE forms a part of health care process and that health care professionals must receive TPE training. Moreover, the 38th article specifies the pharmacists' role formalizing their implication: "*pharmacist can take part in patient education*". Therefore, in the Faculty of Pharmacy of Paris Descartes, it has been decided to gradually incorporate TPE training in pharmacy studies. For the moment this training is only proposed to students in 3rd year who have chosen community pharmacy course of study. The goal of this presentation is to share our experience about such training.

**Materials & Methods** This ten hours TPE introduction training was conducted by pharmacists graduated and experienced in TPE. The aims of this class were to define TPE and to introduce the students to TPE practice. This non compulsory training had been fractionated in 4 sessions. We used active pedagogy methods although the training set in a lecture hall. Each session included different sequences alternating brief summarizations and pedagogical workshops. To make the workshops possible, we shared out the students into 4 groups. Every session was conducted by 5 moderators: one in each group and a supervising one.

**Results** At the beginning of the first session, students were asked their expectations relating the training. Many of them expected that the class would provide them a TPE definition (12/48) and give them keys to practice TPE in a community pharmacy (10/48). During the last session students were asked to assess the training in aid of a questionnaire using the "target technique". Most students found the training promoted participants' involvement (46/57). Many of them pretended the training met their needs (38/57) and met its objectives (35/57). On the other hand, only several of them found the training suitable for their future job of pharmacist (25/57).

**Discussion & Conclusion** In a first time, students had been puzzled by the class. Finally it appears that they really appreciated the sessions and the use of active pedagogy methods. This kind of training makes the students actors of their own learning process and provides good results in terms of acquisition. Moreover, all methods we employed can be reused to practice TPE so that students can appropriate them. Concerning next year training, we will have to readjust the training in order to redefine the pharmacists' role in a health care process including TPE. Nevertheless, these results are promising. This training will be continued in 4th, 5th and 6th years totalling 40 h as requested by the law. In a second time, this programme will progressively be extended to hospital pharmacy curriculum.

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**Keywords** Active pedagogy, Pharmacy studies, therapeutic patient education, Training session

## CET-17

### Patient treatment follow-up in internal medicine – development and implantation of a new skill for pharmacy student

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**Introduction** Patients hospitalized in internal medicine service are often polypathologic and polymedicamented. That means that must be taken in account: nutrition, life mode, treatment and evaluation of each drug utility. Our study should make students in pharmacy be able to help physicians in therapeutic decision and monitoring.

**Materials & Methods** Creation of two electronic boards on Excel®. The first board concerns drug history review: treatment at entrance, during hospitalization, and when patient leave the hospital. The second board gives diagnosis and patient past data. Information is collected from medical file and CrossWay® software. In a second time, there is development of a new skill (booklet form) for patient observation and treatment analysis. Then we tested the functionality of all these tools on three patients.

**Results** Tools are practical to use: the booklet size can be carried in the pocket and when completed, can be put on the patient file. In this booklet, students in pharmacy can sum up in a few words their pharmaceutical interventions approved by senior pharmacists. Anonymous electronic boards can be consulted from both internal medicine and pharmacy services. Results obtained with our tools are positive: we collected and sum up information from patients' files, we found out pharmacologic profile taking in account the most important elements for prescription's analysis. Tools make possible to give advices about the way to take medicine for one patient, and for another patient to give advices to ameliorate the observance.

**Discussion & Conclusion** purpose is to initiate all pharmacy students in clinical pharmacy. Our method offered proved efficiency when used in an internal medicine service. However, it must be tested with more patients to evaluate reproducibility.

We already noticed that the method help collaboration between the two services. It also makes students in pharmacy have a real working tool and pharmaceutical mission in different care units. This model will be extend to the different clinical services where pharmacy student practice.

**Keywords** Clinical pharmacy intervention, Implementation, Pharmacy student

## CET-18

### Optimization of drugs' use in elderly patients suffering from swallowing disorders

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**Introduction** Swallowing disorders are common in elderly patients; they can complicate the administration of drugs and increase the risk of pneumonia and/or suffocation. In order to avoid such events, healthcare providers have to crush tablets or open capsules before administration which may alter pharmacokinetic and pharmacodynamic properties of the drug.

The objective of this work was to optimize the administration of oral drugs by proposing presentation appropriated to elderly patients suffering from swallowing disorders.

**Materials & Methods** The geriatric department consists of one unit of hospitalization in the long course (N = 31 beds) and one unit of daily hospitalization (N = 4 beds). The pharmacist controls and validates 450 medical prescriptions by month with the Phedra prescription-validation software, and he can leave a message to the prescriber.

Drugs used in the department of geriatrics were listed and information on the existence of more suited presentations were gathered from different databases and from pharmaceutical companies.

**Results** Among the 127 drugs included in the analysis, 60 of them (47.2%) can be dispersed, crushed or opened without affecting their properties. These drugs were listed in a document for nursing use. As for 38 other drugs (29.9%), another presentation containing the same active molecule could be used in patients having swallowing disorders. Syrups and suspensions being the most represented presentations (n = 20). Patches (n = 2), injectable drugs used through oral route (n = 1) and inhaled forms (n = 1) were other possible options. Parenteral route was the single alternative in only 5 cases. For 9 drugs an alternative presentation was available if using another dosage. Finally, there was no direct drug equivalence for the last 29 drugs (22.8%). Prescribers and pharmacists in charge of the validation of geriatric prescriptions can consult the different suggestions of optimization through the intranet of the hospital.

**Discussion & Conclusion** This work, realized in partnership with the geriatric department, provides, in a simple and practical way, guidance for a safe and effective use of the main orally administered drugs in elderly patients. It promotes pharmaceutical care through the control of geriatric prescriptions by a decrease of risks.

**Keywords** elderly patients, swallowing disorders

## CET-19

### Analysis of pharmaceutical opinions issued on electronic prescriptions

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**Introduction** The computerization of medical prescriptions—with the PHARMA software—has been used in the two pilot departments of dermatology and geriatrics since early 2009. The pharmaceutical validation of these nominative prescriptions is performed daily, with pharmaceutical opinions if necessary.

We made an analysis of issued pharmaceutical opinions and measured their impact on prescriptions.

**Materials & Methods** A retrospective analysis of pharmaceutical opinions issued from January 1st, 2010 through March 31st, 2010 on electronic prescriptions of the two pilot departments was carried out using the pharmaceutical intervention sheet from the French Society of Clinical Pharmacy.

For each opinion, surveys were made on:

- The therapeutic class involved
- The description of the problem linked to drug therapy
- The amending process of a prescription

**Results** 159 pharmaceutical opinions were issued (100 for dermatology and 59 for geriatrics). It represented 24% of nominative prescriptions.

The most common medicines concerned were blood and hematopoietic system drugs (22%), anti-infective drugs (21%), cardiovascular system drugs (18%) and nervous system drugs (14%).

The main identified problems concerned inappropriate methods of administration (28%), monitoring to follow (16%) and overdose (12%).

Physicians acknowledged 94% of pharmaceutical opinions. A change in prescription was performed in 67% of cases in the department of geriatrics, but only in 34% of cases in the department of dermatology. The medical interventions mainly consisted in drug interruption (25%), optimizing the methods of administration (23%), and adjusting the dosage (17%).

**Discussion & Conclusion** The impact of our pharmaceutical opinions on prescriptions is limited compared to other studies [1], especially in dermatology where treatments introduced by general practitioners are rarely amended.

We identified recurrent problems related to miswritten prescriptions, notably for administration methods of injectable drugs. This analysis highlights heterogeneity of practice among the different opinions of pharmacists. A reflection on harmonization of practices is in progress in order to enhance the relevance of pharmaceutical opinions. The study emphasizes the importance of prescriber's computer training, and the daily support provided by the pharmacist while using the software.

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**Keywords** Drug use process, Electronic prescription, Pharmaceutical analysis, Pharmaceutical opinion

## CET-20

### Elaboration of a teaching tool for antibiotics in aid of pharmacists and interns in pharmacy

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**Introduction** A Pharmacist/Infectious Disease Specialist operational team was implemented in our hospital. The role of this team is to meet physicians directly in care units in order to specify the clinical context of prescriptions identified by the pharmacist, and eventually to propose a new prescription if needed. Within the framework of our experience in this domain, the need of teaching pharmacist and interns in pharmacy in the field of antibiotics appeared rapidly after implementation of the team. In order to propose key notions with constant quality of the formation whatever the trainer, we wished to elaborate a complete, convivial and practical tool, allowing the standardization of knowledge for pharmacists and interns in pharmacy implied in the team.

**Materials & Methods** Key knowledge essential to the work of the pharmacist and intern of pharmacy were identified during our practice. Then, we thought about their formatting through a slideshow carried out using the software Microsoft® Office PowerPoint® 2007.

**Results** Our slideshow is articulated around seven principal sections: “Antibiotics of frequent use”, “Antibiotics of rare use”, “Diseases/Bacteria”, “Order analysis”, “Toolbox”, “Good questions” and “Knowledge evaluation”. For example, the section “Order analysis” provides a sum of practical advices, locally adapted for the pharmaceutical analysis. Another example: for antibiotics of rare use, we created an identification sheet for each, summarizing the paramount elements such as useful spectrum, usual dosage, interest, and principal use. Navigation through the slideshow is allowed by links or buttons which give an easy-to-use side to the slideshow. The data-processing support allows an easy and at will update of the tool. So it could be diffused later over a network of virtual education of clinical pharmacy.

**Discussion & Conclusion** This tool offers an attractive answer to the problem of teaching interns by applying knowledge acquired in university to the daily practice. The section “Knowledge evaluation” will allow futures improvements, thanks to user’s feedback.

**Keywords** antibiotics, operational team, teaching tool

## CET-21

### Identifying the needs of liver-transplant patients concerning therapeutic education

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**Introduction** Since March 1999, a pharmaceutical therapeutic education consultation has been held to liver-transplant patients (35 patients/year) within our hospital. Educational and communication techniques based on Calgary- Cambridge interview are used. However, given the complexity of the situation of these patients, educational care cannot be limited to pharmaceutical competences. The aim of our work was to identify educational fields mentioned by patients.

**Materials & Methods** A semi-structured interview was proposed to pre and post-transplanted patients during a hospital stay or a consultation in the hepatology or surgery departments. Open questions were related to their real-life experiences through the health system since the announcement of the transplantation project. 40 Questions related to the disease, transplant, treatments and daily life allows us to specify their needs. Patients answered on a four levels appreciation scale (fully, rather, not really, not at all).

**Results** 14 patients (average age: 53) interviewed. 86% transplanted. 93% Declared their satisfaction by the overall care they get.

43% Told that it is or was hard to consider the transplantation plan (risk of death, complications, addiction).

Among the transplant patients 92% mentioned their immunosuppressant treatment (75% named the drugs).

50% Expressed that they didn’t know how to cope with side effects and 57% would like to have more knowledge.

70% declared their will to deepen their knowledge of the disease, 36% the transplant (informed consent, potential adverse events).

During the pre-transplant period, these needs are rather of practical order (welfare payments) or involved knowledge of the disease and future treatments.

Patients who have been transplanted for less than 3 months express their difficulties dealing with the side effects of drugs, the lack of psychological support...

The other patients evoked their difficulties to overcome the post-transplant complications from which they didn’t receive sufficient information.

The families also expressed their need to be accompanied by attending talking groups. 79% would like to benefit from therapeutic education consultation.

**Discussion & Conclusion** This work highlights that educational needs are still different and strongly related to the patient status regarding the pre- or post-transplantation phase. The possibility to have a privileged interlocutor among the therapeutic educational team seems to be important.

This work allowed us to create a framework of skills truly based on patients’ needs. Keeping in mind the necessity of coordinating the discourse within professionals, we now have to define the needs required to implement an extension of the initial education program (nature and amount of health care professional resources, training, tools and evaluation).

**Keywords** Patient Education, quality of life

## CET-22

### Patient medication knowledge and adherence in neurological rehabilitation medicine

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**Introduction** In neurological rehabilitation, educational therapeutic programs are often focused on medical and paramedical care, without considering specifically the pharmacological treatment (PT). The profile of patients (cardiovascular risk factors, long-term and complexity of medications, cognitive or memory problems) motivated the implementation of a pilot study concerning PT. The aim is to present medications knowledge and adherence of patients, evaluated during pharmacy counseling.

**Materials & Methods** The study (July-December 2009) included only ambulatory patients (at least 3 months after hospital discharge), having 5 or more prescribed drugs, including at least one medication among: analgesics, antispastics, antiepileptics, psychotropics, cardiovascular disease prevention medications (including antithrombotics). The pharmacy counseling was proposed to patient after medical consultation. 2 Questionnaires were used: one evaluating the level of knowledge (15 items) and the other the adherence (10 items). Information and practice advices on PT were also given by pharmacist. The conclusion of counseling was discussed with patient and physician, and then recorded in the patient medical file.

**Results** 31 patients (18 men and 13 women) were interviewed by pharmacist. The average age was 57 years (+/-15 years). 21 patients were accompanied by a family member. The mean duration of the interview was 30 min. Level of knowledge: 71% of patients/family member explain clearly the medications indication, 92% the surveillance to be realized when one is necessary. Only 50% know the difference between their chronic and crisis treatment. 91% know the risk of double dose, when they have forgotten the previous one. Adherence: 65% describe exactly the name and the dosage schedule of medications taken the day before. 46% use a pill box and 40% don’t manage themselves their treatment. 39% mention adverse effects that may affect their adherence.

**Discussion & Conclusion** These primary results show a relatively good PT level of knowledge. They are probably biased for PT adherence evaluation due to the lack of adapted tools used during interview. Nevertheless, the time of the intervention seems to be appropriate: it takes place after discharge, when the patient is confronted with the “real life”. The study underlines the importance of family (for 60% of patients) in the management of medications. The

impact of this pharmaceutical intervention on patient behavior is not yet evaluated; however patient's satisfaction score is good. This first approach is relevant because it permits to better understand patient's representations of their illness and long term PT. The next step will be to implement this approach in a multidisciplinary educational program focused on secondary prevention of cardiovascular disease for post-stroke patients.

**Keywords** adherence, neurological rehabilitation medicine, pharmacy counseling

## CET-23

### Improving drug adaptation to kidney: example of a hospital and community pharmacist network

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**Introduction** The prevalence of renal insufficiency has been reported to be up to 25% in our hospital; about 3% to 15% of drugs need to be adapted to Glomerular Filtration Rate (GFR). For 5 years, a data exchange network had been set-up between hospital and community pharmacists to secure inpatient's prescription. In CHRU of Tours, the Modification of Diet in Renal Disease (MDRD) is now used to calculate GFR and is communicated to care units. Today, if necessary, only 55% of prescriptions are no adapted to GFR in inpatient's prescription [1]. To secure procedure to monitor drug prescription in both in- and outpatient's prescription with a renal insufficiency, a health care team including nephrologists and hospital pharmacists has been set up.

**Materials & Methods** Health-care team:

- organize formation for community pharmacists and general practitioners to explain the network in order to assure safe and rational use of drugs in renal insufficiency in both in- and outpatient;
- create a table with drugs that require an adaptation for patients with a renal insufficiency;
- define groups of patients at risk in term of DFG.

**Results** Four formations were organized between hospital physicians-pharmacists and community pharmacists, formations corresponding to 30% of community pharmacists. Health-care team explained network, presented examples of drugs that require renal adaptation and exchange experience with both community physicians and pharmacists. Now, health-care team develops education session associating community pharmacists and general practitioners to optimize drug adaptation for patients with a renal insufficiency. Two sessions have been already organized with community pharmacists and general practitioners. GFR are systematically communicated for inpatient's prescriptions to inform community pharmacists. A table of 158 drugs has been created to list drugs that required a renal adaptation for patients with  $GFR < 30 \text{ ml/min/1.73m}^2$ .

**Discussion & Conclusion** Improving communication between hospital and community physician or pharmacist has been shown to be the most effective way of preventing discrepancies in drug treatment for both in- or outpatient. Mention of GFR on prescription discharge could improve drugs adaptation to kidney but require a long term monitoring. Moreover, this process can be evaluated to see the benefit of the network to secure prescription for patients with a renal insufficiency.

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**Keywords** drug adaptation, renal insufficiency, Glomerular Filtration Rate (GFR).

## CET-24

### From geriatric service to primary care: a retrospective pharmaceutical analysis of the medical prescription

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**Introduction** The population of elderly persons is increasing and negative outcomes due to polymedication are frequent. Discrepancies in information about medication are frequent when older persons are transitioning from hospital to home, increasing the risk of hospital readmission. The aims of this study were a) to determine discrepancies in medical regimen indicated in two official discharge documents (DS = discharge summary, DP=discharge prescription); b) to characterize the pharmacotherapy prescribed in older patients discharged from a geriatric service.

**Materials & Methods** Elderly patients (N=230) discharged from the geriatric service (CHUV, Lausanne) over a 6-month period (January to June 2009) were selected. Community pharmacists compared DS and DP to identify discrepancies including (a) drugs' name; (b) schedule of administration, dosage, frequency, prn prescription, treatment duration and galenic formulation. Beers' criteria were applied to identify potentially inappropriate drugs and a descriptive analysis of drug costs, prescription profiles and generics were also performed.

**Results** On average, patients were  $82 \pm 7$  years old and stayed  $23.0 \pm 11.6$  days in the geriatric service. The delay between the dates of patient's discharge with the DP and the sending of the DS to his general physician averaged  $14.0 \pm 7.5$  days (range 1–55). The DP had an average of  $10.0 \pm 3.3$  drugs (range 2–19). 77% of patients had at least one discrepancy. A drug was missing on the DS in 57.8% of patients and 19.6% had a missing prn prescription. Among the 2312 drugs prescribed, 3% belonged to Beers' list. They were prescribed to 61 patients (26.5%), with 6 patients cumulating two Beers' potentially inappropriate drugs in their treatment. Analgesics (85% of the patients), anticoagulants (80%), mineral supplements (77%), laxatives (52%) and antihypertensives (46%) were the drug classes most frequently prescribed. Mean costs of treatment as per DP was  $160.4 \pm 179.4$  Euros. Generic prescription represented more than 5% of the costs for 3 therapeutic classes (cholesterol-lowering agents (64%), antihypertensives (50%) and antidepressants (47%)).

**Discussion & Conclusion** The high discrepancy rate between medication listed in the DP and the DS highlights a need for safety improvement. Potential benefits are expected from reinforced pharmacist-physician collaboration in transition from hospital to primary care. In addition, even though Beers' criteria are questionable, the drugs prescribed in this already fragile population, and the potential opportunities of economical optimizations, are advocating the development and the scientific evaluation of a structured advanced collaborative pharmacy practice service. This foresees improved



effectiveness, safety and efficiency in the medication management of elderly persons.

**Keywords** Advanced collaborative pharmacy practice service, Continuity of care, Medication discrepancies

## CET-25

### Pharmaceutical interventions circuit and redaction: what is prescribers opinion?

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**Introduction** In our institution, drug related problems and consequently pharmacist clinical interventions are transmitted to medical team in a written form. These reports detail drug related problem detected, risk, suggestion or intervention of pharmacist and monitoring implementation. A survey of physicians realised in 2004, allowed to propose the latest version of intervention report. Meanwhile, since October 2004, a pharmacist referent is present every day in each clinical department. The aim of our practice investigation was to analyze, since this change, the different stages of interventions circuit.

**Materials & Methods** A questionnaire consisting of nine closed questions was sent by internal mail to each physician usually receiving interventions, or a total of 28 prescribers. The following data were analyzed: writing, transmission to doctors, sending a reply to the pharmacist and archiving.

**Results** Just over half of physicians (54%) returned the questionnaire. Most of information transmitted in intervention reports are clear and understood but they want details about the proposed intervention by pharmacists (36%), risk and side effects (29%) and the monitoring to be applied (29%). In fact, 80% of physicians sometimes ask to clarification to referent pharmacist of service. Regarding the transmission of interventions, doctors have identified several solutions: by nurses (47%), through the prescription book (40%), or by the pharmacist referent (27%). Over half of physicians (67%) want a change from the current transmission mode and they think that intervention should be transmitted to them directly by writing (50%) or phone (40%). After intervention, answer is transmitted to pharmaceutical team by 40% of physicians and this transmission is easier near of referent pharmacist of clinical department (75%). Finally, less than half of prescribers (43%) systematically archive the intervention in the patient record.

**Discussion & Conclusion** This survey has identified some critical points in the circuit of written intervention requiring a modification of the intervention's support compared to the version of 2004 (repeal of written response, greater emphasis given to the description of intervention and risk), an awareness of pharmacists on best practices of writing and reflection on institutional archiving of interventions in the patient file. By cons, this study has highlighted the key role of the pharmacist referent in the communication with prescribers.

**Keywords** drug related problem, pharmaceutical intervention

## CET-26

### Patients under Vitamin K antagonist: education to self-medication

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**Introduction** The cardiovascular and metabolic pharmaceutical team of the Hospital of Toulouse has integrated the anticoagulant clinic, a

structure dedicated to educating patients on vitamin K antagonist treatment (VKA) during days of therapeutic education (TED). After finding that the TED's workshop had been unsuccessful for a few patients, the team has decided to renew its educational teaching tools. The first objective has been to define patients' expectations regarding their medication. Following this inventory, the team chose to create a new educational tool to promote self-medication.

**Materials & Methods** Upstream of this project, we conducted a telephone survey of a sample of patients participating in TED (25%). This helped prove that 97% of them want to have pharmaceutical advises and that 51% specifically on the over the counter (OTC) drugs. We decided to use the list of OTC drugs published by AFSSAPS (French Agency for Sanitary Safety of Health Products). We first reviewed literature for drug-drug interactions between oral anticoagulants and the 274 specialties of this list. The information gathered was then used to provide authorization or to forbid each of the 74 DCI. We then developed a simple visual message to sort interactions. We used the principle of traffic lights: green when administration is allowed, orange when allowed under certain conditions (INR control, medical assistance required), and red when banned.

We then developed an educational workshop. The exercise begins with a simulation of a mild disease chosen in the AFSSAPS's list. The educator asks patients to list all self medication drugs that they usually take. Then they rank these drugs according to the rule of traffic lights. He helps patients find a solution by giving them hints using his expertise, interpersonal skills, assessing the patients' knowledge. To supervise self-medication at home patients should be given responsibilities while avoiding excessive autonomy. Therefore we decided to give patients the complete list of interactions. The support we chose is an educational booklet containing the principle of traffic lights.

**Results** After six months of bibliography and conceptualization, a workshop test will take place in July. This test will be conducted by the EVACET structure (Evaluation and accompaniment of TE). It will make a first assessment of the implementation of new teaching tools. The workshop "Self-medication under AVK" will begin in September 2010 led by a pharmacist. The booklet will be given to each patient participating to the workshop (150/year).

**Discussion & Conclusion** One challenge will be periodically updating data. In addition, it is necessary to verify regularly that this workshop answers patients' needs, and moreover to ensure that the patient empowerment is well controlled. This will involve regular re-evaluation of the educational effectiveness of the workshop and assessment of patient knowledge.

**Keywords** educational workshop, OTC drugs, self-medication, therapeutic education program, Vitamin K antagonist

## CET-27

### Development of an education program for patients receiving rivaroxaban

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**Introduction** A therapeutic educational program (TEP) for patients receiving rivaroxaban was developed in our hospital to increase patient's knowledge about their treatment and to prevent iatrogenic disease.

**Materials & Methods** The study began in January 2010. After inclusion of the patient by the anaesthetist, a pharmacy student carries out a TEP. The first session takes place 2 days after the intervention

using a questionnaire. The second session takes place the day before the patient is discharged from the hospital using the same questionnaire. A follow-up book is given to the patient as well as a “rivaroxaban aid book” recalling key points of the treatment. We have assessed how the patient’s knowledge improves between two sessions using statistics, comparing the level of knowledge of the name of rivaroxaban, the moment they take it and the moment they detect signs of bleeding. At the end of the treatment, a follow-up telephone call is carried out in order to assess compliance, the emergence of possible adverse effect (AE) and the usefulness of the TEP.

**Results** A total of 50 patients [aged: 49–86] were included in the study. Only 46 patients (92%) received two sessions of TEP and 39 patients (85%) whole of their treatment with rivaroxaban.

Between two sessions, TEP has had an strong effect on the moment of taking AC (20 patients vs. 30 patients), a median effect on detecting signs of bleeding (3 patients vs. 12 patients) and no effect on the knowledge of the name of rivaroxaban (4 patients vs. 8 patients).

Telephone follow-up confirmed that all of the 39 patients were compliant and 3 patients have mentioned AE. Only one patient has had its treatment modified.

The TEP has been useful to 34 patients (87%): documents were appreciated as well as information about treatment.

**Discussion & Conclusion** This study shows that elderly patients with a lot of drugs do not have initial knowledge of their medication, but the TEP significantly enhances this knowledge and contribute to the optimization of patient support.

**Keywords** clinical pharmacy, therapeutic education program

## CET-28

### Impact of a clinical pharmacist intervention in a cardiac medical unit

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**Introduction** The aim of this work is to use pharmaceutical intervention forms of SFPC to describe medicine errors in a cardiac medical unit, analyzed by a resident pharmacist.

**Materials & Methods** Pharmaceutical validations of computerized prescriptions are made by the resident pharmacist on PHARMA software, according to data collected in DX CARE software.

**Results** 31 pharmaceutical intervention forms have been completed without major consequence for patients (only prescriptions errors).

*5 Concern insulin therapeutics:* 2 dose errors (prescription in ml instead of IU), 2 regimen errors (a forgotten prescription of slow insulin in the evening and a prescription of a rapid insulin in the evening instead at midday) and 1 bad transmission between IV and SC injection from surgery unit to medical unit;

*8 Concern outpatients prescriptions:* 2 dose errors (prescription of a double dose of oral sodium with a risk for a patient with heart failure), 1 error of product (prescription of metoclopramid instead of domperidon with a risk of adverse effects), 1 error of duration of treatment, 4 errors of therapeutic regimen.

1 Concerns an error of dose adaptation of an antibiotic for a patient with renal failure.

1 Concerns a drug interaction. 1 concerns a bad choice of a galenic form. 7 concern a double prescription of the same product. 5 concern errors of computerized prescription. 1 concerns a bad duration of treatment.

2 Concern drugs monitoring.

**Discussion & Conclusion** The role of clinical pharmacist to reassure prescription is double: validation of prescriptions and validation of protocols. The interest of computerization of prescription with automatic data transmission to the pharmacy department is reduced by new types of medicine errors, errors due to different approaches between computerization and medical methodology. Then the pharmaceutical validation plays its whole role.

**Keywords** clinical pharmacy, medicine errors, computerized prescription

## CET-29

### A retrospective analysis of chemotherapy induced side effects among patients with cancer monitored by non administered preparations

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**Introduction** At the Georges Pompidou European Hospital, the pharmacy department provides all the clinical wards with chemotherapy compoundings. In 2008, we built an innovative program in order to optimize our organisation. FabAct<sup>®</sup> is a program that allows its users to define the molecules which preparation (according to a medical prescription) can be anticipated before the final medical validation. Several criteria are taken into account: molecule cost, number of preparations performed annually and the stability. However, in some cases, the preparation cannot be administered because of a side effect that forbids the administration. Monitoring the non-administered preparations offers us the opportunity to perform a retrospective analysis of chemo-induced side effects among cancer patients.

**Materials & Methods** In order to be exhaustive, non administered preparations were systematically destroyed at the pharmacy. We performed an eight months monitoring between June 2009 and January 2010 using an Access<sup>®</sup> (Microsoft) database where were reported the molecule, the dose and the side effect that led to the non-administration of the preparation. Among the molecule that we are daily preparing, four were selected for an anticipated preparation (fluorouracile, cisplatine, oxaliplatin and paclitaxel) in relation with the recommendation provided by FabAct<sup>®</sup>.

**Results** 311 non administered preparations were listed from a global amount of 12,880 preparations performed during this period (2,5% rate). Side effects mostly reported were related to hematologic toxicity (25%), performance status alteration (19%), infection (13%), digestive toxicity (8%), neurotoxicity (5%), fatigue (4%), allergy (2%)... Fluorouracile was involved for 45% of the non administration cases, oxaliplatin 20%, cisplatine 6% and paclitaxel 4%.

**Discussion & Conclusion** These results clearly demonstrate that a retrospective analysis of the choices made regarding the anticipated preparation is mandatory. Due to its long-term stability, fluorouracile shelf life has been extended because we noticed that, in most of the cases, the administration was only postponed after the occurrence of the side effect with no modification of the dose. This corrective action will surely decrease the rate of preparation not administered. Regarding oxaliplatin, neurotoxicity was mainly reported and is related to a cumulative dose toxicity, the non anticipation of the preparation after the third cycle should be the solution to evaluate. Consecutively, as the hematologic toxicity was mostly reported, we implemented another program in order to perform the medical validation the day before the chemotherapy according to the last biological report and a clinical questionnaire filled through a phone call to the patient.

**Keywords** chemotherapy, side effects, non administered preparations, the anticipated preparation

## CET-30

### Evaluation study of the predictors of publication productivity among hospital pharmacists

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**Introduction** To our knowledge, there are no data dealing with a detailed comparative description of the publishing productivity of hospital pharmacists between France and Canada. Nevertheless, our professional experience based on our previous exchanges between France and Quebec led us to believe that French hospital pharmacists published more than did their colleagues in Quebec. Within this context, our intention was to identify and compare the publishing productivity of hospital pharmacists in France and Quebec.

**Materials & Methods** Variables that relate to scientific publishing were identified through a review of literature and organized into four themes (i.e., personal and professional situation, hospital activities, research and publishing activities, publication-related motivations and perceptions). A 58-questions questionnaire was developed that included multiple choice questions and short development questions. The questionnaire was published on the SurveyMonkey site. The continuous variables were compared using Student's or Mann-Whitney *T* tests according to the normal or abnormal distribution of the variable. Chi-square tests were used to compare the categorical variables. Ordinal logistic regression was used to model the number of papers published in Medline-indexed journals.

**Results** 422 Hospital pharmacists (218 respondents from France and 204 from Quebec) were recruited. Results showed that pharmacists from France published more than those from Quebec, even when considering factors such as time worked and gender. We noted a significant difference between the respondents who had published and not published for 18 of the 28 predictive factors and an absolute variance of at least 20% for five professional factors and five factors related to team dynamics and motivation. The ratio of respondents working in a University Health Center was lower in France than in Quebec (46 vs. 70%,  $p = 0.001$ ) as was the ratio of respondents who had indicated a mastery of English in France than in Quebec (43 vs. 88%,  $p = 0.001$ ). This study highlighted seven predictive factors: practicing hospital pharmacy in France, being male, having academic duties or a PhD, having participated in a clinical trial, having secured funding in one's own name for a research project and the number of hours of work put in during a week.

**Discussion & Conclusion** Scientific publishing is a key activity that can affect the promotion of hospital pharmacists in France more than it can those in Quebec. Scientific publishing is more influenced by competition and promotion than by other professional motivations. Pharmacy practice has experienced unprecedented growth over the last few years. Hospital pharmacists are called on to contribute more than ever to scientific publishing in both clinical research on medications and evaluative research on modes of healthcare intervention including pharmaceutical practice.

**Keywords** publishing, factors, hospital pharmacists, questionnaire

## CET-31

### Implementation of a patient education programme in breast cancer women

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**Introduction** Patient education has been progressively emphasized as an essential component in chronic disease care in France. With treatment improvements cancer is being increasingly considered as a chronic disease. However, research and practices in patient education remain very limited in oncology.

**Materials & Methods** An education programme for cancer patients was designed and established at our centre by a multidisciplinary working group involving a physician specialized in onco-geriatrics, a haematologist, 2 nurses, a dietician, a pharmacist and pharmacy resident. The initial population studied was targeted for breast cancer patients aged 60 years or more, treated by oral chemotherapy (capecitabine, lapatinib and vinorelbine). Women will be seen after a medical consultation introducing the oral chemotherapy as a new treatment. In the initial stage, the educational consultation will consist of the patients learning how to adequately plan their treatment. The caregivers will also benefit from the consultation to perform a review of the patient's medication (drug-drug interactions, self-medication evaluation). Subsequently, a meeting aimed at assessing the skills of the patient will be held. If such skills are deemed sufficient, the patient will benefit from a consultation in order to learn how to manage the various side effects of chemotherapy. Otherwise, a new treatment planning session will be proposed. A follow-up contact will also be introduced on a weekly basis to evaluate treatment adherence and side-effects at home.

**Results** The project will consist of elaborating the programme content: which dimensions are to be explored with the patients (physical, psychosocial aspects, etc.), design of the educational diagnosis (content, guidelines for the caregivers and related documents), skills to be acquired by the patients, design of tools to be used during the educational consultation (treatment planning, patient diary), educational follow-up documents, guidelines for follow-up contacts, evaluation criteria. The first patients are to be included in the study at the end of June 2010.

**Discussion & Conclusion** Our study will provide data in terms of adherence, tolerance and quality of life, data on side-effects in the elderly patients treated by oral chemotherapy. This could eventually highlight underestimated difficulties for these not institutionalized elderly patients.

Some constraints are to be taken into account in this project, such as the integration of this practice into daily activities. An evaluation of the programme is planned, in particular to identify difficulties in expanding this practice and to determine time requirements for the consultations and follow-up contact. Eventually, our objective would be to expand our project to apply this programme to all eligible hospital patients.

**Keywords** Education programme, Elderly patients, Oral chemotherapy

## CET-32

### First step of an educational program about oral chemotherapy: patients' needs!

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**Introduction** Given the increase of oral chemotherapy prescriptions, our hospital would like to improve its management security at home. A therapeutic educational program on patients with oral

chemotherapy has to be implemented. This patient-centred approach must focus on patients' needs, resources, values and strategies. Before carrying an educational program out, we want to assess patients' expectations and needs related to treatment follow-up difficulties.

**Materials & Methods** Patients treated by capecitabine, erlotinib or temozolomide in monotherapy for at least 2 months were included in a 6 weeks prospective study. They were interviewed about their needs and difficulties occurred at initiation and during their treatment. Expectations related to an educational program were also assessed.

**Results** Thirty patients (6 capecitabine, 12 erlotinib and 12 temozolomide) were included. Mean age was 63.4 years [23–87] and treatment median duration 6.9 months [2–24]. All patients were informed about treatment management by their physician at prescribing time. Written support (30%) and nursing advices (37%) were completed doctor's explanations. However, 77% of patients had treatment difficulties dealing with taking modalities (36%) and side-effects management (64%). Personal searches were realized by 27% of patients. At the interview time, 70% of patients still had questions related to illness (47%), treatment management (35%) and side-effects (18%). Therefore 47% of patients were immediately motivated to take part in a future educational program. They would be mainly interested by information about their disease, their treatment and any advices to manage side-effects (36% digestive disorders and 23% fatigue). A collective program was preferred by 68% of patients because of an experience sharing needs. As most of patients (90%) had personal support, 50% of them would like to include family in the therapeutic education program.

**Discussion & Conclusion** Our study shows us what patients' needs are: more information about the treatment modalities and side effects management and more experience sharing. A multidisciplinary workgroup was constituted to conceive an adapted program based on patients' needs, with aim of reducing potential complications, as well as improving their quality of life and therapeutic compliance.

**Keywords** oral chemotherapy, patients' needs, therapeutic educational program

## CET-33

### Survey on patients' needs: first step to develop an information tool for long-term corticosteroid treated patients

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**Introduction** Corticosteroids are among the most prescribed drugs. If their beneficial effects are obvious, however, side effects are often observed. Perception of the discomfort caused by corticosteroid-induced adverse events are under-estimated by health care professional and is different from patients' perception<sup>(1,2)</sup>. Discomfort and lack of information about side effects may be a cause of reluctance to receive treatment with corticosteroids and may have an impact on patient compliance. The objective of this study was to assess concerns, expectations and information needs of long-term corticosteroid treated patients, in order to design a patient oriented information tool on corticosteroids.

**Materials & Methods** Individual semi-structured interviews were conducted with both patients having long-term corticosteroid treatment and patients with an initiation of corticosteroid treatment for a period exceeding one month. Interviews were conducted by two previously trained pharmacy residents and directly transcribed on a

data collection sheet. Collected data were gathered thematically to be analyzed.

**Results** A total of 25 patients aged between 18 and 81 years, including 18 women and 7 men were met between November 2009 and May 2010. They suffered mainly from immunological diseases (rheumatoid arthritis, sarcoidosis, vasculitis, uveitis, psoriatic arthritis, etc.). Almost all patients interviewed expressed at least one need of information on treatment with corticosteroids. The most expressed needs were related to side effects, diet, indication and mode of action of corticosteroids.

**Discussion & Conclusion** These interviews were rich in qualitative information and reflected patients' desire to share their experiences with professionals and get answers to their concerns and questions. The assessment of patients' needs helped identify educational themes. Customized information on treatment should be dispensed to reinforce their feeling of personalized care and to improve their comfort and their experience with long-term corticosteroid treatment.

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**Keywords** Needs survey, corticosteroids, patient education, educational need

## CET-34

### Position of IgIV in the treatment of narcolepsy-cataplexy in Montpellier

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**Introduction** Narcolepsy-cataplexy is a rare disease (0.05%) with probably autoimmune origin. There isn't any known etiological treatment available. However, recently some experts recommend the use of intravenous immunoglobulin's (IgIV) as treatment of patients diagnosed early. Under the Good Using Agreement (CBU), health authorities require to justify the validity of this treatment used without marketing authorization and out of off referential. The aim of this study is to assess the position of IgIV in the treatment of Narcolepsy-cataplexy in Montpellier the referral center in France.

**Materials & Methods** A retrospective study of patients who received IgIV in the context of their Narcolepsy-cataplexy, was conducted from June 2009 to June 2010. Data were collected through computerized medical report but also using the software traceability of medicines derived from blood.

**Results** The study included 5 patients, 4 men to 1 woman, aged 5–48 years at diagnosis (median 14 years). The disease has been immediately severe in 4 patients, the fifth presented with a form unusually early and atypical.

IgIV treatment was started between 15 days and 14 months after the onset of symptoms (median 2 months). The protocol used was: one dose of IgIV (1 gr/kg/day), 3 cycles of 2 days to one month apart. Four patients were treated in first intention by IgIV. One patient received the full protocol, the other 3 patients were still receiving treatment at the



time of the study. The youngest patient received additional cycle and showed a period of eight months since the end of treatment.

In this patient, each IgIV cycle resulted in clear improvement followed by a rapid relapse, without contribution of the additional fourth cycle. The treatment resulted in no clinical improvement in the second patient.

These 2 patients were subsequently treated symptomatically by modafinil or methylphenidate as stimulant associated with venlafaxine against cataplexy attacks, with a relative efficiency. Finally we used 1,452 g of IgIV, the cost was 56628 euros a year.

**Discussion & Conclusion** The use of IgIV in the treatment of Narcolepsy-cataplexy increase (5 cases a year currently). Our first results shows inconstant efficiency for this recent indication. Nevertheless, IgIV is an alternative to symptomatic treatment, moderately effective, and in the absence of other etiologic treatment. The existence of publications with encouraging results led to classify these use in the group “without repository” of CBU billable as having been recommended by scientific societies and publications in international journals with references. The CMDMS limited the prescription of IgIV in narcolepsy-cataplexy immediately severe and precociously diagnosed. The requirement is restricted to the physical to the referral medical center of this disease.

**Keywords** Intravenous immunoglobulin's (IgIV), Narcolepsy-cataplexy, alternative treatment

## CET-35

### Set up of therapeutic education consultation concerning medications and breastfeeding for post partum women

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**Introduction** Promotion and education for breastfeeding are important for post partum women's care. Moreover, even if drugs represent difficulties during breastfeeding, they are not approached in a systematic way with the women. For this reason, we first realized an educational need analysis for this population. The objective is to develop a therapeutic educational consultation for medication and breastfeeding, adapted to their expressed needs.

#### Materials & Methods

- Multidisciplinary team constitution to define the objectives of the consultation
- Definition of intervention's modalities
- Pedagogic tools realization
- Definition of evaluation's modalities

**Results** The multidisciplinary team is constituted by a midwife, a nursery nurse breastfeeding referent and a pharmacist. Objectives for women are to understand the drugs diffusion in mother's milk, to know how to behave face to symptoms and currents diseases. The pharmacist will realize individual consultation, 2 h, 3 times per week, since the second post partum day. An illustrated sorter has been realized to explain drugs diffusion and Barrows cards has been created to allow women to evaluate their capacity has making adapted decisions face to problematic situations. Fifteen questions with False-true answers with degrees of certainty will allow to evaluate the women's knowledge and satisfaction survey will evaluate the program.

**Discussion & Conclusion** This consultation integrated into mothers care will completed actions who are already done. This innovating program interest in a new domain of patient's education.

Readjustments will have to be made according to evaluation results and others professionals' formation will be essential for program perpetuation. Lastly, the development of a partnership with nonhospital healthcare professionals is essential.

**Keywords** Patient Education, breastfeeding, medication, obstetrics and gynecology

## CET-36

### Implementation of a therapeutic education program for polyarthritis patients

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**Introduction** Implementation of a therapeutic education program for polyarthritis patients needs to define a multidisciplinary team trained in the pedagogy of therapeutic patient education, and able to answer all patients educational needs. The objective of this work is to describe steps of implementation, especially the pharmacist role, and to evaluate efficacy of the therapeutic education program by a patient questionnaire about knowledge's acquired and their satisfaction rate.

**Materials & Methods** The multidisciplinary team is composed by a doctor, six nurses, a dietician, a physiotherapist, a social worker, a psychiatrist, and a pharmacist. A training program has been applied to the health-care professionals in order to learn communication and teaching skills, but also to contribute to redefine health care professionals' roles and improve their patient relationship and psychosocial abilities. The therapeutic education program includes an individual assessment of patient's educational needs followed by 7 h of educational group sessions on one day with a common lunch. At the end of the day, patients have to evaluate the therapeutic education program on this organization, the interest of sessions, quality of speakers, and their global satisfaction and suggestions.

**Results** The pharmacist is charged to conduct an educational group session about treatments. It relies on giving explanations on usual and crisis treatments, adverse effects, terms of use, etc and helping patients to acquire self-care and coping skills by a new guidance approach with cards games, puzzles, and clinical cases. 6 months after to have begun, 15 patients have been included in the program. Results of the patient questionnaire indicate they acquired the basic knowledge at the end of the session, with 77% of correct answers. Furthermore, the patients' satisfaction rate toward the therapeutic education program is evaluated to 88%.

**Discussion & Conclusion** Therapeutic patient education is a new humanistic medical approach based on the patient's own perception of sickness. It allows them to be active participants in their treatment with the aim of improving their quality of life and therapeutic compliance, as well as reducing potential complications. Thus, participation of a pharmacist is justified by the need for patients to acquire abilities in managing themselves the treatment and to choose their own strategies for pain reduction, which bring them the maximum benefit.

**Keywords** evaluation, pharmacist role, polyarthritis, therapeutic patient education

## CET-37

### Parenteral nutrition of the child: helping tool for prescription

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**Introduction** Parenteral nutrition is getting increasingly frequent for children having a digestive system not allowing them to feed by ordinary, natural means.

The clinician pediatrician has, often as a matter of urgency, to take action to satisfy child or infant nutritional needs.

There is a large choice of nourishing formulas (personalized or standard), and it is necessary to select carefully the procedure, hence the necessity of having a reactive medium, of simple and reliable use.

The objective is to elaborate a practical document, easy to distribute, directed at pediatricians, in order to help them track down proven cases of child under-nutrition and react appropriately by applying the right procedure.

**Materials & Methods** Working on behalf of the Hospital Center of Le Mans, CLAN (A multidisciplinary pharmacy and pediatric medicine workgroup) has undertaken the elaboration of a tool which allows, through a decision-making tree, under-nutrition detection in an hospitalized child.

**Results** This tool also acts as a reminder of the main indications and recommendations associated with the use of these medicines. Its main purpose is above all to give clinicians of the various units of pediatric care of the CHM a table, acting as a guide to estimate the nutritional needs of the infant and the child. It helps:

1. Estimating infants and children nutritional needs.
2. Choose the conduct to be held when a nutritional risk is spotted and define the behavior to be held according to various situations.
3. Nutrition acts coding.

By using the board, the doctor finds the list of the parenteral nutrition treatments available on the CHM with their composition, favouring the best choice of nutritional contribution, the right diagnosis code, and therefore the right medical treatment.

This tool, conceived for and by health professional, is a reactive medium, of simple and reliable use.

This document, validated by the CLAN and the COMEDIMS was distributed to different doctors during the various multidisciplinary meetings. It has also been given to new internal in the concerned services, and is available on the Intranet site of the Hospital center.

**Discussion & Conclusion** This table will help prescribers when handling pediatric nutritional tasks, and will act as a complement along with the already validated documents “Adult parenteral nutrition” and “under-nutrition management in cancer research”

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**Keywords** Child, nutrition, parenteral, Way, nutritional contribution

## CET-39

### Access to biological data: impact on pharmaceutical validation in orthopedic surgery unit

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**Introduction** Frequently pharmaceutical validation is based on simply drug-drug interactions and over dose study. We suggest that to monitor the treatment, pharmacist should take in account biological data [BD]. To demonstrate this point of view we conducted a prospective and comparative study of 500 prescriptions' sheets with and without biological data. The objectives were to identify the non-pertinent pharmacist interventions and the prescription errors non matched by pharmacist.

**Materials & Methods** We conducted a prospective and comparative study of prescriptions in orthopedic surgery unit. Five hundred consecutive prescriptions sheets without BD were analyzed by a pharmacist and 500 consecutively prescriptions with BD were analyzed by the same pharmacist. We evaluated the pharmaceutical interventions: prescription errors [PE], supposed errors [SE]—cases for which pharmacist should contact physician to have more information—and prescriptions without problem [PP]. PE, SE and PP were compared in both groups using  $\chi^2$  test.

**Results** In the group without BD 4,414 lines of prescriptions were analyzed and 5,069 in BD group; frequency of PE was evaluated respectively at 3,1% [ $3,1 \pm 0,5$ ] and 7,7% [ $7,7 \pm 0,9$ ], SE 4% [ $4,0 \pm 0,5$ ] and 0,5% [ $0,5 \pm 0,02$ ] and PP 92,9% [ $92,9 \pm 0,8$ ] and 91,8% [ $91,8 \pm 0,8$ ]. Difference between two groups was different for PE and SE ( $p < 0,05$ ) but not for PP ( $p > 0,55$ ).

**Discussion & Conclusion** Practically, during pharmaceutical validation the SE would be ignored by pharmacist and certainly a large part of PE would be avoided. Also SE could conduct to a systemically pharmaceutical intervention and probably, non necessary in many cases.

The BD enable the pharmacist to make a pertinent prescription analysis: it highlights the prescriptions non-adapted to BD [in particular; renal function, kaliemia or drugs concentration] and also avoids pharmacist to contact physicians when BD are necessary to understand the problem [in particular drug-drug interactions with kaliemia]. As regards the physician-pharmacist relationship, the more the pharmacist would contact physician for real problems, the easier would be this relationship and the efficiency of the pharmacist intervention. In this objective, BD seems to be a precious help for the pharmacist to be pertinent.

**Keywords** clinical pharmacy

## CET-40

### Pharmacist support in outpatient chemotherapy: a questionnaire survey

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**Introduction** Many oral chemotherapy drugs against cancer have been released. Besides advantages, difficulties with adherence, safety, patient teaching and access to oral agents can hinder treatment. In France, since 2005, in order to facilitate access to outpatient treatment, many of these drugs are only dispensed in community pharmacies. After discussion with oncologists in our cancer center, a pharmaceutical consultation has been introduced at the hospital to improve compliance. This meeting is intended for all patients with a first oral chemotherapy hospital prescription, with pharmacy community drug delivery. An unsigned questionnaire survey was conducted for community pharmacists to improve our hospital pharmaceutical role.

**Materials & Methods** During the pharmaceutical meeting, we propose to contact the patient community pharmacist and to fax him the prescription. Information exchange is then performed on the monitoring of the patient. On any given day, a telephone investigation was conducted among community pharmacists by pharmacists of our cancer center. 12 questions were inquired. The aim of this study is evaluation of this measure and the community pharmacist expectations.

**Results** 55 patients who received pharmaceutical hospital meeting during the last six months (11/2009 to 04/2010) were included. Among these patients, 21 did not want their pharmacist to be contacted. 34 community pharmacists were enrolled and 27 agreed to answer. About regular contact with hospital pharmacists, only two pharmacists have

already been contacted by a hospital pharmacist for a hospital-city relay. But 93% of them consider that it is necessary to be contacted for support of oral chemotherapy. In terms of practicality, pharmacists are very pleased to receive by fax the prescription in advance (logistics, patient comfort, information about the drug) and find it useful to an hospital contact (93%). According to 81% of community pharmacists, the management of patient care is facilitated by the hospital pharmaceutical meeting. A second meeting should be provided (according to the patient profile) and could be conducted in the community pharmacy during the second cure. Our community colleagues are well interested in oncology drug data for themselves (87%) and for patients (67%). They are also interested in formation sessions between pharmacists.

**Discussion & Conclusion** These results show a lack of communication between hospital pharmacists and community pharmacists. That is in contradiction with the French Cancer Plan recommendation, which requires complementary switch to inpatient to outpatient treatments. The survey results are quite positive and encourage us in our approach. Community pharmacists have a vital role to play in encouraging the optimal use of oral chemotherapy and prompt management of adverse events, to achieve a better clinical outcome. Teamwork becomes essential as well as the establishment of city-hospital network.

**Keywords** pharmacist intervention, oral chemotherapy

## CET-41

### Establishment and assessment of a medical-pharmaceutical education in a geriatric CRU

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**Introduction** In 2007, the High Authority of Health and the National Institute of Prevention and Education for the Health published a methodological guide on a program of therapeutic education of the patients (ETP).

Three medical-pharmaceutical education sessions led by the clinician pharmacist and a nurse from the health care service, have been organized in order to inform, educate the patient (or the family) and to improve the observance at his hospitalization discharge. This work presents the evaluation of the sessions efficiency and measures the patients satisfaction.

**Materials & Methods** This is a retrospective study in a Geriatric Care and Rehabilitation Unit (CRU), performed over six months. The data were collected from the creation of a form of transmission from pharmacist and medical staff, including the Mini Mental State Examination (MMSE) of the patient, the number of prescribed drugs, the nature of the various associated pathologies, the specific data on the medication (knowledge of drugs, use, monitoring) and the evolution noted between the three sessions. Furthermore, a questionnaire on the pharmaceutical intervention was completed by the patients and/or the family.

**Results** Among 101 patients, we note 12 deaths, 53 excluded patients (MMSE too low, refusal, lack of caregiver) and 36 educated (patients and/or family). The average age is 86 years [73–100] with a majority of women (sex-ratio 1.5). At the first session, 58% of the participants were unaware of drug names, nor their indication. The last session showed a 20% improvement on the knowledge and the use of treatments. An active participation of the patients was underlined. Also, we observe 61% of autonomy in the manipulation of the dosage forms (patches, pens, sprays). 85% of the patients and the families were satisfied with the progress and the knowledge acquired during these

workshops. At the discharge of hospitalization, a clear and detailed treatment plan offering to the patient an individualized document has been given to all patients, whether returning home or going in an establishment for dependent elderly.

**Discussion & Conclusion** To improve patient adherence to his treatment, it is essential that he really understands his disease and the interest of his treatment. He has to become an actor in everyday life. The involvement of the pharmacist, in the hospital centers ETP, remains poorly described in the literature. This work, original by the targeted population, underlines the success of a multi-professional collaboration where the pharmacist has his entire place in particular as a mediator between the patient and his doctor.

No conflict of interest

**Keywords** clinician pharmacist, elderly subject, medical and pharmaceutical education, observance

## CET-42

### Falls and Iatrogenia in the elderly people: retrospective study in two geriatric units

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**Introduction** It seemed to be interesting to analyze drug prescriptions of elderly people who felt in two geriatric medicine units in order to identify the most frequently fall risks. The secondary objective was to compare drug treatments at admission and at the end of hospitalization, compared with prescription guidelines in elderly people, to identify a iatrogenic risk.

**Materials & Methods** A retrospective and descriptive study in two geriatric medicine units (behavioral neurology and palliative care units) was conducted between the 1st January 2008 and the 30th June 2009 and included all patients who were the subject of fall statement. The data were collected by analyzing the discharge letters and patient's files. The tool for collecting data was formalized by a table established from the professional recommendations.

**Results** A total of 47 patients were studied (mean age 84,7 [66–98]) and 68 falls were listed. The number of medications consumed per patient and per day averaged 6,9 [0–12] at the admission and 9,9 [2–18] at the end of hospitalization. 41 patients (87%) were poly-medicated (superior to 4 medications per day) at the admission and 46 patients (98%) at the end. The most frequently medications prescribed were nervous drugs (42 patients (89%) used at least one nervous drug at the admission, and 45 patients (96%) at the end) and cardiovascular drugs (37 patients (79%) used at least one cardiovascular drug at the admission, and 36 patients (77%) at the end). The number of psychotropics consumed per patient and per day averaged 1,4 [0–4] at the admission and 1,9 [0–5] at the end. At the admission, 32 patients (68%) used at least one psychotropic and 20 patients (43%) used at least two psychotropics. These rates reached respectively 41 (87%) and 24 patients (51%) at the end of hospitalization.

**Discussion & Conclusion** This study could not show a relation between drug treatment and falls because the moment of drug's change was not known. However, the results showed that the hospital stay had not reduce drug prescriptions in these polymedicated patients, but they were adapted to optimize their care. These results pointed out once again polymedication observed in frail elderly people and the extreme difficulty to prescribe in this age group, which could precipitate elderly people in disability leading to institutionalization.

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**Keywords** elderly people, falls, iatrogenia

## CET-43

### Pharmaceutical follow up of patients under chemotherapy

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**Introduction** Five month outcome of a pharmaceutical tracking of patients under cancer chemotherapy. It's a prospective study concerning all patients under chemotherapy

**Materials & Methods** for each patient, performing of an analysis including its biological balance work ups, its prescriptions and check out instructions, its treatment with a description of the takes and the interactions including medicines versus chemotherapy A more particular tracking of the Erythropoietin stimulant agent (ASE) limitation is performed according to the hospital's validated terms of reference.

**Tools:** Theriac, guide "prescribe" 2010, synthesis of medicinal interactions, available on the International Pharmaceutical Association (ADIPH).

**Results** Analysis of 66 prescriptions. From a total record of 21 medicinal interventions, written or verbally transmitted to the physicians, 14 had been accepted, 12 of the 21 interventions concerned the ASE requirements\*.

The problems identified through the 21 prescriptions are:

- 12 non-compliance to the references (ASE reference system included)\*.
- 2 low dosages (parenteral iron, transcriptions errors of capecitabine doses on the balance prescriptions)
- 2 no treatment (failures in new prescription of bevacizumab, lack of information about the end of a medicinal treatment)
- 3 interactions (neбиволol-paroxetine, AVK and chemotherapy, clopidrogel-PPI)
- 1 unwanted outcome (5FU)
- 1 inappropriate administration (noncompliant biphosphonates oral administration)

The results of the 14 accepted interventions are:

- 8 new requirements (marital balance, parenteral iron, ASE)\*.
- 3 stops (2 erythropoietin treatments, almost well conducted, non-effective treatments, 1 due to an interactive antidepressant medication)
- 2 prescriptions changes (parenteral iron, capecitabine)
- 1 administration change (oral to intravenous)

**Discussion & Conclusion** The result of the interventions underlines the interest of a comprehensive follow up of the patients under antineoplastic (anticancer) chemotherapy even if a large extent of the interventions regards the observance of the ASE requirement references. The main difficulties are the collection of all the treatments and the time requirement for the data processing.

**Keywords** Chemotherapy

## CET-44

### Prevention and treatment of pressure ulcers: 3rd phase of professional practices evaluation

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**Introduction** Since 2006 the pressure ulcer group (PUG) of our hospital works on improving the quality of prevention and treatment of pressure ulcers (PU). Each action of the PUG is followed by a survey on practices and prevalence, in order to assess its impact on the quality of care. In March 2010 a first information session for the nursing staff, about prevention and treatment of PU, was organized. Assessing the impact of this session represents the 3rd phase of survey that will be included in the next certification procedure of the hospital.

**Materials & Methods** We conducted a prospective practices survey in 15 units of acute, long term and rehabilitation care and retirement home. Data were collected during individual interviews. In each unit, the head nurse was interviewed about available resources (documents, staff, equipment and training) and 2 nurses and 2 care assistants were sound out on their knowledge and practices. The prevalence survey was led on a single day. We collected data on every patient of the 15 units (age, sex, hospitalization's date, Norton's score, number, localization and stage of PU).

**Results** 15 head nurses, 30 nurses and 30 care assistants participated in the 2 practices surveys. The caring is mostly multidisciplinary and the session organized is the main information source for the staff. Some documents require a wider distribution and the endowment in dressings must be reviewed in some units. More than 80% of the nursing staff has a good knowledge about PU and risk factors. 68% know the care protocol elaborated by the PUG. 97% assess the risk for PU at patient's admission, 93% repeat it if there is any change in patient condition, 70% use the Norton's scale. The nursing staff is aware that managing immobility and under-nutrition, two predictive risk factors for PU development, is very important: repositioning, selection of an appropriate support surface and nutritional assessment are the practices mostly quoted. On the other hand, traceability and patient's education and information were never mentioned.

**Prevalence survey:** 426 patients were included (mean age 72 years, sex-ratio F/M=1.5). According to Norton's score, 53% have a low risk and 47% have a high risk of developing a PU. 47 patients have one or more PU(s), for a global prevalence of 11%. Most of it are heel PU (47%) and most are stage 1 (34%).

**Discussion & Conclusion** General knowledge about PU is good and practices are mostly in accordance with the recommendations. The care protocol must be distributed even more widely, as well as the traceability and information documents. Indeed, using those documents can help to improve communication within the staff and information of the patient. Prevalence is stable compared to the previous surveys. Thanks to these results, the PUG can plan its future actions to improve the quality of care.

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**Keywords** Professional Practices Evaluation, Prevalence, Pressure Ulcers



## CET-45

### A six months prospective study of amoxicillin clavulanic acid prescriptions in a general hospital

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**Introduction** Antibiotic prescription of amoxicillin clavulanic acid represents almost 27% of all antibiotics prescriptions as analysed in an infection control unit. We aimed to analyse prospectively the prescriptions of amoxicillin clavulanic acid in different departments of the hospital.

**Materials & Methods** This study is a monocentric prospective study realized in a general hospital, using a standardized questionnaire protocol. Criteria analyzed in the questionnaire were age, gender, indication of treatment by amoxicillin clavulanic acid, administration mode, duration of treatment and clinical outcomes. The questionnaire was filled in by the medical staff of each medical department involved in the study. Internal medicine, intensive care unit, and geriatrics were the mean departments associated to this study.

**Results** 92 Patients issued from different units: medicine, intensive care unit, geriatrics were included in this study. Mean age was 70.5 years old and F/M ratio was 1.2. Of all indications for this antibiotic use: 77% was for respiratory tract infection, 3% for a urinary tract infection, 6% for a skin infection, 14% for other infections. Among 77% of prescriptions documented with antibiogram: 9% microorganisms were resistant to amoxicillin-clavulanic acid, 6% were sensitive to amoxicillin, and 85% were sensitive to amoxicillin-clavulanic acid. Mean duration of treatment with amoxicillin-clavulanic acid was 8 days.

**Discussion & Conclusion** Respiratory infections were the most common infection treated by amoxicillin-clavulanic, accounted for 77% of amoxicillin-clavulanic prescriptions. However, the use of antibiotic with a more strength spectrum than amoxicillin clavulanic acid should be preferred when the prescription is correlated to an antibiogram.

**Keywords** Amoxicillin-clavulanic acid, Prescription evaluation,

**Materials & Methods** To quantify activity over four month, we counted the number of prescription validated daily. The sole format of nominative prescription is not present in all care units. Consequently, pharmaceutical validation is adapted to the type of format used. The weighting by pharmaceutical file analyzed will be the one given by the SFPC. Regarding quality, each PIF is analyzed according to the type of problem, the medicinal class, the solution suggested as well as its future. The FPI used in December and January was the one by the SFPC. However, some points are not adapted to the organization of our pharmacy which is why we worked out and evaluated a new PIF from February to April. So, we quantified the number of interventions and the pertinence of the PIF of the SFPC versus the new FPI.

**Results** The medium number of prescription validated monthly is 4,041 (1,347 by chemist/intern). The pharmaceutical activity monthly amounts 429948 points (143316 point by chemist/intern). These results do not include the activity of on-call duty. The number of PI realized is 272. The frequent problems are: drug unreferenced (27%), non-conform prescriptions (24%) and overdose (17%). The most common medicinal classes are: anti-infective (28%), metabolism (16%) and cardiovascular system (16%). The interventions essentially suggested are: substitution (40%), optimization of administration modality (19%) and dosage adaptation (18%). The new FPI allowed to increase the number of PI by 13%, the rate of acceptance by 11% and to decrease the rate of unjustified interventions by 24%.

**Discussion & Conclusion** The development of individual nominative paper format to prescribe and provide treatment involves an increased activity in the hospital pharmacy. The FPI is a major tool to follow and value the pharmaceutical activity. However, the number of FPI realized is limited by this difficult task. The unreferenced drugs prescribe show the ignorance of therapeutic books in the care units. The future computerization of drug circuit should help to resolve these difficulties and to decrease the rate of non-conform prescriptions.

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**Keywords** indicators of activity, pharmaceutical interventions, production and pharmaceutical quality

## CET-46

### Evaluation of the indicators of activity used to provide treatment in hospital

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**Introduction** Modification of the law on the financing of the social security (fee for service basis) in France led to new internal discussions including implementation of indicators of activity. French Society of Clinical Pharmacy (FSCP)<sup>1</sup> defined indicators concerning production and pharmaceutical quality. In our hospital, we were interested in pharmaceutical validation of prescriptions. First aim is to calculate indicators of production i.e. the number of prescriptions validated monthly and evaluate the equivalent in the corresponding points of activity. Indicator of quality will be assessed thanks to the number of pharmaceutical interventions (PI) calculated with the PI form (FPI) and acceptance rate. Second goal is to evaluate discernment (use) of a new FPI introduce during in our study.

## CET-47

### A six-day training session about pharmaceutical care in a Quebec teaching hospital for French pharmacist to support the development of pharmaceutical care in their practice

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**Introduction** French pharmacists are quasi absent from hospital wards in France and there have been limited training opportunities about pharmaceutical care in academic courses to sustain the development in the European practice model.

**Materials & Methods** Objective: To develop a specific and short internship in pharmaceutical care for French hospital pharmacists abroad to support the development of pharmaceutical care in France. The objectives, the content and the practice exposure, the length, the number of participants and the funding had to be identified and planned. The program had to be feasible for French and Qu  bec

pharmacist and sustainable over the years. A pre/post/3-month post-survey with open-ended and closed-ended questions was developed for participants to evaluate their perception and satisfaction.

**Results** A program was developed in 9 months by a group of 4 leading pharmacists (2 in France, 2 in Quebec). A six-day-long internship was offered in May 2010 at CHU Sainte-Justine, Montréal QC, a 500-bed mother-child institution. Seven clinical pharmacists offering full-time pharmaceutical care in specialized patient care wards were paired with French pharmacists on 1:1 ratio. Each in-training pharmacist was exposed to the daily routine and pharmacy clinical activities including an active participation in the writing care plans. In-training pharmacists had the opportunity to observe, to question and to understand how the pharmaceutical care practice model is applied in a real environment. Survey results indicated a high level of satisfaction post internship. The detailed program and the pre/post survey results will be presented. Post-internship follow-up were identified for further online meetings and potential collaboration (SFPC pediatric group) between all participants.

**Discussion & Conclusion** We report an innovative training program that promote the development of pharmaceutical care by French hospital pharmacists through direct clinical exposure with Quebec hospital pharmacists. Such program could be developed for other European pharmacists. Further evaluation is required to evaluate the impact of such program on the development of pharmaceutical care in France.

The Société Française de Pharmacie Clinique (SFPC) and Association Nationale des Enseignants de Pharmacie Clinique (ANEPC) supported this project.

Financial disclosure: the program has been developed by an unrestricted grant from Astra-Zeneca

**Keywords** Pharmaceutical care, Training session

## CET-48

### Role of pharmacy technicians in analysis of prescriptions in hospital

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**Introduction** The role of pharmacy technicians has undergone substantial change over the years with increased use of electronics prescriptions, practice innovation and new technologies. Their responsibilities are expanding based on their qualifications, experience and training. In France, pharmacy technicians attend a specific training to work in various activities in a hospital. Clinical pharmacy is commonly activity to develop and promote the rational and appropriate use of drugs. Pharmacy technicians and pharmacists in collaboration can perform in clinical pharmacy and pharmaceutical analysis. So, we developed a specific form, with different essential points to validate a prescription, to facilitate the first analysis by pharmacy technicians. The aim of this study was to test the process enabling pharmacy technicians to identify drug-related problems (DRPs) and interventions.

**Materials & Methods** A pharmacist, a resident pharmacist and 3 pharmacy technicians analysed 10 prescriptions. One pharmacy technician received a specific training to become a hospital pharmacy technician; another one did not receive specific training but used the form and the last one was free of training and form. They had access to all databases.

**Results** Pharmacist and resident identified 19 interventions associated with DRPs. Pharmacy technician who used the form identified 17 interventions and other pharmacy technicians 15 interventions. The agreement concerned 15 of interventions by resident, 8 of interventions by training pharmacy technician, 7 of interventions by other

pharmacy technicians. The most commonly identified DRPs were drug interaction (between 42% by pharmacist and 70% by pharmacy technician free of training and form). The most commonly identified interventions were optimization of administration (between 42% by pharmacist and 53% by pharmacy technician free of training and form). The average analysis time was different between users:  $18 \pm 6$  min for pharmacy technician without the form,  $10 \pm 4$  min for resident and other pharmacy technicians, and  $10 \pm 3$  min a prescription for pharmacist.

**Discussion & Conclusion** These results showed that pharmacy technician can participate to clinical pharmacy.

A specific training associated with a specific form can become help tools to pre analysis of prescriptions and reduce analysis time for pharmacy technicians. Pharmacy technicians detect fewer interventions than pharmacist but they could identify some interventions. In the future, we would develop a monthly formation about pharmacology and rational use of drugs. Pharmacy technician have to assist hospital pharmacist in clinical pharmacy activities to promote the correct and appropriate use of medicinal products and devices, particularly to improve patient safety.

**Keywords** Drug-related problems (DRPs), Interventions, Pharmacy technicians

## CET-49

### Adherence assessment to salicylate in patients with ulcerative colitis

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**Introduction** It is well established that adherence to salicylate is associated with a decrease recurrence in ulcerative colitis. More recently, major studies have shown that chronic treatment with salicylate in ulcerative colitis is associated with a reduced occurrence of colorectal dysplasia and cancer. Adherence is a major problem in chronic diseases. The aims of the study were 1/ to evaluate the adherence to salicylate, and 2/ to assess adherence factors, including the impact of informing patients about the protective effect of salicylate treatment on colorectal cancer risk.

**Materials & Methods** A total of 41 patients were enrolled in the prospective study. Inclusion criteria were as follows: ulcerative colitis patients treated by salicylate, able to complete the questionnaire, followed-up in gastroenterology unit, and seen in consultation during the period January-June 2008.

The patient questionnaire included data on the disease, treatment, and socio-demographic. Adherence was assessed by 2 criteria: a visual analogue scale (VAS) (good adherence = score above 9 on a scale from 1 to 10) and the forgetting treatment (FT) over a period of 2 weeks.

**Results** Average patient age was 39.5 years ( $\pm 15.7$ ), sex ratio 1:1. It was observed that the majority of patients were in remission (68%). Characteristics of the disease were: disease duration 5.73 years  $\pm 5.21$ , and average number of hospitalization except for Remicade administration  $1.34 \pm 1.11$ .

We used VAS or FT to measure adherence and found that VAS = 68% and FT = 63.5%. The factors found to be associated with good adherence were: age ( $p = 0.04$  and  $p = 0.08$ ; NS), marital status ( $p = 0.04$  and  $p = 0.07$ ; NS), presence of other drugs to treat ulcerative colitis ( $p = 0.03$  and  $p = 0.006$ ), confidence in their physician ( $p = 0.05$  and NS), patient information on the protective role of salicylate ( $p = 0.01$  and  $p = 0.025$ ). The factors found

associated with good adherence after informing patients about the protective effect were age ( $p = 0.00036$ ), duration of disease ( $p = 0.01$ ), and the presence of other drugs that treat ( $p = 0.03$ ) or do not treat ulcerative colitis ( $p = 0.003$ ).

**Discussion & Conclusion** Patients with ulcerative colitis should be advised of the importance of strictly following their treatment. Our study shows the major factors involved in adherence and non-adherence in this pathology and may be useful in improving the patient/physician dialogue.

**Keywords** Adherence factors, Salicylate, Ulcerative colitis

## CET-50

### Evaluation of pharmaceutical validation implementation in a not paediatric intensive care unit computerized

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**Introduction** The aim of this study was to assess pharmaceutical involvement, in addition to clinical activity, for medical prescription validation in a not paediatric intensive care unit computerized.

**Materials & Methods** Pharmaceutical validation is performed several days per week in the unit care. Guidelines compliance, dosage, solvent for drug dissolution... are examples systematically validated. Pharmacist put one's name to paper after validation. This step is obligatory for drugs dispensation. And when it is necessary, medical doctors can be directly begged to discuss about therapeutics.

In order to quantify and qualify our activity, pharmacist team use board of the Clinical Pharmacy French Society (SFPO). The data have been recorded after on the website of the SFPO. The number of patients and drugs validated have been reported in an Excel® table.

**Results** During four months, 4034 drugs have been validated (including chemotherapies treatments). This represents 10.9 drugs per day and per children.

36 Pharmaceutical interventions have been recorded. All of advises have been accepted by medical team (doctors and resident medical student).

Majority of actions have been for drugs monitored by pharmacy (immunosuppression drugs, antibacterial agents...). This activity represents a important part of work done by the pharmacist in the unit.

The second reason of pharmacist interventions was represented by respecting not the drugs guidelines established in our hospital, for example, error in solvent for drug dissolution. The others interventions was for dosage errors.

**Discussion & Conclusion** This data show firstly the lowest of intervention apart pharmacokinetic activity. This result can be explain by work done before prescription with the medical team allowed better security in drug use. Pharmaceutical presence in the unit allows direct contact with doctors and nurses in order to have better collaboration between different actors of health system.

Finally, this study demonstrates the necessity of being closer the prescription process to enhance the quality of pharmaceutical validation.

**Keywords** clinical pharmacy, paediatric intensive care unit, pharmaceutical intervention

## CET-53

### Pharmaceutical time required for the analysis of computerized physician order entry in medicine units

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**Introduction** A computerized physician order entry systems is enabled for 440 beds in medicine and obstetric units in our institution. We perform a partial pharmaceutical analysis of these orders, according to the French Society of Clinical Pharmacy. This included the control of regulatory compliance, dosages, interactions, rhythms of administration, pharmaceutical advice, and the analysis of biological results for the optimization of treatment. This analysis takes place from Monday to Sunday, three times a day, the morning after the prescription of the night, after the visit in the late morning and in the late afternoon. The aim of this study is to determine the workload generated by the computerization of the drug circuit in term of pharmaceutical analysis of orders.

**Materials & Methods** The average time of analysis for an order was evaluated in an in-depth study. The number of orders analysed from January to April 2010 has been taken from the software used.

**Results** During the collection of the pharmaceutical activity, the average time of analysis of an order has been estimated at 84 s during the day, 67 s in the evening (i.e. off business hours) and 74 s on the weekend. In four months, approximately 32,000 orders have been analysed, 30.5% of which were during evenings and weekends. 2,885 pharmaceutical interventions have been conducted (8.6% of prescriptions). The number of orders analysed each day (mean  $\pm$  standard deviation) was  $323 \pm 35$  from Monday to Friday (including  $46 \pm 32$  in the evening),  $202 \pm 34$  on Saturdays and  $153 \pm 17$  on Sundays and public holidays. In other words, 73% of the beds are analysed each day (10% of which are in the evening), 46% and 35% on Saturdays and Sundays respectively. The time required for pharmaceutical analysis each day is 7.4 h (including 0.9 h in the evening), 4.2 h on Saturdays and 3.1 h on Sundays.

**Discussion & Conclusion** The workload represented by the analysis of computerized physicians orders can be estimated for medicine and obstetric units (seconds per bed and per day)  $53 \pm 8$  during business hours,  $7 \pm 5$  in off business hours,  $34 \pm 6$  on Saturdays and  $26 \pm 3$  on Sundays. Nearly a third of the pharmaceutical activity is conducted during evening and weekends, because the pharmacist must analyse the order after its amendment by the physician. This time of pharmaceutical analysis, especially off business hours, is a major criterion to consider in the development of computerized physician order entry systems. It is necessary to add the dispensation time for treatment, after the pharmaceutical analysis.

**Keywords** computerized physician order, pharmaceutical analysis

## CET-54

### Evaluation and integration of clinical pharmacy in an internal medicine department

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**Introduction** Within the framework of the prescription's computerization of an experimental department, the pharmacy interacted with the medical team to help in the prescription and to improve the parameter setting of the software Crossway®. This contribution allowed the simultaneous implantation of clinical pharmacy. The objective of this study is to analyze the types of pharmacist interventions (PI) and to estimate their impact on prescriptions.

**Materials & Methods** This forward-looking study took place over 21 weeks in a 24-bed internal medicine department. The pharmacy intern attended the daily visits and confirmed every new prescription and modification of prescription with the software Pharma®. He gave his advice PI orally (during the visits or by telephone) or by writing via computer.

The data were seized in an Excel file: date, patient identity, description of the PI. PI were classified according to 7 categories defined by the SFPC<sup>1</sup> and data input errors. PI was considered as accepted when it ended in a modification of prescription. We compared the impact of the interventions according to the prescribers (physicians / interns) and the mode of transmission (oral / written).

**Results** The study concerned 485 patients. 170 prescriptions were the subject of one or several PI. 192 PI were given with 59% during the admission of the patient in the care unit. On average, the pharmacist made 1 intervention for 2,8 prescriptions and 9,2 PI a week. The PI concerned dosage adaptation (25%), replacement (23%, 75% of which were drug substitute registered on the notebook of the establishment), stop (13%) or addition of treatment (9%), choice modalities (9%) or route of administration (3%), therapy follow-up (3%).

Unregistered prescriptions into the notebook were reduced by 50%.

The prescribers followed 82.2% of the pharmacist opinions that were communicated by writing (84.6%) or orally (81.1%) with a rate of acceptance higher for the interns (86.5%) than for physicians (70.1%). 17.9% of the opinions were not taken into account, and only 1/3 of these justified. The important rate of modified prescriptions, close to that found in the study of Bedouch<sup>2</sup>, confirms the integration of the pharmacist.

**Discussion & Conclusion** The few interventions of the pharmacist about therapy follow-up, modalities and routes of administration, could be explained by:

- a long work of computer configuration (dosage plans, protocols and modalities of administration)
- a data bank which prevents from drugs interaction

The pharmacist concentrates on the patient from his admission in the care unit. He integrates into his analysis the biological, pharmacokinetic and physio-pathological data. These results encourage the deployment of the clinical pharmacy towards other services. But we wonder about the management of time to dedicate to it. To avoid keyboarding of data errors, a user guide is distributed to news prescribers.

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**Keywords** computerization, analysis prescription, clinical acceptance

#### CET-55

##### The Effect of Pharmacist-Led Education on Skills of Patients with Chronic Obstructive Pulmonary Disease in Using Inhaler Device

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**Introduction** The proper use of inhaler devices is an important aspect of the patient's treatment involving inhalation therapy. Several studies showed that many of the patients with COPD may have failed treatment because of inadequate inhalation technique. In this study we aimed to assess the patients' inhalation skills and the effect of

pharmacist-led education on these skills of the COPD patients who were using metered-dose inhalers, discuses, turbuhalers or aerolizers.

**Materials & Methods** The study conducted in patients with COPD who were former user of at least one inhaler device. The demographic, clinical and medication data of the patients were recorded. Baseline patients' inhaler usage attitudes were scored by using 10-item inhaler skills assessment tool which included accurate inhaler device usage steps. One point was given for each correct step and zero points for incorrect answers/steps. According to inhaler skill assessment score, a higher total score indicate better skill using the inhaler. The clinical pharmacist gave oral and written education about accurate skills about each inhaler device to patients especially the inappropriate skills detected in previous (baseline) inhaler usage assessment. To assess the effects of pharmacist-led education on using the inhalation device knowledge, pre and one month post intervention was evaluated by using score of inhaler skill assessment tool.

**Results** A total of 41 patients, the mean age was  $64.36 \pm 11.78$  (range from 29–83). The female/male rate was 7/34. The year of education was lower than five years in the most of patients (90.3%). Patients inhaler administration skills were found to be affected by pharmacist's education ( $p < 0.05$ ). The pre- and post-education skill scores were as follows, respectively; metered-dose inhaler:  $5.6 \pm 1.6$  and  $8.4 \pm 0.85$ ; discus:  $6.38 \pm 0.96$  and  $8.92 \pm 0.95$ ; turbuhaler:  $7.0 \pm 1.9$  and  $9.1 \pm 0.9$ ; aerolizer:  $7.22 \pm 1.05$  and  $9.03 \pm 0.85$ . The difference between the pre- and post-education skill scores was the greatest for the metered-dose inhalers. Besides, rate of mouth rinsing after corticosteroid inhalation was found to increase by pharmacist's education (38.2% vs. 91.2%).

**Discussion & Conclusion** As conclusion, patients have inadequate information of inhaler administration skills; therefore, this area necessitates the input of clinical pharmacist-led education.

**Keywords** Chronic obstructive pulmonary disease, Clinical pharmacist, Inhaler, Patient education

#### CET-56

##### Temozolomide in clinical practice: a survey conducted in 17 French hospitals

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**Introduction** Temozolomide (TMZ) is an oral alkylating drug indicated in the treatment of high grade gliomas. In France, TMZ delivery for outpatients is provided exclusively in hospitals. Specificity of patients (lack of understanding, loss of memory, management of their treatment by a third party) and complexity of therapeutic scheme require to be vigilant during the drug dispensing process and to have a good doctor-pharmacist communication.

**Materials & Methods** A questionnaire was sent to 34 hospitals to evaluate the framework of the organizations used to dispense this drug in the different settings. Seventeen centers (representing 800 dispensations per month) replied.

**Results** Neuro-oncologists, oncologists and radiotherapists prescribe respectively 48%, 35% and 17% using a prefilled form (13 centers), a free datasheet prescription (9 centers) or a computerized prescription system (4 centers). A double prescription system (manual/computerized) exists in 3 centers. Pharmacy technicians participate directly to



TMZ dispensing (under pharmacist control) in 43% of cases. Pharmacists, pharmacist residents and pharmacist non residents participate to TMZ delivery in respectively 38% 5% and 3% of cases. Specifics dispensation's procedures are available in 9 centers.

During radiochemotherapy with TMZ (42–49 days of treatment), drug delivery is partial in 16 centers (mean 17 days of treatment delivered). This fractionated drug delivery allows to re-evaluate patient's understanding of his treatment and to evaluate compliance and tolerance. Salvage and destruction of non-used capsules is organized in 11 centers. A comparison between prescribed and really administered doses is performed systematically in 10 centers and punctually in 3 centers.

Formations are addressed directly to the patient (22%) to accompanied patient (43%), to patient's companions alone (17%), to hospital agents (12%) or to ambulancemen/taxi drivers (1%). Specific information guides are provided to patients in 11 centers. Guides contents differs in each center: detailed therapeutic scheme, intake modalities (on an empty stomach, at a distance from corticosteroids), drug handling (do not open or split capsules, caution in case of pregnancy), guidelines in case of inhalation or contact with the skin.

Communication between prescribers and pharmacists is generally limited to a direct phone contact in case of problem (17 centers) and more rarely to regular meetings (2 centers) or follow-up forms (1 center).

**Discussion & Conclusion** These results exhibit that many initiatives have been created in these pharmacy settings to avoid any iatrogenic risk. Validated documents created by some centers could be applied extensively to all to improve patients knowledge concerning their treatment.

**Keywords** brain tumor, clinical practice, Hospital pharmacy, Pharmacist behaviour, temozolomide

## CPG-1

### Steroid resistance in Egyptian patients with nephrotic syndrome is not affected by ACE insertion/deletion genotype

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**Introduction** The presence of D-allele in the ACE gene has been reported as a probable genetic risk factor for idiopathic nephrotic syndrome (INS) but its role in determining responsiveness to steroids remains to be evaluated. In this study we tried to determine the distribution of the ACE gene insertion/deletion (I/D) polymorphism, and its effect on clinical, laboratory, histological findings and therapeutic response in childhood INS.

**Materials & Methods** Fifty one patients (16 females) were enrolled in the study and received oral steroids. The pattern of response to steroid therapy was determined and patients divided into 2 groups: steroid sensitive (SS) and non-steroid sensitive (non-SS). Clinical, laboratory and histological features were determined. The genotypes for ACE I/D polymorphism were analyzed by using a PCR based method.

**Results** Twenty patients were SS and 31 were non-SS, of the non-SS group. The presence of hypertension at presentation was significantly related to steroid unresponsiveness. Among the SS group the frequencies of the II, ID, and DD genotypes of the ACE gene were 20% (n = 4), 65% (n = 13) and 15% (n = 3), respectively, while the frequencies among the Non-SS group were 19.4% (n = 6), 74.2% (n = 23) and 6.5% (n = 2), respectively. The differences between the two groups were statistically insignificant (Chi square = 0.59).

**Discussion & Conclusion** ACE gene I/D polymorphism has been recognized to affect the level of angiotensin converting enzymatic activity<sup>1</sup>. The current study on Egyptian children with INS reveals no association between ACE gene I/D polymorphism and clinical, histological findings, steroid resistance or progression of the disease. These results are at variance with reports from other parts of the world suggesting that the impact of ACE gene polymorphism on pediatric INS is likely to be influenced by the ethnic origin. However, fewer studies rejected this influence<sup>2</sup>. Results of this study revealed an association between hypertension at presentation and non-responsiveness to steroid, emphasizing the highly important, but sometimes overlooked role of repeated clinical evaluation. Patients with steroid non responsiveness were more liable to develop impaired renal function.

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**Keywords** Idiopathic nephrotic syndrome, Angiotensin converting enzyme gene, ACE gene

## CPG-3

### Optimizing thiopurine therapy: contribution of pharmacogenetic testing

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**Introduction** Thiopurines, 6-mercaptopurine (6-MP) and its prodrug azathioprine (AZA), are cytotoxic and immunosuppressive drugs currently used for the treatment of acute lymphoblastic leukaemia (ALL) and inflammatory bowel diseases (IBD). These drugs cause severe haematological toxicity in up to 10% of treated patients. Conversely around one over ten patients is resistant to thiopurines. Pharmacological activity of thiopurines is related to the production, by a multistep enzymatic pathway, of cytotoxic active metabolites, the thioguanine nucleotides (6-TGN). Besides that, a detoxifying enzyme, the thiopurine S-methyltransferase (TPMT) catalyzes the biotransformation of 6-MP into 6-methylmercaptopurine, of which ribonucleotide derivatives (6-MMPR) take also part in the thiopurine efficacy. TPMT activity variations, originated by a known genetic polymorphism, modulate 6-TGN concentrations. To date, approximately 90% of the non wild TPMT alleles in the Caucasian population are represented by 3 mutant alleles, leading to TPMT deficiency. Patients, with a TPMT deficiency, are at high risk to develop haematological adverse events. Thereby, pharmacogenetics is useful to identify these patients and to prevent severe toxicities. At the opposite, a high TPMT activity may predict a resistance to thiopurine therapy. We report two cases (one haematological toxicity and one resistance), illustrating the use of pharmacogenetic testing of TPMT

in order to optimize thiopurine therapy in an ALL patient and in an IBD patient.

#### Materials & Methods Pharmacogenetics:

- (i) Phenotyping (TPMT activity);
- (ii) Genotyping (identification of TPMT\*2, TPMT\*3A, TPMT\*3C alleles)
- Therapeutic drug monitoring (TDM) (6-TGN and 6-MMP metabolites concentrations)

**Results** A 60-year old patient with ALL receiving 6-MP develops a bone marrow aplasia resulting in a two months hospitalization in intensive care unit. She presented a TPMT activity dramatically decreased to  $2.3 \text{ nmol/h/}8 \times 10^8 \text{ RBC}$ . The genotype shows that the patient was homozygote, with TPMT\*3A allele.

A 25-year old patient with IBD exhibits AZA resistance during one year after introducing thiopurine therapy. TPMT activity was considerably high at  $61.5 \text{ nmol/h/}8 \times 10^8 \text{ RBC}$ . TDM shows also a very high 6-MMP blood level at  $26304 \text{ pmol/}8 \times 10^8 \text{ RBC}$  and low 6-TGN blood level at  $132 \text{ pmol/}8 \times 10^8 \text{ RBC}$ .

**Discussion & Conclusion** Although thiopurines are largely prescribed and effective for maintaining remission in IBD and in ALL, treated patients require a close clinical and biological monitoring because of the risk of toxicity. As well, resistance to thiopurines is observed in around one over ten treated patient. Pharmacogenetic testing (phenotyping and genotyping), associated to TDM, allow to optimize efficacy and prevent toxicity of thiopurines, and thus provide the opportunity to translate into practical guidelines with tailored advices.

**Keywords** pharmacogenetics, pharmacogenomics, information, cancer, personalized, thiopurine, tpmt

## CPK-2

### A physiologically-based pharmacokinetic model for predicting neonate dose after breast-feeding by women treated with clonidine

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**Introduction** There are few descriptions of clonidine use during lactation. We decided to develop an original approach to predict the exposure of neonates to clonidine taken by the mother during breast-feeding. We propose an *in silico* approach, based on a physiological model of drug kinetics (PBPk model), relying on a few basic properties of the drug.

**Materials & Methods** We used a PBPk model with 17 compartments, including mammary gland with specific equations to describe kinetics into milk and neonate. The model was implemented into ADAPT II software. Specific parameters, extracted from the literature were: clonidine partition coefficient (Km), milk fat fraction (fm), sucked milk flow (Qm), body fat fraction (fat) and clonidine renal and hepatic clearance (CLr and CLh respectively). PKsim<sup>®</sup> software was used to calculate the partition coefficients of clonidine into organs, based on its physicochemical properties. Clonidine clearance in newborns was calculated from literature data.

With this program, we can estimate clonidine concentration in plasma ( $\mu\text{g/l}$ ), free concentration in mammary gland fluid ( $\mu\text{g/l}$ ), cumulative amount excreted in milk ( $\mu\text{g/kg/12h}$ ), concentration in milk ( $\mu\text{g/l}$ ), milk to plasma concentration ratio and steady-state concentration in neonate plasma ( $\mu\text{g/l}$ ). Population simulations of 300 women were carried out, with a dose of  $150 \mu\text{g}$  orally twice a day, assuming an interindividual coefficient of variation of 25% on each parameter (body weight, Qm, Km, CLh, CLr and fat).

**Results** The simulated concentration profiles in the mother are consistent with the available kinetic data. The median (10th and 90th percentiles) absorbed dose and clonidine C<sub>ss</sub> simulated in neonates were  $0.14 \mu\text{g/kg/12h}$  ( $0.09\text{--}0.25 \mu\text{g/kg/12h}$ ) and  $0.10 \mu\text{g/l}$  ( $0.05\text{--}0.2 \mu\text{g/l}$ ) respectively. The median milk to plasma concentration ratio was 6.1% compared to 6.8–7% in the literature. These results are similar to experimental results found in literature.

**Discussion & Conclusion** We found in the literature only two studies that described adverse effects of clonidine during the pregnancy and breastfeeding: hypertension during the first three days of life, hyperactivity and sleep disturbances in six-year-old children, apathy syndrome, symptomatic hypoglycemia and feeding difficulties during the first 2 weeks of life. In adult population, for a dose of  $275 \mu\text{g}$  (therapeutic dosage) once a day, clonidine concentration profile was in the range  $0.4$  to  $4 \mu\text{g/l}$ . If the concentration-effect relation is similar in neonate, the exposure of neonate by breast-feeding would merely produce any effect.

This model could be applicable to a large panel of drugs (anti-hypertensive, antiepileptic...) for which passive diffusion is the main mechanism of penetration into milk. Only a few physicochemical and pharmacokinetic properties of the molecule need to be incorporated in the model.

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**Keywords** breast-feeding, clonidine, infant dose

## CPK-3

### Determinants of steady-state mycophenolate mofetil pharmacokinetics in lupus patients

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**Introduction** Mycophenolate mofetil (MMF), the pro-drug of mycophenolic acid (MPA), is an immunosuppressive agent increasingly used for the treatment of systemic lupus erythematosus (SLE). Some studies identified serum albumin levels and renal function as major predictors of MPA pharmacokinetics in lupus nephritis. Conversely, the determinants of MMF in SLE patients with non-renal manifestations during steady-state conditions are unknown. The aim of the study was to explore the effects of clinical, biologic and demographic patients' characteristics on the pharmacokinetics of MPA and its major glucuronide MPAG in SLE patients with extra-renal manifestations.

**Materials & Methods** This single-center, observational study included 26 patients (10 males, 16 females) receiving MMF ( $1\text{--}3\text{g/day}$ ) plus oral prednisone ( $0.25\text{--}0.5 \text{ mg/kg/day}$ ). Total and free MPA and MPAG area under the plasma concentration–time curve between 0 and 12 h ( $\text{AUC}_{0\text{--}12\text{h}}$ ), maximum concentrations ( $C_{\text{max}}$ ), times to maximum concentration ( $T_{\text{max}}$ ), 12-h trough concentrations ( $C_{12\text{h}}$ ), MPA apparent oral clearance ( $\text{CL}/F$ ), MPA free fraction and metabolic ratios ( $\text{MPAG}/\text{MPA AUC}_{0\text{--}12\text{h}}$ ) were determined. The ratio of  $\text{MPA AUC}_{6\text{--}12\text{h}}$  to  $\text{AUC}_{0\text{--}12\text{h}}$  was used to estimate the contribution on enterohepatic recycling (EHC) in total MPA exposure. The effect of clinical, biologic (serum albumin, total serum bilirubin levels, creatinine clearance, hepatic enzyme levels) and demographic (age,

weight, gender) parameters on MMF pharmacokinetics variables were assessed using univariate and multivariate analysis.

**Results** The mean  $\pm$  standard deviation total MPA  $AUC_{0-12h}$ , metabolic ratio and  $AUC_{6-12h}/AUC_{0-12h}$  ratio were  $64.7 \pm 28 \text{ mg} \times \text{h/L}$ ,  $11.5 \pm 7.5$ , and  $36 \pm 15\%$ , respectively, with high between-patient variabilities (all coefficients of variation above 40%). According to multivariate analysis, MPA free fraction significantly correlated with serum albumin levels ( $P = 0.04$ ). Metabolic ratio was the only independent factor associated with MPA CL/F ( $P = 0.0003$ ). Male gender ( $P = 0.02$ ) and higher total bilirubin levels ( $P = 0.0004$ ) were significant and independent predictors of enhanced metabolic ratios.

**Discussion & Conclusion** In our SLE patients without renal manifestations and/or involvement, gender and biliary excretion were the independent determinants of MMF pharmacokinetics.

**Keywords** mycophenolic acid, pharmacokinetics, systemic lupus erythematosus

## CPK-4

### Pharmacokinetics of raltegravir in plasma and peripheral blood mononuclear cells

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**Introduction** Raltegravir, the first integrase inhibitor, inhibits the insertion of HIV-1 complementary DNA into the host genome. It is indicated in combination with other antiretroviral therapy agents for the treatment of HIV-1 infection in treatment-experienced or naïve adult patients with viral resistance. Very few data are available on the pharmacokinetics of this drug. We determined plasma and intracellular concentrations of raltegravir in antiretroviral therapy naïve or multi-drug resistant HIV patients.

**Materials & Methods** A total of 13 HIV infected patients (9 men and 4 women, mean age, 49 years) were included in an observational cohort study. All patients receiving raltegravir (400 mg twice daily) in association with other antiretrovirals. Intracellular and plasma concentrations were measured 3h post-dose ( $C_{max}$ ) and 12 h post-dose ( $C_{min}$ ) using a validated high performance liquid chromatography assay coupled with mass spectrometry (HPLC-MS). Intracellular concentrations were determined in peripheral blood mononuclear cells (PBMCs). Quantitative variables were expressed as medians and inter-quartile ranges [Q1;Q3]. Correlation between intracellular and plasma raltegravir concentrations was evaluated with the non-parametric Spearman correlation coefficient. Inter-patient coefficient of variation (CV %) was determined for plasma and PBMCs using the formula [standard deviation/mean of concentrations  $\times 100$ ].

**Results** Median [Q1;Q3] raltegravir  $C_{max}$  and  $C_{min}$  were 710 ng/mL [538;1025] and 305 ng/mL [285;325] in plasma and 74 ng/mL [50;106] and 55 ng/mL [49;60] in PBMC, respectively. The median intracellular concentration/plasma concentration ratio was approximately 17%. Correlation was observed between intracellular and plasma concentrations ( $r = 0.66$ ,  $P < 0.05$ ) suggesting that intracellular concentrations could be predicted by plasma concentrations. High inter-patient variability of intracellular and plasma raltegravir concentrations were noted (inter-patient CV% was  $>40\%$  for both matrices).

**Discussion & Conclusion** Variability in concentrations that we observed probably reflected variabilities in expression of cellular mechanisms (drug efflux, binding) and metabolizing enzymes. The correlation between intracellular and plasma concentrations allows to conduct therapeutic drug monitoring using plasma concentrations. Finally, this pharmacokinetic study will be applied to further

pharmacodynamic investigation which would assess the influence of drug concentration on the kinetics of binding of HIV-1 integrase.

**Keywords** HIV integrase inhibitor, PBMC, Pharmacokinetic study, Plasma, Raltegravir

## CPK-6

### Efficacy of carboxypeptidase G2 in the treatment of methotrexate severe intoxication

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**Introduction** High-dose methotrexate (HDMTX) is used for treatment of some cancers (non Hodgkin's lymphoma, children's acute lymphoblastic leukemia, osteosarcoma). This therapy can induce a severe nephrotoxicity. Precautionary measures are associated with HDMTX: alkalization, hydration, preventive treatment of toxicity by leucovorin and pharmacokinetic methotrexate follow-up. Despite these measures, in cases of severe acute intoxication, an antidote is available in France with nominative Autorization for Temporary Use (ATU): carboxypeptidase G2 (CPDG2), a bacterial enzyme that cleaves methotrexate into non-cytotoxic metabolite 4~deoxy-4-amino-N10-methylpteroic acid (DAMPA). *CPDG2 is a very expensive drug* (€ 7.000 per vial 1000 IU) used at a dose of 50 UI / kg in one intravenously infusion. CPDG2 administration must be done in maximum 96 h after the date of administration of high-dose methotrexate.

**Materials & Methods** The purpose of this study was to examine the efficacy of this antidote through various cases. The study was conducted over one year (April 2009–April 2010) at the Timone Hospital. During this period, 3 patients were treated with CPDG2.

Blood levels of MTX measured using florescent polarization immunoassay (FPIA) and high-pressure chromatography (HPLC) before and after CPDG2 administration were chosen as markers of treatment efficacy. Before CPDG2 administration, MTX concentrations are measured by FPIA. The inactive metabolite of CPDG2 (DAMPA) cross-reacts in MTX immunoassays, so after carboxypeptidase infusion, MTX concentrations have to be measured by HPLC.

**Results** After HDMTX infusion and before the use of CPG2, patients had concentrations of MTX 33.3  $\mu\text{mol/L}$  (24 h after HDMTX), 12.9  $\mu\text{mol/L}$  (48 h after) and 3.97  $\mu\text{mol/L}$  (48 h after). 12 h after injection of CPDG2, concentrations of MTX were respectively 0.88  $\mu\text{mol/L}$  (97.4% reduction), 0.32  $\mu\text{mol/L}$  (97.5% reduction) and an undetectable level for the last patient, 24 h after antidote administration. The average reduction rate of MTX was 98.3% in these three patients twelve hours after the administration of this antidote.

**Discussion & Conclusion** CPDG2 allows a rapid and effective rescue of methotrexate acute intoxication.

The ATU drug status gives at CPDG2 an additional security, avoiding misuse of this product, because the form must be validated by the Agence Française de Sécurité Sanitaire et des Produits de Santé (AFSSaPS). Given the circumstances of use of CPDG2 and the place of supply (England), an emergency stock for a patient was authorized by the AFSSaPS in our University Hospital.

**Keywords** antidote, carboxypeptidase, high-dose methotrexate, methotrexate severe intoxication

## CPK-7

### Pharmacokinetic evaluation of a novel anti-cancer drug

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**Introduction** A novel anti-cancer drug is currently under investigation in a phase II clinical study. Designed as an infusion solution, this new chemotherapeutical approach is meant to be used by end station patients for whom other conventional treatments are no longer indicated. Its combination consists of four active agents: alpha-ketoglutaric acid (KG), hydroxymethylfurfural (HMF), N-acetyl-L-methionine (NALM) and N-acetyl-L-selenomethionine (NASELM). The mechanism of action of the drug consists of different effects including angiogenesis suppression and disruption of the tumour cells metabolism. A pilot pharmacokinetic study is presented concerning the analytical data of KG in blood samples of patients affected by lungs tumour with interpretation and strategy planning for a future study.

**Materials & Methods** A group of 8 patients carrying NSCLC cancer were treated with the infusion solution and blood sample were collected. Measurements were performed with two different methods. The first involved a SPE purification of the plasma samples by two different cartridges, an ion exchange cartridge for KG, NALM and NASELM and a polymeric cartridge for HMF. Eluates containing KG were derivatised with dansylhydrazine and analyzed via fluorescence detection. For the second method GS-MS was used for detection. A derivatisation step was directly applied to plasma samples using O-(2,3,4,5,6-pentafluorobenzyl) hydroxylamine (PBFHA). The oxime derivatives were further derivatised with (N-methyl-N-[tert-butylidimethylsilyl] trifluoroacetamide (MTBSTFA) as silylation agent.

**Results** The analysis performed revealed no significant difference between the initial concentrations of KG among the 8 patients. The dose response curve clearly indicates a quick elimination of the substance from the blood already five minutes after stop of the administration. In 4 cases the level of KG returned to its initial level, in two cases there was a slight increase and in two cases we noticed a huge increase. No HMF was found in plasma samples.

**Discussion & Conclusion** Since only few literature reports concerning the concentration of KG in blood are present in literature and even fewer related to cancer patients, this pilot pharmacokinetic study could be considered as one of the first investigation regarding KG in cancer patients' blood. Due to the limited number of case, no definitive conclusion can be assumed regarding its role as biomarker in the treatment monitoring of patient administered with the infusion solution described. Therefore a wider study including a urine and plasma screening before the treatment is necessary. The absence of HMF, even in traces, suggests a quick metabolism. As a result its possible role as biomarkers is ruled out and the attention should be focused on one or more of its metabolites.

**Keywords** Cancer, GC method, HPLC method, Pharmacokinetics

## CPK-8

### Enhanced bio-availability of propranolol and diltiazem associated with transjugular intrahepatic portosystemic shunt

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**Introduction** An emerging technique to treat end-stage liver disease is the placement of a transjugular intrahepatic portosystemic shunt (TIPSS) which is less invasive than surgery. It reduces portal pressure in patients with complications related to portal hypertension, as the shunt functions as the connection within the liver between the portal and systemic circulation. As a significant amount of orally administered drugs are absorbed via the portal circulation and undergo first-pass metabolism in the liver, it can be expected that bio-availability will be enhanced for some drugs in patients with a TIPSS. Our case illustrates the potential pharmacokinetic (PK) changes induced by a TIPSS.

**Materials & Methods** Case report based on clinical data. Emergency department of a tertiary hospital. Reporting altered bio-availability in a patient with a TIPSS, leading to an adverse drug reaction and to prolonged length stay in hospital. The pharmacological evaluation was carried out by the clinical pharmacist.

**Results** A 76-year old man with end stage cirrhosis was admitted upon the hepatology ward for placement of a TIPSS. Postoperatively, the patient developed dyspnoea and drowsiness explained on ECG as sinus bradycardia. He was transferred to the emergency department. Intravenous atropine was administered twice, however with no relief of bradycardia nor hypotension. The patient's drug chart showed long-acting propranolol (80 mg) by mouth the night before and bisoprolol (2.5 mg) and long-acting diltiazem (300 mg) by mouth in the morning. A beta-blocker and calcium channel blocker intoxication was presumed leading to bradycardia and hypotension. Glucagon 1 mg, known to be used as an antidote for both betablocker and calcium channel blocker intoxication, was administered as test dose and the heart rate and blood pressure increased. Glucagon was started and titrated in continuous infusion of 8 mg/h. After one day, glucagon could be stopped and patient's heart rate remained 68 bpm.

**Discussion & Conclusion** Propranolol and diltiazem are drugs with a high first pass effect; the oral bio-availability is respectively 30 and 40%. After placement of TIPSS, the metabolising step in the liver is bypassed leading to enhanced bio-availability and potential toxic systemic drug concentrations. Our case confirms an earlier study showing that the bio-availability of oral midazolam was greater in cirrhotic patients with TIPSS compared to cirrhotic and healthy control subjects.<sup>1</sup> Unfortunately, only very limited data are available about altered pharmacokinetics (PK) in patients with a TIPSS. This is an exciting and important area for clinical pharmacists to explore. In patients with a TIPSS, it is important to keep changing PK in mind. Intoxication can be avoided by titrating drugs, preferably with a low oral bio-availability, very carefully.

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**Keywords** Clinical pharmacy, Drug-related problem, Intoxication, Pharmacokinetics

## CPK-9

### A high performance liquid chromatographic method for benzimidazole quantitation in plasma of Chagas disease patients

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**Introduction** Chagas disease is endemic in Latin America, affecting 16–18 million people and with more than 100 million exposed to the risk of infection. Its etiological agent is *Trypanosoma cruzi*. In Europe, benznidazole is the only available treatment of Chagas disease. The goal of this study was to develop a new assay to quantify benznidazole in human plasma for pharmacokinetic and safety studies.

**Materials & Methods** A reversed-phase isocratic high-performance liquid chromatographic method for benznidazole analysis in human plasma is described. Controls and samples were precipitated with trichloroacetic acid (TCA) (0.3 M) (1/1, v/v). 100 µL of the supernatant were injected into the chromatographic system. Benzocaine was used as internal standard. The stationary phase was a silica based column Kromasil® C<sub>18</sub> (250 × 4 mm). The mobile phase consisted of 60% ultrafiltered water and 40% of acetonitrile. The flow rate was fixed to 0.9 mL/min and UV absorbance detection was set at 324 nm.

**Results** The assay was linear over a benznidazole concentration range: 1.6–100 mcg/mL. The method provided good validation data (N = 15): inaccuracy (5.6%), intra and inter-day variability (1.13% and 3.9%, respectively), recovery (94.9%), limit of detection (0.8 mcg/mL), lower limit of quantitation (1.6 mcg/mL) and acceptable stability within 24h in the auto-sampler and after three freeze (–40°C) and thaw cycles.

Benznidazole plasma concentrations (from 12 patients who received the standard dose of 300 mg/day) showed values within the therapeutic range (3–6 mg/L) in only 58% of all samples (male:44% vs. female:56%;  $p = 0.28$ ). Three (1 male and 2 female) out of 43 samples (7%) resulted to be subtherapeutic (<3 mg/L), while 15 samples were clearly above the recommended therapeutic range (>6 mg/L) (male:53% vs. female: 47%;  $p = 0.34$ ). Additionally, no significant differences were observed between groups as regards to age ( $p = 0.08$ ).

**Discussion & Conclusion** The method offers a fast and simple approach to determine benznidazole in human plasma which could be of use in pharmacokinetic and safety studies.

**Keywords** Analytics, Chagas disease, High pressure Liquid Chromatography, Human plasma

## CPK-10

### Renal function estimation and dosages adaptations

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**Introduction** In the monographs, dosages of various medicines have to be adapted to the creatinine clearance of the patients. Different indirect estimators of the renal function are used by clinicians, MDRD and CG (Cockcroft and Gault) being the best known. These 2 formulas give different results. The second concern is the measurement method chosen for blood creatinine (Cr).

The aim of this work was to compare the agreement of 2 estimators of renal function for a clearance limit set to 30 mL/mn. This limit was chosen because under this value, various drugs dosages have to be adapted. In a second part, we want to determine if the change from a Jaffé measurement method to an enzymatic one may affect the dosage adaptation of Gentamicine.

**Materials & Methods** A prospective study was carried on 99 geriatric patients. The renal function was estimated by 2 estimation formulas usable by clinicians (MDRD and CG). The statistical analysis used ROC curves which define the best sensibility and specificity for the agreement of 2 variables. The classification variable follows a

binomial law: 1 means agreement between the estimations, 0 means disagreement. CG clearance vs MDRD (CG/MDRD) was tested. For the second part, we collected Cr of 132 geriatric patients quantified by an enzymatic technique. The laboratory which changed its creatinine measurement method from Jaffé to enzymatic had estimated that the differences for the results between both methods were an average 13 µmol/L, Jaffé results being higher than enzymatic ones. We added 13 µmol/L to the 132 Cr collected. Then we entered the 132 original Cr and the 132 modified ones in our dosage adaptation software (USC Pack®). And we observed if there was a significant difference in the Gentamicine doses recommended by the software. The statistical analysis used the normal law applied to matched data collections.

**Results** The area under the ROC curve was 0.73 for CG/MDRD. For 57 mL/mn limits, the best sensibility/specificity ratio for agreement was 64/100. For a renal function estimated by CG vs MDRD to 30 mL/mn, the sensibility is 78% and the specificity only 5%. For the 2nd part of the study, the comparison between the original Cr and the modified ones showed a significant difference of 5 mg.

**Discussion & Conclusion** This study highlights the problems faced by clinicians in term of interpretations of the various results given by estimation formulas but also concerning the measurement method chosen. We don't adapt dosages the same way whether we choose one formula or another. Thus we advice to keep CG formula as reference, even for geriatrics patients, because it's the formula used in Vidal monographs to estimate clearance limits involving dosages adaptations. For measurement method, this study shows there's a significant difference but it's not relevant in term of clinical practice. We can thus conclude that the biggest concern in term of dosages adaptations remains the choice of the estimation formula.

**Keywords** Cockcroft-Gault, drugs adaptations, MDRD

## CPK-11

### Loss of propofol during ECMO treatment

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**Introduction** Extracorporeal membrane oxygenation (ECMO) is a life support system used during severe respiratory or cardio respiratory failure. It has been suggested that patients receiving ECMO require larger doses of sedative drugs than do non-ECMO patients to achieve similar levels of sedation.

Propofol is one of the drugs mostly used for sedation purposes in ECMO patients. The aim of this work was to evaluate in vitro the amount of propofol lost within the extracorporeal circuit over time.

**Materials & Methods** Two different studies were realized. Whole ECMO circuit was used for ex vivo tests (membrane, oxygenator, pump, and tubings). 800 ml of drug-free human blood were introduced in the circuit. The temperature of the circulating blood was set at 37°C and flow rate was at 4.5 L/min. Propofol was introduced into the circuit to achieve a final concentration of 2 µg/ml. Blood samples were removed from the circuit and propofol was quantified by high performance liquid chromatography.

In vitro, two separate experiments were realized to study the effect of the oxygen and interactions with PVC.

**Results** The first part of the study showed a significant decrease in propofol concentrations with a loss of 71.5% 30 min after its introduction into the circuit. 5 h later, only 12% of initial concentration of propofol was detected. The second part of the study contributed to explain these results, showing a 30% decrease in propofol concentrations under oxygen exposition. The loss of propofol by adsorption on PVC was more important; it reached 50% and 90% respectively 5 min and 45 min after contact.

**Discussion & Conclusion** Our study showed an important loss of propofol during ECMO therapy. We demonstrated that this loss is partly due to adhesion of propofol to PVC tubings and oxidation. Hence therapeutic concentrations of propofol cannot be guaranteed in patients on ECMO using standard doses and a therapeutic drug monitoring is recommended.

**Keywords** Extracorporeal membrane oxygenation, Pharmacokinetics, propofol

## CPK-12

### Therapeutic monitoring of vancomycin in the empiric methicillin-resistant *Staphylococcus* treatment in adult patients

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**Introduction** Therapeutic monitoring of vancomycin (VAN) is recommended to adjust dosing regimen. An Area Under the Inhibitory Curve (AUC) value of  $\geq 400$  has been established by recent 2009 consensus review as the pharmacokinetic-pharmacodynamic target. Local recommendations in our hospital are to treat with an initial dose of 15 mg/kg (actual body weight) followed by 30 to 60 mg/kg/day in continuous infusion regimen. The aim of this study was to review serum VAN concentrations and to evaluate if AUCs attain this target (AUC  $\geq 400$ ).

**Materials & Methods** A retrospective analysis was performed on the data of patients who received in 2009 VAN for empirical treatment of methicillin-resistant *Staphylococcus* sp. and whom a clinical bacterial strain was isolated. Data collected are serum VAN concentrations dosages, vancomycin MIC values among the isolated strains and serum creatinine concentrations. AUC ratios were calculated for each serum VAN concentration value. (AUC ratio = area under the concentration-time curve for 24 h of dosing divided by the minimum inhibitory concentration (MIC) (AUC<sub>0–24</sub>/MIC)). The analysis was to determine rate of patients with all systematic AUC ratios  $\geq 400$ . Toxicity is analyzed by the number of patients with a serum VAN concentration over 30 mg/L or an increasing of serum creatinine levels overtaking 100  $\mu$ g/L.

**Results** 16 patients were identified with a total of 33 serum VAN concentrations. 12 patients were hospitalized in ICU, 2 in internal-medical care unit, 1 in surgery unit and 1 in long term care unit. Pathogens isolated from clinical samples were methicillin-sensitive *Staphylococcus aureus* (n = 4), methicillin-resistant *Staphylococcus aureus* (n = 6), *Staphylococcus epidermidis* (n = 3), *Staphylococcus haemolyticus* (n = 1), *Enterococcus* sp. (n = 2). Number of strains with MIC  $\leq 1$  or  $\geq 2$  mg/L were respectively, 12 and 4. 2 of 16 patients had at least one serum VAN concentration  $\geq 30$  mg/L. 20 of 33 AUC ratios were  $< 400$ . 3 of 16 patients had systematically AUC ratios  $\geq 400$  and 13 of 16 had all or at least one AUC ratio  $< 400$ . No AUC ratio was  $\geq 400$  for patients infected by strains with MIC  $\geq 2$  mg/L. 2 patients had a baseline creatinine level  $> 100$   $\mu$ g/L at the beginning of the treatment, and 2 patients had an increasing creatinine level ( $> 100$   $\mu$ g/L) at the end of the treatment.

**Discussion & Conclusion** Local recommendations have been revised following the study including systematic serum VAN dosages for all treated patients and the calculation of the AUC to individualize vancomycin dosage regimen. Due to the vancomycin-induced nephrotoxicity, local recommendations are to avoid to treat by VAN if the MIC is  $\geq 2$  mg/L and to consider alternative therapy.

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**Keywords** therapeutic drug monitoring, vancomycin

## CPK-14

### Vancomycin dosage in patients with sepsis undergoing continual renal replacement therapy

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**Introduction** Current vancomycin dosage is targeted to reach higher plasma concentrations with an optimum AUC/MIC ratio of  $\geq 400$ . Plasma concentrations should not decrease below 10 mg/l to avoid induction of bacterial resistance. Continuous renal replacement therapy (CRRT) in patients with sepsis is currently used for metabolic homeostasis control and as an adjuvant therapy of sepsis, so the therapy is usually used in earlier stages of AKI. This can result in high filtration of administered antibiotics with the risk of under dosage. The aim of the study was to analyze the efficacy of vancomycin dosage in critically ill patients undergoing CRRT during the early stage of sepsis.

**Materials & Methods** Critically ill patients with sepsis and acute kidney injury (AKI) treated by vancomycin were involved in this study. Pre-post HVCVVH was performed at multi-Filtrate FMC machine with blood flow 200 ml/min and filtration dose of 45 ml/kg body weight/hour. Filters with high-flux polysulfone membrane Ultraflux AV600S FMC or Ultraflux AV1000S FMC were regularly changed every 24 h. Dosage of vancomycin was scheduled according to the AKI stage by RIFLE criteria. In class I patients, vancomycin was administered every 12 h in 60 min infusion intravenously, in class F, the 24-h intervals were used. Vancomycin concentrations in serum and filtrate were measured by RIA using ABBOTT AxSYM machine at hours 1, 6, 12, and 24 after the dose and immediately prior to each dose. Pharmacokinetic analysis was performed on the second day of treatment using software MWPharm 3.30.

**Results** Preliminary results were obtained in 10 patients with sepsis caused by *Staphylococcus* spp. (4 cases), *E. faecalis* (3), MRSA (2), *S. anginosus* (1). In 6 patients, vancomycin was administered twice daily (Group A), in 4 a single daily dose was used (Group B). Mean AUC<sub>24</sub> was 361 in Group A and 378 in Group B; a targeted AUC/MIC  $\geq 400$  was reached during first 24 h of treatment in 3 patients of Group A (50%) and 4 patients (100%) of Group B. Pharmacokinetic analysis resulted in increase of dose in 3 patients (50%) of Group A and 3 (75%) in Group B. Plasma concentrations before the second dose were insufficient ( $C \leq 10$  mg/l) in 4 patients (66%) of Group A and 2 patients (50%) of Group B.

**Discussion & Conclusion** Current recommendations for vancomycin dosage and monitoring were insufficient for patients with severe sepsis and CRRT in class I and partly in more severe class of AKI. We suggest using higher first loading dose to ensure sufficient vancomycin plasma concentrations during the first day of treatment and plasma concentration measurement with computer pharmacokinetic analysis before the second dose of treatment for individual dosage optimization.

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**Keywords** acute kidney injury, pharmacokinetics, therapeutic drug monitoring, vancomycin

## MI-1

### Clinical audit for good practice agreement: Limits link to good use guidelines about pacemaker

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**Introduction** The good practice agreement encourages health care centers to start an evaluation process of their prescribing habits. Very few good use guidelines have been published for medical devices, requiring the use of therapeutic indications from the LPPR or the use of the work of regional OMEDIT. The quality of PMSI encoding is a key element that, in addition to the indication, allows the reimbursement of a patient's stay (GHS) and of an implantable medical device (DMI) by the national health insurance.

The main objective of our work is to verify compliance of therapeutic indications for pacemakers in patient files, in the light of LPPR therapeutic indications and the work of our regional OMEDIT. Our second objective is to verify the consistency of the encoding of the CCAM act in the PMSI file of each patient.

**Materials & Methods** This is a prospective study conducted from January 15th to March 1st 2010 in the Rhythmology unit. All patients had had a pacemaker primary implantation: either a single chamber (SC), a double chamber (DC) or triple chamber (CT) pacemaker. The selected guidelines are the LPPR therapeutic indications version 191, 12.15.2009 (SC, DC) and the good use guidelines of the Rhône-Alpes/Auvergne OMEDIT (TC), 02/08/2007 version. The indications were grouped under a grid for doctors to fill in. Patients' medical records and the medical information software version Web100t 2008-P015 were viewed retrospectively to collect data on the hospital stay.

**Results** The cohort is composed of 29 patients (21 men, 9 women) of median age = 80 years old [1,90]. The average length of stay is 10.4 days [1,32] in a conventional hospital unit. For 15 patients (52%), a stay in the ICU was required with an average of 4 days [1,12]. The postoperative mortality was 7% (2 patients / 29). 15/29 patients (52%) received a SC pacemaker, 13/29 patients (45%) a DC stimulator and 1/29 patients (3%) a TC pacemaker. The indications for implantations were consistent with the guidelines for 25 patients (86%). 4 Implantations were non-compliant with guidelines: 3/15 for SC, 1/13 for DC (all CT indications were compliant). Non-compliances were due to indications not yet included in any guideline.

The CCAM acts encoded in the PMSI file were compliant with the type and number of pacemakers implanted (100%) and were encoded in Web100t before the end of the patient's stay.

**Discussion & Conclusion** Our results show the emergence of indications that are not included in any good use guideline. These results raise the issue of the lack of such guidelines for pacemakers that are

very expensive medical devices reimbursed entirely by social security in addition to the GHS. Therapeutic indications should include clinical elements to be compliant with the PMSI. The CCAM acts are traced in 100% of the patient files in this unit.

**Keywords** pacemaker, good use guidelines, clinical audit

## MI-2

### Bortezomib in therapeutic strategy for T cell non Hodgkin lymphomas

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**Introduction** T cell non Hodgkin lymphomas (NHL T) are a rare and heterogeneous group of malignancies characterized by poor prognosis. Treatment management is very difficult because of subtype's heterogeneity. Currently, no reference practice guidelines exist for treatment of newly diagnosed or relapsed NHL T. Bortezomib, used in treatment of multiple myeloma, has shown promising anticancer activity against several subtypes of NHL T in preclinical studies and some case reports. Based on these data, haematologists of our hospital prescribed bortezomib in this pathology. The aim of this study is two-fold: first to evaluate bortezomib efficacy in this off-label use indication and second to follow up bortezomib prescriptions in NHL T patients after presentation of this efficacy study of bortezomib to our clinicians.

**Materials & Methods** A retrospective study from January 2007 to June 2008 was realized in Pharmacy and Haematology departments to evaluate bortezomib efficacy in NHL T patients. The follow up of bortezomib prescriptions was performed from July 2008 to May 2010. Patient data were extracted from Chimio<sup>®</sup> software and clinical files. Efficacy evaluation was validated with haematologists.

**Results** 15 patients were affected by NHL T. 13 (87%) patients were treated with bortezomib, which was always prescribed in combination with conventional chemotherapy. 5 received bortezomib at first-line chemotherapy, 5 at second-line, 1 at third-line, 1 at fourth-line and 1 at fifth-line. 2 patients achieved complete remission (CR), 2 partial response (PR) and 9 died. The results of this study were presented in Clinical Hematology department and since, no bortezomib prescriptions were observed.

**Discussion & Conclusion** Patients achieved CR and PR when bortezomib was prescribed at first or second-line chemotherapy. But all of them relapsed very quickly. Beyond third-line therapy, the results didn't show benefit when bortezomib was combined to NHL T current regimens. These results made our clinicians more sensitive to bortezomib prescriptions in NHL T and since this period, no bortezomib prescription in this pathology was observed. This study allowed an optimization of bortezomib prescriptions in haematology department by close collaboration between pharmacists and clinicians. Currently, bortezomib in combination with new therapies as everolimus or vorinostat in NHL T is evaluated in phase I and II clinical trials and our clinicians expect that results from these studies will be promising.

**Keywords** bortezomib, T cell non Hodgkin lymphoma

## MI-3

### Sir-Sphères<sup>®</sup>: a new implantable medical device used in metabolic radiotherapy of the hepatocellular carcinoma (HCC)

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**Introduction** The HCC is a frequent type of cancer. Transplant is the standard treatment but when the cancer cannot be operated, the alcoholisation, the radio-frequency and the chemoembolization can be palliative alternatives. We hereby present a new active implantable device (AIMD) that uses the concept of vectorised internal radiotherapy. We present the implementation of transarterial injection of microspheres loaded with a radioelement, Yttrium-90 in our hospital.

**Materials & Methods** Sir-Sphères<sup>®</sup> is an active implantable medical device that contains a few millions non-resorbable resin based microspheres, with a diameter between 20 and 60 micrometers, coated on their surface with Yttrium-90, a beta-radiating isotope frequently used in nuclear medicine (synoviorthesis, <sup>90</sup>Y-ibritumomab-tiuxetan). This AIMD has recently received its CE-mark (European Certification) for the treatment of liver tumours. The microspheres have a dual action: they embolise the blood vessels that irrigate the tumour and emit a beta-ray that allows the destruction of the cells and tissues over a few millimetres. This device's preparation consists in adsorbing extemporaneously the Yttrium-90 to the microspheres whilst respecting the sterility and radioprotection rules. This preparation must be realised in the controlled atmosphere zone of the radiopharmacy. The level of activity of the dose is then checked, and then placed in a three-way syringe. After having purged the embolisation system, the whole device is then placed in a 1 cm wide Plexiglass<sup>®</sup> protection. The AIMD is then distributed to the interventional radiology department ready for transarterial injection.

**Results** The administration of Sir-Sphères<sup>®</sup> requires the intervention of the radiopharmacist for the preparation of the injection device and for the suspension, its control (injected activity is approximately 1,2 Gbq), its transport in appropriate conditions of radioprotection and sterility, and will ensure the good functioning of the device, as well as its traceability. He then proceeds to checking for a potential contamination of the staff and premises, as well as the management of the radioactive waste.

**Discussion & Conclusion** Vectorised internal radiotherapy is a promising alternative therapy for the hepatocellular carcinoma palliative treatment and Sir-Sphères<sup>®</sup> tends to supersede the use of [<sup>131</sup>I]-lipiodol because Yttrium-90, because its half life is shorter than iodine is and because of the absence of gamma emission, which would be detrimental for radioprotection, reduces the hospitalization time and diminishes the constraints linked to the radioprotection. Using such a device requires the coordination of the departments of radiopharmacy, radioprotection, nuclear medicine and interventional radiology.

**Keywords** AIMD, Metabolic radiotherapy, Radiopharmacy, Sir-spheres<sup>®</sup>

## MI-4

### Treatment of oral anticoagulant-related haemorrhagic complication in emergency care unit

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**Introduction** Despite efficacy of anticoagulant medications, haemorrhage continues to be a common and often serious complication of this therapy. Rapid reversal of anticoagulation certainly remains a major key to limit progression of haemorrhage. The management of severe bleeding under oral anticoagulation therapy is reminded in a

recent French recommendation (HAS 2008). Moreover, the treatment of the patient who needs rapid reversal of anticoagulation especially in cases of life-threatening bleeding must be optimized in emergency room. We aimed to determine whether physicians working in emergency departments were aware of these guidelines.

**Materials & Methods** We conducted a prospective study during six month. We prospectively identified patients admitted to emergency care unit of a university Hospital with major bleeding occurring following administration of vitamin K antagonist which needed prothrombin complex concentrate (PCC) injection. Data on the timing and type of treatment were collected from medical file.

**Results** Twenty nine patients had excessive anticoagulation which needed PCC injection. Mean age was 81.5 years. 37.9% of patient suffered an intracerebral haemorrhage and 51.7% a gastrointestinal haemorrhage (HAS diagnostic criteria). The overall mortality was 37.9%. The 11 deaths were clearly caused by or related to cerebral haemorrhage. The median patient inpatient hospital day stay was 40 days. Median time from admission to treatment (PCC administration) was 287 [52–2383] min. PCC dose used was according to recommendations in 40% of cases (21,6 UI/Kg). 30 min after PCC administration, International Normalized Ratio (INR) control was performed in 27,6% of cases. Vitamin K was used in 83.2% of cases mainly by intravenous injection.

**Discussion & Conclusion** The delay before PCC administration is too long. Time to treatment has been suggested as a main prognostic factor of anticoagulation reversal. Time to reversal of anticoagulation is crucial, and treatment strategy should be planned in advance in collaboration with local emergency medicine physicians. Compliance with guidelines on the management of severe bleeding under oral anticoagulation remains poor and might be improved by specific teaching program and local communication. Clinical pharmacists should be involved in appropriate prescription and administration of drugs.

**Keywords** anticoagulant medication, guidelines, emergency care unit, prothrombin complex concentrate

## MI-5

### A qualitative study on patient experience with pharmacist follow-up

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**Introduction** In order to study the effect of pharmacist involvement in long-term drug management, a randomized controlled trial (RCT) been initiated. Patients with established coronary heart disease (CHD) are enrolled into a pharmacist follow-up service for individual drug conversations and medication reviews. Patients in the study group meet three times with the pharmacist during one year. Many studies have confirmed the clinical pharmacist's positive influence in drug management, e.g. within management of diabetes, hypertension and hyperlipidemia. To our knowledge, studies exploring patient experience of pharmacist follow-up are few. We wanted to explore how patients in the study described above experienced the pharmacist follow-up service.

**Materials & Methods** A qualitative design was chosen and a semi structured interview guide was developed. We planned to perform interviews with four of the patients in the study group who had met the pharmacist at least twice. A total of nine patients enrolled in the RCT were consecutively invited to participate during February–March 2010. A short deadline for answering was given. Five accepted the



invitation, one was lost due to illness. Interviews were arranged and performed by a graduate student. Interviews were taped and transcribed. Analysis was based on content analysis described by Graneheim&Lundman.<sup>1</sup> The study was approved by the regional ethical committee.

**Results** All four interviewees were strongly positive to the pharmacist follow-up. Their positive attitude was mainly based on: that knowledge of their drugs and disease had been increased, drug related problems had been identified and solved (e.g. wrong dose, side effects, interactions), a “second opinion” on their drug regime had been achieved, time with the pharmacist was appreciated (in contrast to short time at the GP), they felt safe and they had the opportunity to meet the pharmacist face-to-face in contrast to phone contact.

The interviewees emphasized that the procedure should absolutely be part of the normal follow-up procedure from the hospital, pharmacists and physicians should work more closely together and pharmacists should be more visible in the pharmacy. To participate in the follow-up study, the interviewees expressed that it needed to be voluntary and easy to join, with not too much to remember.

**Discussion & Conclusion** The interviewees were all very positive to the pharmacist follow-up procedure.

Tailored information concerning drugs and drug management in addition to medication reviews seems to be a long-awaited health care service, at least in this patient group.

According to the interviewees, pharmacists should be more included and visible in drug management.

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**Keywords** coronary heart disease, interviews, patient experience, pharmacist follow-up, qualitative research method

#### MI-6

##### Demyelinating neuropathy associated with immunoglobulin M: Rituximab and clinical practices at department of Hematology

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**Introduction** Demyelinating neuropathy associated with immunoglobulin M (IgM) is not a current pathology. This peripheral neuropathy is associated with monoclonal gammopathy and is linked to auto-antibodies binding to peripheral nerve components: myelin-associated-glycoprotein (MAG) or gangliosides. Actually, treatments include immunosuppressants, intravenous immunoglobulin, rituximab and plasma exchange but small benefits have been observed and were often transients. Regarding to French Health Authorities, the use of rituximab in this pathology must be justified with medical bibliography and clinical arguments for every patient because of no guideline and poor literature data.

**Materials & Methods** Our aim is to assess, with the hematologists, the clinical profit of rituximab for our patients compared with the updated literature. We have searched for recent clinical studies. In the same time, we have collected clinical data from patients who received rituximab in this indication during 2009 at department of clinical Hematology. Secondly, clinical cases and results coming from publications have been discussed in pluridisciplinary staff with clinicians.

**Results** We report seven prospectives clinical studies published between 2003 and 2009. These were small cohort studies. Only one of

them was a randomised study, in double-blind, versus placebo (Dalakas, 2009). Four weekly intravenous cycles of 375 mg/m<sup>2</sup> of rituximab were administered after failure of other therapeutics in most cases. Efficiency was evaluated by sensorimotor scales or disability score. According to Dalakas, 31% patients improved their Inflammatory Neuropathy Course And Treatment (INCAT) score.

At Rennes University Hospital, 6 patients received 4 weekly infusions of rituximab 375 mg/m<sup>2</sup> during 2009 for a demyelinating neuropathy associated with IgM. 4 had antibodies anti-MAG, 1 anti-gangliosides and 1 without antibody activity specified. Neuropathies were associated to monoclonal gammopathy of undetermined significance (MGUS), Waldenström macroglobulinemia, or Hodgkin lymphoma. Level of impairment and disability was different between patients and most of them received previously other treatments. Improvement was observed for 2 patients, whereas 2 worsened. Plasma exchange is so considered as an alternative therapeutic for 4 patients of 6.

**Discussion & Conclusion** We discussed in Hematology staff about efficacy, recommendations and dosage of rituximab. This synthesis permits us to place rituximab as a third line treatment for neuropathy associated to MGUS and as a second line treatment for neuropathy associated to lymphopathy. Moreover, it gives to clinicians arguments to justify the use of rituximab. It encourages us to do the same work with other prescriptions of rituximab which need to be justify for example cryoglobulinemia or thrombotic thrombocytopenic purpura.

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**Keywords** immunoglobulin M, neuropathy, rituximab

#### MI-7

##### Drugs administration by subcutaneous injection within palliative care

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**Introduction** Subcutaneous route is often the last resort for doctors keen to limit the aggressive and invasive treatments and to avoid imposing to the patient a central venous way, as it is often the case in geriatrics, in cancer research and in palliative care. Subcutaneous injection is often made in spite of official recommendations. Indeed, medicines officially injectable by subcutaneous way are not enough to treat all the symptoms found in palliative care. This is the reason why doctors are very often in these situations and prescriptions are often made according to the habits and to their experience.

**Materials & Methods** The objective of this work is to list the specialties for which a subcutaneous administration is possible, and to determine the possible limits of this modality of administration. A summary table recapitulating these data was then realized in order to help the doctors of the Institute of Cancer research and Haematology of our establishment to take care of this type of patients. The database PubMed was consulted; the main keyword used is “Injections, subcutaneous” associated with the name of either the active principle or the therapeutic class targeted by the research. Furthermore, some French-speaking magazines were consulted. We also used the Vidal<sup>®</sup> monographs of the specialties as well as the recommendations issued by the AFSSAPS in 2002 concerning the palliative care [1], and more particularly the specificities of use of the current medicines, except pain, in this frame.

**Results** Concerned antibiotics are the teicoplanine, the netilmicine and the gentamicine, with a risk of skin necrosis for aminosides. The

midazolam is useful in some indications and can be associated with the morphine in case of dyspnoea. Data on the subcutaneous administration of the dexamethasone, the clonazepam, the haloperidol and the levomepromazine are found in the literature; it's the same for the fentanyl, the nefopam and some antiemetic as the ondansetron and the metoclopramide.

**Discussion & Conclusion** The technique of subcutaneous injection is simple, effective and induces only little pain. It is widely used in the care of the patients to whom the oral route is not useful anymore and/or with difficult venous access. Only some active principles were fully studied using this mode of administration (midazolam, haloperidol, morphine in the indications except pain). This route for other drugs is less documented, while they are necessary within the framework of the palliative care in cancer ward. The articles found in the literature show a possible use of various active principles which requires in-depth follow-up studies to assess exactly their conditions and their limits of use.

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**Keywords** medicine administration, palliative care, subcutaneous injection

## MI-8

### Assessment of professional practices: information provided to patients for management of their chemotherapy side effects

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**Introduction** Informations and advices provided to patients for chemotherapy potential side effects and therapeutic management in public hospital has an important impact on the patient's relationship with the medical team and care quality evaluation by our patients.

**Materials & Methods** Evaluation questionnaire based study (32 items) investigates over a 3 months period, the information provided in our oncology day care unit by our medical staff to patients about their potential acute and delayed adverse effects.

**Results** Seven physicians, 5 nurses, 1 psychologist and 1 medical secretary responded to the questionnaire. All doctors and nurses advise patients on the side effects, 70% of them spontaneously. Two-thirds perceive patients difficulties related to the side effects occurring at home after chemotherapeutic administration. The patient is given verbal advices by 77% of medical staff, and 23% both verbal and written information via patient information booklets provided by oncology unit nurses. Consultation time and information supplies are considered insufficient or substandard by 43% of persons interrogated. Other information resources used include: internet (79% of patients), family environment (50%) and the general practitioner (43%). Patient is the primary target for medical informations, but guidance is offered to their families as well during physician or nurse appointment. Each member of the medical staff enters into the patient's medical record any adverse events occurred during hospitalisation, about 93% are recorded and 64% of those occurred at home. In case of side effects, patients are advised by physicians to contact firstly the oncologist or hospital unit while nurses advise patients to contact the general practitioner. There is no systematic follow-up information on the patient's telephone home calls, and 57% of interviewed unit members report that they discuss them with colleagues. According to 79% of the staff, patients occasionally practice

self-medication to treat delayed secondary effects. All physicians and nurses are aware of the importance in providing information about adverse events, while only half of nurses claim to possess the skills to do it. The majority (86%) of the interviewed feel that a clear written patient's information document validated by the medical staff would facilitate the management of side effects.

**Discussion & Conclusion** As part of professional evaluation committee for good practices and quality, patient information document leaflet were created and validated with pharmacist, physician and nurses. The documents help to clarify side effects, particular cautions and special advices in order to improve management of side-effects and quality of life for both patients and close family. The patient satisfaction survey form will permit to evaluate and make constant improvement.

**Keywords** Antineoplastics, Information, Patient care, Side effects

## MI-9

### Ambrisentan in Pulmonary Hypertension: Experience from the French Reference Center

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**Introduction** Pulmonary Arterial Hypertension (PAH) is a severe disease characterized by elevated pulmonary artery pressure leading to right heart failure and death. Prostacyclin derivatives (PGI<sub>2</sub>), endothelin-receptor antagonists (ETRA) and phosphodiesterases type 5 inhibitors (PDE5i) are the classes of drugs currently used in this disease. The new ETRA ambrisentan (5 and 10 mg tablets) is an orphan medicinal product indicated in monotherapy or in association for patients in NYHA functional class II or III. The aim of this post-authorisation follow-up study was to report our experience in patients with pulmonary hypertension (PH) treated with ambrisentan.

**Materials & Methods** This retrospective study was performed between 1 April 2009 and 30 April 2010 in the Pharmacy and Pneumology units (French Reference Center of Severe Pulmonary Hypertension) in an University Hospital. Clinical characteristics of all consecutive patients with PH treated by ambrisentan were collected (age, gender, type of PH and NYHA functional class at the time of ambrisentan initiation). Tolerance was assessed by recording reported side effects.

**Results** 28 patients were included: F:M 21:7, age 56 ± 15 years, NYHA class II:III:IV 32%:54%:14%. Aetiology of PH was: Idiopathic or heritable PAH (n = 4), connective tissue diseases (n = 5), portopulmonary hypertension (n = 9), HIV infection (n = 1), congenital atrial septal defect (n = 1), sickle cell disease (n = 2), vasculitis (n = 2), neurofibromatosis (n = 1) and chronic thromboembolic PH (n = 2). The median exposure to ambrisentan was 5.3 months (range 0.5–13.0). The prescribed dose was 5 mg (86%) or 10 mg (14%) once a day. Ambrisentan was given for patients who had never received any ETRA (n = 17) or who had previously given bosentan that have been discontinued due to liver enzyme elevation or intolerance (n = 10).

In addition, it was given in 1 patient due to the drug interaction between bosentan and sirolimus. It was prescribed as monotherapy in 25% of patients, and in combination with PDE5i and/or PGI<sub>2</sub> in 75%.

Minor side effects included peripheral oedema, nasal congestion, flushing, constipation, nausea, dyspnea and headache. Treatment was discontinued in 4 patients due to adverse events in 2 cases (hypersensitivity reaction and acute pulmonary oedema) and lack of efficacy in 2. The vast majority of patients (15/18) reported trouble to release the tablet from the blister.

**Discussion & Conclusion** Our experience shows that ambrisentan is well tolerated in the majority of patients with PH. For this new drug, pharmacist's role is important in post-marketing surveillance program to collect additional safety information. A therapeutic Education Program is currently being designed by a multi-healthcare professional team to further contribute to the improvement of quality of life in patients with PH.

**Keywords** Ambrisentan, Pulmonary hypertension, Retrospective study, Tolerance

## MI-10

### Patient satisfaction on personalized counseling in community pharmacy in Belgium: A pilot study

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**Introduction** Advices to the patient on medication is a key role of community pharmacists. Since several years, the Belgian Pharmacist Association (APB) developed patient information leaflets (PILs) helping pharmacists to satisfy this requirement. Written information about drug treatment has been shown to reinforce oral communication. Data concerning the patients' satisfaction about personalized counseling and PILs are lacking in Belgium. The aims of the study were to assess (1) the patients' perception of their medication knowledge (2) their need of information (3) their satisfaction on personalized medication counseling (4) their perceived quality of PILs.

**Materials & Methods** Prospective study in 2 community pharmacies including patients with 3 or more prescribed medications. Two structured interviews were realized on 21 patients, before and after personalized medication counseling (verbal counseling, PILs and medication schedule if not already used by patients). A total of 47 PILs were provided to the patients. Evaluation of PILs quality was based on the expanded EQIP tool [1]. Descriptive statistics were used to analyze the results.

**Results** (1) 14%, 32%, 41%, 9%, and 4% of patient have a very good, good, medium, bad and very bad perception of their medication knowledge, respectively. 77% are rather satisfied on information received on medication.

(2) Patients' need of information: 33% and 62% would like to be better informed about their disease and medication, respectively. The need of information mostly (> 50%) refers to therapeutic effect, side effect, contraindications and medication interactions. Only 18% would like to receive a personalized counseling about their medication.

(3) After personalized counseling, 81% of patients are fully satisfied with information received, 14% satisfied, and 5% unsatisfied. Concerning the verbal counseling, 33%, 57%, and 10% of patients consider it as very important, rather important, not very important, respectively. Similar results are obtained with written information. However, 90% of patients report that, usually, they never receive PILs from their pharmacist.

(4) Using the criteria of the EQIP tool, the majority of the patients (> 50%) are fully satisfied with the content and structure of the PILs. 70% and 55% of patients reported the PILs to be useful for their theoretical and practical medication knowledge, respectively.

**Discussion & Conclusion** This pilot study suggests a positive impact of personalized medication counseling on perceived patient knowledge. The majority of the patients are fully satisfied with verbal counseling and with PILs provided. Pharmacists should promote PILs

as a useful resource. Larger studies measuring the impact of this intervention on patient competence and adherence need to be performed.

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**Keywords** Community pharmacy services, counseling, information leaflet, patient perception

## MI-11

### A snapshot of the use of specific Alzheimer's Disease medications in a geriatric center

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**Introduction** Part of pharmaceutical management of Alzheimer's Disease (AD) is the use of specific medications. Four drugs are currently available: three cholinesterase inhibitors (donepezil, galantamine and rivastigmine) and one N-methyl-D-Aspartate (NMDA) antagonist (memantine). The current guidelines consider their use in monotherapy according the different stages of the disease. Also, some assessments remain in abeyance. One of them is the potential benefit of adding memantine to cholinesterase inhibitors (ChEIs). A cross sectional study was undertaken in order to make an inventory of clinical practices in our geriatric hospital gathering nearly 900 nursing beds.

**Materials & Methods** An extraction of the totality of prescriptions involving at least one of the drugs mentioned above was undertaken with the help of our computerized prescription tool. In addition, a literature search was performed in order to evaluate the amount of evidences available concerning the potential benefit of combined ChEIs / memantine therapy.

**Results** A total of 105 patients treated by at least one specific AD medication has been reported. Among the 44 patients treated with memantine, 15 patients had a ChEI associated with the following distribution: 26.7% donepezil-memantine, 40% galantamine-memantine and 33.3% rivastigmine-memantine. These results highlight a non-adherence to the current guidelines in 34% of the memantine prescriptions. Our literature search revealed strong disparities concerning the benefit of bitherapy: 2 studies suggest a benefit for donepezil, one for rivastigmine and none for galantamine. Although, contradictory results were usually found. The combined therapies memantine + ChEI identified in our center did not reflect the current state of evidence.

**Discussion & Conclusion** The clinical pharmacist is confronted to the discordant literature concerning these practices. The lack of long term efficacy evaluation of AD drugs and the lack of data to argue for or against prolonged therapy could be considered as part of an explanation for this situation. Furthermore, these medications are involved into a social lobbying from part of the caregivers and families that makes difficult the decision of stopping or continuing treatment (1). Even if these drugs are generally well tolerated, it seems important to remind that they can expose to adverse effects like pharmacological antagonism with atropinics, elevated risk of cardiac adverse effect and elevated risk of seizure. Further studies evaluating cost-benefit and appreciating long-term effects are required, especially for biotherapy, to develop a revision of current guidelines.

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**Keywords** Alzheimer's disease, cholinesterase inhibitors, memantine

## MI-12

### Ischemic stroke care: impact on a pre-existent anti platelet treatment

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**Introduction** Prescriptions of antiplatelet (AP) drugs are essential in ischemic stroke care. This pharmacologic class is mainly representing by 2 drugs: aspirin and clopidogrel. No recommendation exists to help medical staff to choose between both of them. This choice becomes even more difficult when ischemic stroke happens whereas patients are already treated by an AP drug. No guideline exists about the concern whether it is better to change AP or not. The aim of our study is to describe which AP treatment strategy is applied to patients suffering from ischemic stroke and already treated by this pharmacologic class.

**Materials & Methods** Our work is a retrospective study of prescription practices, made in collaboration between department of pharmacy and the Stroke Unit of Besançon. This study is based on medical files contains. Each patient hospitalized in the stroke unit for an ischemic stroke is included. Two separated inclusion periods have been chosen, the entire years 2004 and 2008, to evaluate if prescription habits have changed. The study criteria are medical history, risk factors and therapeutic strategies during and after the stay.

**Results** 111 Patients are included. Among them, 36 transitory ischemic strokes, 34 atheromatosis origin ischemic strokes, 32 embolic origin ischemic strokes and 9 unknown origin strokes are diagnosed.

During hospitalization, therapeutic is homogeneous. Prescriptions of heparin-aspirin association are found as a majority (85%), without significant difference between the 2 years ( $p = 0,09$ ).

The discharge AP prescription is various. It is unchanged for 29% of our population. In 26%, AP therapy is stopped, often when cardioembolic troubles are found. In this instance, the AP drug is replaced by a vitamin K antagonist (VKA) drug. Finally in 45% of cases, modifications of treatment occur. 11 increases of aspirin posology are done, often among patients without identified ischemic risks. Clopidogrel is preferred to aspirin for the 31% of presenting the highest risk of recurrence. An association to VKA is prescribed for 5 patients, presenting cardioembolic troubles and ischemic risks. All these results do not differ significantly between 2004 and 2008 ( $p = 0,12$ ).

**Discussion & Conclusion** This study highlights difficulties that the physicians can meet due to a lack of national guidelines, as demonstrated the comparable percentages of prescription stop, maintain and change.

The handling of treatment is left to medical staff discretion, who applies its own strategy. The use of clopidogrel is the most important one. This drug is preferred to aspirin for higher ischemic risk patients, despite nothing proving it superiority. It seems appropriate to create new guidelines, to standardize practices.

**Keywords** anti-platelet treatment, ischemic strokes

## MI-13

### Quality and clinical relevance of prescription of parenteral nutrition

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**Introduction** Parenteral nutrition is less physiological, contains more risk of complications and is more expensive than enteral nutrition. For these reasons, it has to be used as last resort. This study was conducted collaborating with the Liaison Committee for Alimentation and Nutrition (LCAN). This study aims to evaluate the relevance of prescriptions and nutritional care (concerning quality and quantity).

**Materials & Methods** This prospective audit was carried out on a whole day of hospitalization, within 6 healthcare units. Indications were considered justified if there is a proved malnourished state, a non-functional digestive tract or contraindicated enteral feeding and a hospitalization exceeding 7 days. The quality of the nutritional care was analyzed considering the timing of feeding start, the duration, the way and the flow of administration and the supplementation or not in vitamins and trace elements. The prescription is considered adequate as far as a total intake of energy covered 90% > 110% of the recommended target for the patient.

**Results** 22 patients were included in the study, 16 were malnourished, including 13 severely malnourished. For 27,3% (6) patients the indication was not justified (functional tract digestive was not sufficiently or correctly made profitable). Patient medical record almost never show an indication justification 4,5% (1), a nutritional assessment 9,5% (2) and a nutritional status 22,7% (5) which are quality standards in V2010 certification of the French national authority for health "HAS". A good nutritional care has often been observed, nutrition often starts early: 3,9 days after admission on average (1 - 17), but the phosphorus and magnesium in the total parenteral nutrition are often overlooked. Only 18,5% (4) patients received a food in adequacy with their recommended energy target, a majority of patients 54,5% (12) were overfed (from 11,7% to 94,5% of their needs), and 27% (6) patients were underfed (from - 49% to -27% of their needs). Among patients in total parenteral nutrition, an analysis of the nitrogen supplementation was carried out: most of patients (7/9) received insufficient protein supply (- 66,3 to -14%).

**Discussion & Conclusion** To conclude, this evaluation shows that the nutritional care is often approximate and inadequate. Requesting a dietitian advice and doing a more systematic assessment of the nutritional status would allow to optimize prescriptions of parenteral nutrition and its indications. This study has justified the creation of a new tool by the "LCAN" which helps to prescribe parenteral nutrition and a meeting with medical teams in order to train them. A new quality control study will be programmed in order to measure the impact of such a formation on the clinical practices.

**Keywords** nutritional care, Parenteral nutrition, quality of prescribing, relevance of prescriptions

## MI-14

### Determination of knowledge and pharmaceutical care issues in senile osteoporotic women

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**Introduction** The aim of the study was to determine the knowledge and pharmaceutical care needs of  $\geq 65$  years of age patient receiving alendronate treatment with a former diagnosis of senile osteoporosis.

**Materials & Methods** The study was conducted in senile osteoporotic women treated with alendronate at least past 3 months in a



physical medicine and rehabilitation outpatient clinic. The demographic, clinical and medication history was taken from patients and medical records. ‘The Osteoporosis Knowledge Assessment Tool (OKAT)’ was applied to assess the knowledge of patients about osteoporosis. Therapy adherence classed as high, medium and low using a modified four-item Morisky Medication Adherence Scale. Knowledge about appropriate use of alendronate and observed adverse effects during alendronate therapy was investigated by ‘Alendronate Monitoring Form’. Pharmaceutical care issues were also determined.

**Results** Among 46 senile osteoporotic women, the mean age was  $69.70 \pm 4.52$  (range from 65–83). The duration of menopause was  $45.63 \pm 6.16$  (range from 25–58). In general, the patients were of a low education level. Consumption of milk and dairy products was seen very low. Most of the patients (69.7%) have never taken regular exercise. 50% of the patients had history of previous fracture. The prevalence of previous fracture was higher for the group with never exercise ( $p < 0.05$ ). The most common comorbid disease was hypertension (56.5%). 32.5% of patients have no comorbid disease. The mean t-skor of the patients was  $-2.98 \pm 0.34$  ( $-2.50 - -3.97$ ). The fasting blood calcium, phosphorus, alkaline phosphatase (ALP) levels were  $9.37 \pm 0.30$ ,  $3.47 \pm 0.36$ , and  $63.50 \pm 13.03$ , respectively. The patients were not received the oral and written education were found to give false answers to the majority of the questions of the ‘‘Osteoporosis Knowledge Test’’ including the role and the source of vitamin D, the relation between osteoporosis and menopause, and negative effect of caffeine and tea consumption on osteoporosis. The patients in this group also had lower adherence rates ( $1.30 \pm 0.84$ ). Taking pills after meals ( $n = 9$ ) was the most common mistake with alendronate therapy. Also 19.5% of patients declared gastrointestinal complaints especially stomachache. It was found that the most common problem of patients were back pain (34.8%) and low back pain (26.1%). Previous ulcer history found in 2 patients (4.3%) who receiving alendronate therapy at least 3 months.

**Discussion & Conclusion** We suggest that pharmacist-led oral and written education has a major importance in prevention of osteoporosis and its complications and in improvement of adherence, as well.

**Keywords** Alendronate, Osteoporosis, Pharmaceutical Care, Patient Education

## MI-15

### Irinotecan in therapeutic strategy of advanced ovarian cancer

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**Introduction** Irinotecan (IRI) is indicated in treatment of colorectal cancers. However, in our hospital, oncologists prescribe IRI with 5-fluorouracil (5-FU) in treatment of advanced ovarian cancer (aOC). The justification of this off-label use is that IRI has a better toxicity profile than topotecan (same class of antineoplastic agent), which has marketing authorization in aOC. The French National Institute of Cancer (InCa) has published in 2010 an update of gynecological cancers good practice. This referential classified the use of IRI as an unacceptable situation for treatment of OC in first line therapy or in relapse in combination with variable anticancer drugs. We therefore decided to investigate efficacy and tolerance of IRI in patients with aOC.

**Materials & Methods** 40 month-retrospective study (from 01/07/2007 to 30/04/2010) was performed in Oncology and Pharmacy departments. Data were collected from Chimio<sup>®</sup> software and electronic medical records.

**Results** 113 patients were treated with chemotherapy in our hospital for aOC. 16 (14%) patients were treated with IRI in combination with 5-FU (FOLFIRI protocol). They received a total of 115 cycles with a median of 7.5 [range: 1–21]. Median age was 62 years [51–78]. IRI was prescribed in second-line treatment for 2 patients, in third-line for 5 patients, in fourth-line for 8 patients and in fifth-line for 1 patient. 2 (12,5%) patients had partial response, 4 (25%) stable disease, 2 (12,5%) disease progression. Efficacy did not assess for 8 patients: 4 died from their disease before evaluation, 2 died ongoing treatment, 2 patients had missing data. No grade 3 or 4 toxicity related to IRI or 5FU was observed.

**Discussion & Conclusion** IRI is prescribed by our oncologists in late line therapy for relapse aOC, because of the strong use of platinum regimen therapy. Partial response to IRI after several lines of treatment in 12,5% of patients is a quite good result for this poor prognosis cancer. IRI compared to topotecan presents advantages for patient quality of life. It was well tolerated in comparison with topotecan that has an important hematological toxicity in late lines and may be too aggressive in these relapsed patients after several lines of treatment. FOLFIRI therapy is realized in a day-care unit at day1 in contrast to topotecan that requires either a hospitalization or 5 consecutive days of day care. Combination between IRI and 5-FU is not mentioned in the referential. 5FU has an acceptable toxicity in relapse aOC in contrast to docetaxel or doxorubicin that are mentioned in the referential as unacceptable situation in combination with IRI for aOC. Although IRI in combination with 5-FU in aOC is off-referential use, our study showed acceptable results in tolerance and efficacy of IRI in treatment for relapse aOC. However, the follow up of further prescriptions of IRI in aOC must be continued in collaboration with our oncologists.

**Keywords** irinotecan, off label use prescription, ovarian cancer

## MI-16

### Drug and therapeutics committees in Denmark vary in organization and activity

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**Introduction** In order to promote rational pharmacotherapy, it is important to develop, implement, and evaluate hospital drug formularies (HDFs). A report from Denmark recommended standardizing activities of the Drug and Therapeutics committees (DTCs) among the 5 regions of Denmark, but little is known about, how their activities are today. The aim of the study was to describe the organization of the DTCs, how the HDFs were developed and implemented, and to what extent policies that support the use of HDFs existed.

**Materials & Methods** A survey was designed with inspiration from guidelines and surveys of DTCs. The survey included twenty closed and open-ended questions. The chairman of the nine DTCs, covering the 5 regions of Denmark, received the survey by e-mail.

**Results** All nine surveys were returned, resulting in a response rate of 100%.

The chairmen of the DTCs were specialist physicians 6 (67%) or managers of Hospital Pharmacy 3 (33%). Most of the members were specialist physicians, but nurses, pharmacists, managers of hospital pharmacies, general practitioners, and others were also represented. The meeting activities varied between 2 and 6 per year, and the duration of the meetings varied between 1 and 2.5 h. The DTCs

covered between 1 and 13 hospitals, and 8 (89%) developed a drug formulary and, to some extent, treatment guidelines. However, monitoring of the drug use from the HDFs, and the methods used for implementing the HDFs varied from “not at all” to “to very high degree”. Most of the DTCs developed policies and guidelines to support the medication use.

**Discussion & Conclusion** The DTCs in Denmark were organized differently, the composition of the DTCs varied, and the number of hospitals covered differed. The main activity was developing HDFs, and most of the committees developed policies that supported medication use. However, the implementation of HDFs was only supported to a lower degree. Improved collaboration between the DTCs might streamline HDFs and guidelines. In addition, it can lead to exchange of knowledge of the methods used for implementing the HDFs, which might improve adherence to HDFs.

**Keywords** Drug and Therapeutics, hospital drug formularies, survey, hospital

## MI-17

### Usefulness of skin tests and re-administration tests in betalactam allergy

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**Introduction** Antibiotics allergy represents 50% of drugs allergy. Aminopenicillins are principally suspected. It is important to confirm the allergy because betalactams are among the most useful antibiotics to treat common or severe infections. The diagnosis of betalactam allergy is based on the clinical history that enable to ascertain the drug imputability and on the realisation of skin tests (prick tests, intradermal reaction, patch tests) as defined in the European Network of Drug Allergy (ENDA) guidelines<sup>1</sup>. The skin tests are combined with re-administration tests.

**Materials & Methods** We retrospectively analysed the files of patients referred for betalactam reaction between January 2007 and December 2009. The patients were identified using the nominative prescriptions. For the purpose of the analysis a standardized collection data sheet was developed compiling demographic, clinical and pharmaceutical data

**Results** Ninety nine patients had skin tests over the considered period. We were able to analyse the files of 72 patients (52 women, 20 men). Amoxicillin was suspected in 22 patients. Skin tests were positive in 14 patients. Two of them were allergic to other drugs than betalactams (i.e carbamazepine and paracetamol). Five patients who had positive skin tests experienced angioedema. Re-administration tests were performed in all patients who had positive skin tests. Ceftriaxone was rechallenged when skin tests were positive with amoxicillin and amoxicillin was rechallenged when skin tests were positive with ceftriaxone. All of these re-administration tests were negative which means those rechallenged betalactams could be used in the future. Forty six re-administration tests were performed in the 58 patients who had negative skin tests. Amoxicillin was rechallenged in 34 cases. The re-administration tests were positive for two patients. One patient had a positive reaction to amoxicillin, the other one had a positive reaction to amoxicillin/clavulanic acid. Both should avoid the betalactam rechallenged.

**Discussion & Conclusion** Betalactam allergy was diagnosed in about 20% of patients who consulted for a suspicion of betalactam allergy. In the anamnesis, clinical data in favor of a betalactam allergy were found in 10 of the 12 patients who had positive skin tests which illustrates the

sensitivity of the skin tests. When skin tests are positive, it is important to rechallenge another betalactam the structure of which is different from the one who gave positive skin tests. This study also showed that re-administration tests should follow skin tests in order to screen false negative skin tests. In both cases re-administration tests help physician to have a clear therapeutic approach. This study demonstrated the usefulness of skin tests combined with re-administration tests to diagnose betalactam allergy. This diagnosis of betalactam allergy should not be made without realising that kind of tests.

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**Keywords** Betalactams, Allergy, Diagnosis, Skin tests, Re-administration tests

## MI-19

### Synthesis of use of dyes in clinical practice

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**Introduction** The dyes are components found in many areas, including food and pharmaceutical industry. In this latter use, they may even play the role of active substance. However, even though many dyes are used in clinical practice, only 3 of them have clinical drug status and approved indications. Other dyes are used in clinical practice without a formal recommendation but are not without side effects. Their uses are therefore under the responsibility of health professionals. To provide utilization as relevant as possible, we have listed the most common practices and tolerance of dyes available in our institution.

**Materials & Methods** We conducted a literature review concerning dyes listed on our hospital through main medical databases (such as PubMed and Drugdex) using as different keywords, namely the name of the dye, “toxicity”, “tolerance” and “use”.

**Results** The methylene blue is mainly used as an antidote (intravenous = IV) for methemoglobinemia, ifosfamide induced encephalopathy, and for sentinel lymph node localization and biopsy in breast cancer (intraparenchymal). Reported side effects are anaphylaxis, pulmonary oedema, hemolytic anemia with Heinz bodies and methemoglobinemia.

The fluorescein is indicated intravenously to assess retinal function especially by angiography and as eyedrop to see abnormalities of the cornea. It is also used for cataract surgery in intracapsular way. However, the existence of anaphylaxis with shock including a death has been reported, as well as cardiovascular disorders with cardiac arrest.

The patent blue V in IV has approved indications for identifying lymphatic vessels and arterial territories, and for the use of sentinel lymph node localization before biopsy in patients with operable breast cancer. regarding safety profile, hypersensitivity reactions with shock and pulmonary oedema have been reported.

Toluidine blue is sprayed locally in chromoendoscopy for diagnosis of oropharyngeal cancer. No serious adverse events have been identified in the literature.

The indigo carmine is used for digestive chromoendoscopy in local use, and intravenously to characterize the renal function. Anaphylactoid reactions and bronchospasm have been reported.

Lugol employed in preoperative thyroidectomy as oral drops and locally during chromoendoscopy or colposcopy. A case of anaphylactoid reaction was reported during a colposcopy.

**Discussion & Conclusion** The dyes are used in many medical fields, and seems to bring advantages compared with recommended treatments. Nevertheless it would be necessary to validate this by strong clinical studies, in view to formalize and bring cautions for their use in clinical practice by validated indication all the more that they can be responsible of severe side effects requiring important vigilance for users.

**Keywords** dyes clinical use safety

## MI-20

### Available antiadhesion medical devices: Which choice?

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**Introduction** During surgery, the peritonea may be injured. If the scar formation, leading to its repair, is not successful, an epithelization network may persist by collapsing several organs together creating adhesions. They may deeply impact morbidity: intestinal obstructions, secondary infertilities in women, chronic pelvic pain. The only remedy to adhesions is the removal in situ. Preventing adhesions creation is therefore decisive. Many clinical trials have been testing different pharmacological treatments (Fibrinolytics, Corticosteroids, Non-steroidal anti-inflammatory) in order to reduce post-surgical adhesions. But they didn't lead to significant results. Few Medical Devices (MD) have been developed to prevent contact between organs and the peritonea, so as to limit the formation of adhesions. The aim of our study is to evaluate and to compare different Antiadhesion Medical Devices (AMD) after the commercialization of new antiadhesion agents.

**Materials & Methods** We realized a bibliographical research on available AMD and analysed each technical documentation. We compared these MD according to their indications, mechanism of action, safety, resorption time, advantages or disadvantages, scientific evidence and finally their price.

**Results** AMD are available in spray, membrane, visco-elastic materials or liquid form. Their mode of action is: hydroflotation (liquid separating organs) or physical barrier. They are resorbable or not. They differ by their efficacy, their ability to be used in area at risk and their cost. Thirteen AMD are available. Among them, only 3 have real scientific evidence and a good benefit/risk ratio. These 3 MD have different compositions, forms and mechanism of action; but have similar indications (abdominal and /or gynaecological surgery): resorbable membrane with oxidized regenerated cellulose; resorbable barrier film with hyaluronic acid, carboxymethylcellulose and adhesion reduction solution with 4% icodextrin. Surgeons will choose the appropriate MD according to the geometry, the accessibility of the area to be treated, the scientific evidence and also the cost.

**Discussion & Conclusion** Our study showed that several difficulties concerning AMD exist: lack of clinical trials, few patients enrolled, lack of scientific evidence, different kinds of surgeries are concerned which doesn't allow to make a conclusion. The explanation is perhaps the difficulty to carry out clinical trials in such diseases or to realize a "second look laparoscopy". The clinical trials should evaluate performance, incidence of intestinal obstructions, prevention of chronic pelvic pain or fertility preservation. In the future, physical barriers combined with active substances could allow a better efficacy. Others MD are going to be developed in others indications: polyethylene and carboxymethylcellulose in lumbar disc herniation, and a system of humidification with insufflations carbon dioxide in laparoscopic surgery.

**Keywords** Antiadhesion medical devices

## MI-21

### Decision-support tools to manage drug incompatibilities: evaluation by nurses

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**Introduction** Preventing drug incompatibilities has a high impact on the safety of drug therapy. Although there are no international guidelines to manage drug incompatibilities, different decision-support tools such as handbooks, cross-tables and databases are available. In a previous study, two decision-support tools have been pre-selected by pharmacists as fitting nurses' needs on the wards<sup>1</sup>. The objective of this study was to have these both tools evaluated by nurses to determine which would be the most suitable for their daily practice.

**Materials & Methods** Evaluated tools were:

1. *Cross-table* of drug pairs ([http://files.chuv.ch/internet-docs/pha/medicaments/pha\\_phatab\\_compatibilitessip.pdf](http://files.chuv.ch/internet-docs/pha/medicaments/pha_phatab_compatibilitessip.pdf))
2. *Colour-table* (a colour for each drug according to the pH: red = acid; blue = basic; yellow = neutral; black = to be infused alone)<sup>2</sup>

Tools were assessed by 48 nurses in 5 units (PICU, adult and geriatric intensive care, surgery, onco-hematology) using a standardized form<sup>1</sup>. The scientific accuracy of the tools was evaluated by determining the compatibility of five drugs pairs (rate of correct answers according to the Trissel's Handbook on Injectable Drugs, chi-square test). Their ergonomics, design, reliability and applicability were estimated using visual analogue scales (VAS 0-10; 0 = null, 10 = excellent). Results are expressed as the median and interquartile range (IQR) for 25% and 75% (Wilcoxon rank sum test).

**Results** The rate of correct answers was above 90% for both tools (cross-table 96.2% vs colour-table 92.5%,  $p > 0.05$ ).

The ergonomics and the applicability were higher for the cross-table [7.1 (IQR<sub>25</sub> 4.0, IQR<sub>75</sub> 8.0) vs 5.0 (IQR<sub>25</sub> 2.7, IQR<sub>75</sub> 7.0),  $p = 0.025$  resp. 8.3 (IQR<sub>25</sub> 7.4, IQR<sub>75</sub> 9.2) vs 7.6 (IQR<sub>25</sub> 5.9, IQR<sub>75</sub> 8.8)  $p = 0.047$ ].

The design of the colour-table was judged better [4.6 (IQR<sub>25</sub> 2.9, IQR<sub>75</sub> 7.1) vs 7.1 (IQR<sub>25</sub> 5.4, IQR<sub>75</sub> 8.4)  $p = 0.002$ ].

No difference was observed in terms of reliability [7.3 (IQR<sub>25</sub> 6.5, IQR<sub>75</sub> 8.4) vs 6.7 (IQR<sub>25</sub> 5.0, IQR<sub>75</sub> 8.6)  $p > 0.05$ ].

The cross-table was globally preferred by 65% of the nurses (27% colour-table, 8% undetermined) and 68% would like to have this decision-support tool available for their daily practice.

**Discussion & Conclusion** Both tools showed the same accuracy to assess drug compatibility. In terms of ergonomics and applicability the cross-table was better than the colour-table, and was preferred by the nurses for their daily practice. The cross-table will be implemented in our hospital as decision-support tool to help nurses to manage drug incompatibilities.

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**Keywords** drug incompatibilities, Hospital pharmacy, tools' evaluation

## MI-22

### Cefuroxime in single-unit sterile doses for intracameral use: toward safe practices

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**Introduction** Cefuroxime 1000 µg/mL in intracameral injection was shown by a prospective, randomized, placebo-controlled trial of the European Society of Cataract and Refractive Surgeons, to be a powerful agent in preventing postoperative endophthalmitis, in comparison of prophylactic use of latest-generation fluoroquinolones. Nevertheless, 77% of members of the American Society of Cataract and Refractive Surgeons don't use intracameral injection because cefuroxime isn't available in industrialised and labelled presentation, with safety and medical-legal guaranties.

The recent publication of a technical note in European pharmacopeia allowed pharmacies to prepare secure unit-doses. Thus, the objective of this work is to present the implementation of this new activity developed in our hospital.

**Materials & Methods** We use a laminar flow hood and respect recommendations of the n°1190 pharmacopeia technical note. After preparing 140–170 syringes of 1 mL in each production campaign, the unit-doses are packaged in a black packaging unit, and frozen for maximum 3 months. After defreezing, cefuroxime has to be injected into the 6 h. Thus, a specific packaging label was studied in order to note the defreezing day and hour, and the deadline for use. Furthermore, a syringe label indicates name and dosage, expiry date, dose to inject, and legal endorsements such as cefuroxime registration on poisonous substances list. We are using a globalized dispensing system to provide the unit-doses to the operating room after a pharmaceutical analysis of computerized prescriptions. Finally, we defined a middle-cost for the single dose, charged to ophthalmic operating room at each dispensing, considering operating time, raw material, the cost of workforce, etc.

**Results** 5 months after implementation, we have prepared 305 unit-doses for 280 patients, representing 100% of patients operated for cataract without cefuroxime administration restrictions. The middle-cost of one syringe was established at 4,25 Euros, and 25 unit-doses were discarded for exceeding expiry date. Finally, we evaluated the necessary time to perform this new activity at about 120 min for each production campaign.

**Discussion & Conclusion** Today, ophthalmic surgeons in our hospital think cefuroxime unit-doses prepared by pharmacy are safe, by respect of appropriate aseptic conditions in accordance with good preparations practices, by the use of trained personnel, by a twice control of each step of the process by pharmacy operators, and by a pharmaceutical validation of traceability elements and macroscopic aspect before releasing preparations. Furthermore, preparing unit-doses in pharmacy limits risks of errors in doses and dilutions responsible for "Toxic Anterior Segment Syndrome", as well as risks of toxic contaminations responsible for iatrogenic endophthalmitis.

**Keywords** cefuroxime, intracameral injection, pharmaceutical preparation

## MI-23

### Evaluation of a computer-based medication dispensing system prototype after six months of use in a gastroenterology unit

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**Introduction** Reducing medication errors in hospitals has led to the implementation of automated medication dispensing systems in wards. The company Sextant Medical has developed the computer-based medication dispensing system "High Security Dispenser" (HSD) intended to reduce such errors. Competitor systems already exist such as Pyxis and Omnicell devices. Our project aims to evaluate the impact of the implementation of the HSD device in our hospital. We have supported the development of a prototype so that it better meets the hospital's expectations.

**Materials & Methods** Evaluation at 3 and 6 months were carried out in our hepatogastroenterology care unit (9 beds). Assessments include: stored products typology, adequacy features to the ideal dispensing system specifications and satisfaction by pharmaceutical and nursing teams.

**Results** We have stored in the HSD system 227 drug references, which represents 74% of usually prescribed drugs of the care unit, including: 100% of dry formulations and 85% of injectables drugs, apart from refrigerated products and massive solutes. To date, scores of the 46 criteria of the ideal dispensing system specifications established by the pharmacy are: ergonomics and modular storage 7/10, detention security 9.4/10, dispensation security 9.3/10, traceability of streams 6.7/10, inventory management 6/10, supply management 10/10, information management 6.9/10.

The quality perceived by the users (8 nurses, 4 technicians and 6 supervisors) is in progress: satisfaction rates are respectively 88%, 97% and 93% for storage layout, delivery function and human-machine interface ergonomics. These results are much better than at 3 months (82%, 71%, and 67%). For users, the main advantages of the prototype are: potential diminution of medication errors, storage quality and traceability.

The limits are: storage capacity for voluminous drugs or drugs with high turnover, entry and access time. Major organizational changes came with the implementation: presence of a technician and a pharmacist resident are required 5/7 days to analyze prescriptions, to manage drug substitutions and to enter the list of drugs to be dispensed for each patient.

**Discussion & Conclusion** In conclusion, the HSD experimentation shows a good functional response and satisfaction of the users. Benefits are superior after 6 months of use than after the first evaluation, due to the implementation of profile management (detention security), automatic re-stocking information (supply management), and INN/name product search software (information management). Users satisfaction has raised by 21%. However, the system still needs pharmacist presence in the care unit 5/7 days. These first results are positive and work is in progress.

**Keywords** detention security, dispensation security, HSD Pyxis Omnicell, implementation of automated medication dispensing systems, medication errors

## MI-24

### Metabolism of 5-hydroxymethylfurfural following the application of a novel anti-cancer infusion solution

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**Introduction** A novel combination of four different molecules designed as infusion solution mixture is currently undergoing Phase II



clinical trials. This infusion solution can be seen as a new strategy against cancer as its action towards tumor cells is based on differential metabolism. One of these four active ingredients is 5-hydroxymethylfurfural (HMF). The present work deals with the analysis of the metabolic products of HMF occurring in the human body. Till now four main metabolites are supposed to be found in human urine: the monocarboxylic acid, 5-hydroxymethyl furoic acid (HMFA), its dicarboxylic acid 2,5-furanodicarboxylic acid (FDCA), N-(5-hydroxymethyl-2-furoyl)glycine (HMFG) and 5-sulfoxymethylfurfural (SMF) that is addressed as a potential carcinogenic substance. Up to now no HMF has been found in urine and therefore it is supposed to be completely metabolized [1,2]. The analytical procedure developed will be used for analyzing urine samples of cancer patients treated with the infusion solution.

**Materials & Methods** Due to the matrix complexity of urine, we started with a sample purification step by means of SPE using anion exchange cartridges (Strata SAX and Strata Screen A). The metabolites were separated and detected via HPLC/UV (column RP-C6-Phenyl 150 x 4,6mm 3µm; WL 265 nm; 1.0 mL/min) with a gradient program switching from mobile phase A (water: ACN: TFA, 91.95: 8: 0.05) to mobile phase B (water: MeOH, 60: 40) after 5 min. Peak identification ensues through standardized substances.

**Results** SPE method for urine purification and HPLC method for the detection of relevant substances have been investigated, especially for two potential metabolites FDCA and HMFA. Recovery rate was higher than 90% for both of them when using a Strata Screen A cartridge. HPLC separation was improved to eliminate interferences especially for the FDCA peak and the method has been validated following ICH guidelines. HMFG and SMF were not detected with this method since the unavailability of stable standards.

**Discussion & Conclusion** Since the infusion solution containing HMF is meant to be used in clinical treatment of end stage cancer patient, there is the necessity of biomarkers for its clinical screening.

The aim of this study is to investigate potential metabolites of HMF and explore their possible use as biomarkers in future pharmacokinetic studies. We were able to separate and quantify HMFA and FDCA in the low picomole range with good reproducibility. HMFG and SMF will be investigated via LC-MS-MS study.

This study will also answer the open question about the possible presence of SFM, thus enhancing the medication safety.

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**Keywords** 5-Hydroxymethylfurfural, Cancerology, HPLC method, SPE method

#### MI-25

##### Use of surgical glues: a survey made on expert interviews in two French university hospitals

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**Introduction** Surgical glues (SG) are health products commonly used in order to achieve hemostasis or sealing of sutures. However, there is currently no recommendation concerning their proper use and moreover, the scientific background supporting their efficacy appears to be very poor. As part of an overall review on SG's interest, a survey based on expert interviews was performed with surgeons from the Hospices Civils de Lyon (HCL) and the University Hospital of St Etienne. Our objectives were: to evaluate the positioning of SG as compared with conventional techniques (CT) and the respective positioning of each SG; to identify selection criteria for the use of glues and to evaluate the surgeons' needs.

**Materials & Methods** The survey consisted of interviews based on questionnaire divided into five parts. The first one was aimed at listing the situations in which a SG could be used. The second one reported all the surgeries which can lead to this surgical situation. The third part was devoted to the description of the techniques and glues used as well as the terms and selection criteria for use. The fourth part dealt with glues associations and collected surgeon's satisfactory levels. Finally, requests regarding the need for new SG were noted in the last part. The survey was carried out by a pharmacist.

**Results** Twenty-two surgeons were interviewed representing six different surgical specialties. 67% of surgical situations concerned bleeding situations. Any confused surgical situation, a CT (suturing, cauterization) was reported to be the main first line option (60%). The use of glue alone (57%) or in combination with a CT (43%) was reported in the remaining 40% of cases. According to the surgical specialties and anatomic location, the glue used is different. The main criteria used for the choice of SG were surgeon's experience (33%), ergonomics (21%) and the easiness of preparation (12%) whereas scientific background was reported in only 0.7% of cases. Finally, thirteen requests for new glues from eleven surgeons were identified, concerned five adhesives.

**Discussion & Conclusion** Although the survey was conducted with a small number of surgeons working in two hospitals, the investigation revealed heterogeneous and non-consensual practices. Moreover, bleeding appears to be the main concern of surgeons. The conflicting requests underlie the problem of SG since there is not one single product used in different situations. As it has been reported, glues are used in 40% of cases in first line even if it is not mentioned in product's characteristics. Therefore, local recommendations on the use of glue could be proposed and validated by surgeons and hospital pharmacists in order to promote the rational and appropriate use of SG in our hospital.

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**Keywords** Surgical glue, evaluation, good practice

#### MI-26

##### A survey of extemporaneous preparations for paediatrics in a Malaysian teaching hospital

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**Introduction** The administration of medicines in children are often faced with challenges due to inavailability of suitable dosage forms.

Most of the liquid dosage forms need to be prepared extemporaneously using appropriate excipients as there are limited commercially prepared products locally. However there are also limited information on stability and formulation of crushed medications. The objective of this study was to find out the extend of the problem, identify types of drugs frequently extemporaneously prepared, and to identify useful vehicles which can improve the preparations of extemporaneous medicines.

**Materials & Methods** Data were collected and analyzed from online prescriptions of all paediatric wards for a period of 10 weeks. Documentation included all extemporaneously prepared oral medications. Method of medicine preparation were identified based on interview with staff nurses and checking of pharmacy assistants' work sheet. Each medication prepared which required crushing of tablet and dispersing in a diluent were considered as one unit sample.

**Results** There were a total of 110 extemporaneously prepared oral liquids. Those with stability data are 35 units (32%) and 75 (68%) without. These 110 units involved 51 types of drugs. Only 19 types of liquid medications could be prepared with stability data. Most of these were Folic Acid and Trimethoprim syrup. Whereas 32 others had to be prepared conventionally by simply cutting, crushing or mixing with simple diluents to ease oral feeding. This is either due to inavailability of ingredients which includes buffering, suspending agents, vehicles and preservatives or stability data. Results showed that most of our oral liquids, 75 (68%) are prepared without evidence of stability data. Among the top were Flucloxacillin, Thioguanine, Frusemide, Ibuprofen, Dexamethasone and Prednisolone syrup. Therefore the quality of medication for these children would be jeopardised. Two important suspending vehicles were identified useful to improve the stability of our frequently extemporaneously preparations liquids in which 11 oral liquids could be prepared with Oral-Plus while 9 oral liquids could be prepared with Methylcellulose.

**Discussion & Conclusion** Most of the drugs commonly used for children are still unavailable in the readily made oral liquid form in our country. There were still a wide range of drugs prepared extemporaneously without stability data. We propose the purchase of the said vehicles in our pharmacy to enhance the safety and efficacy of some of our extemporaneously prepared oral liquids.

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**Keywords** Documentation

## MI-27

### Topical metronidazole can reduce pain after surgery and pain on defecation in postoperative hemorrhoidectomy

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**Introduction** Topical metronidazole (10 percent) has been previously demonstrated to decrease postoperative pain after hemorrhoidectomy. The aim of this study was to evaluate the effect of topical metronidazole (10 percent) in reducing postoperative and after-defecation pain of hemorrhoidectomy.

**Materials & Methods** A double-blind, randomized trial was conducted to compare posthemorrhoidectomy pain with use of topical

metronidazole (10 percent) vs. placebo carrier, applied to surgical site. Forty-seven patients were randomly allocated to receive metronidazole (n = 25) or placebo (n = 22). Pain was assessed using a visual analog scale preoperatively and on postoperative hours 6 and 12 and at days 1, 2, 7, and 14. The use of narcotic, additional analgesics, and complications were recorded. (Pain scores were calculated and compared with baseline values and control group (t test, SPSS ver.10).

**Results** Patients in the topical metronidazole group had significantly less postoperative pain than those in the placebo group up to day 14 (P)

**Discussion & Conclusion** Metronidazole has been shown to reduce postoperative pain in recent studies 2, 11–13. The efficacy may be in part from bactericidal action, in addition to its less understood anti-inflammatory action 14. In this prospective examination of postoperative pain after open hemorrhoidectomy, patients receiving metronidazole 10 percent topical ointment reported less pain at 6 and 12 h post surgery, which may be attributed to the anti-inflammatory properties of metronidazole. Also, patients experienced less pain during days 1 to 14 after surgery, which may be because of metronidazole's antibacterial properties. Compared with the placebo group, lower narcotic and oral analgesic consumption in the metronidazole group confirms the improved pain management following an open hemorrhoidectomy. Pressure to the surgery site may be a major factor for pain on defecation. In the present study, metronidazole, 10 percent topical ointment was efficacious in reducing pain on defecation at 48 h after surgery. These findings suggest that inflammation may be interfering with defecation in the primary days post surgery. In our study, more women were recruited than men (76.5 percent). The reason for this recruitment bias is uncertain. In both groups, a large number of patients lived in cities (68.08 percent). The cause of this finding may be related to treatment expense, availability of physician, and cultural differences. Overall, these results suggest that addition of topical metronidazole, 10 percent to conventional pain medications may be efficacious to reduce pain in patients after a hemorrhoidectomy.

**Keywords** hemorrhoidectomy, pain, topical metronidazole

## MI-30

### Expensive drugs: Electronic support tool for prescription based on scientific referential

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**Introduction** The reimbursement of drugs included on the list of expensive molecules (French T2A) depends on the respect of the evidence-based medicine (EBM). Because of constant EBM evolution, the latest data access is difficult. In order to facilitate the prescription, we wanted to develop a tool helping physicians and pharmacists to access the latest update guidelines.

**Materials & Methods** First, we performed a review of scientific data: AFSSaPS (French Health Products Safety Agency), INCa (National Institute for the fight against Cancer) and Scientific Societies.

Then, we developed an electronic support tool for the prescription of drugs included on the "French T2A" list.

**Results** The developed tool gathers all expensive molecules in a table. Each drug is related the latest AFSSaPS guidelines and INCa guidelines for the anticancerous drugs. In order to ensure the sustainability of this document, the internal software system (CISMEF) updates all data from the referentials.

The “prescription modalities” section permits access to the type of specific prescription: computer or paper prescription. The referral centers\* are also included to facilitate the validation of each orphan drug treatment. Regarding the out referential prescriptions, a document is available to justify and argue thus it is mentioned in the medical patient file. This tool has been validated by several establishment committees: COMEDIMS (committee for drugs and sterile medical devices) and CBPC (committee of Good Clinical Practice).

Then, it transmitted to physicians via an internal electronic management of documents and information. Prescribers have a permanent access to scientific referentials by this system which ensures, via CISMEF, an automatic update of files concerned.

**Discussion & Conclusion** The objective of this tool is to simplify the access of the latest guidelines in order to improve prescription quality and to have better monitoring of expensive molecules. The next stage will lead a satisfaction investigation of the physicians to optimise this tool.

## Bibliographic references

\*French government bulletin January 25, 2010; prescriptions of drugs designated as orphan.

**Keywords** electronic support tool, expensive molecules, referential

## MI-31

### Serum vitamin D concentration in pandemic 2009 H1N1 influenza infected patients

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**Introduction** Recently immunomodulatory effect of vitamin D is well known. It was proposed that serum level of vitamin D in some populations including patients with asthma, cystic fibrosis, chronic obstructive pulmonary disease (COPD), tuberculosis and respiratory infections is lower than normal population. It was shown that vitamin D status is associated inversely with recent URTI, common cold and influenza (2). We have evaluated serum vitamin D concentration in H1N1 infected patients.

**Materials & Methods** Fifty-two patients with documented H1N1 influenza were enrolled the study during pandemic 2009 flu. Patients' demographic data was recorded and one venous blood sample (3 ml) was collected from each patient at same time a day (at morning). Serum 25 (OH) D concentrations was measured by Chemiluminescence method.

**Results:** Mean serum 25(OH)D level was  $39.29 \pm 27.14$  nmol/L in men and for women this level was  $52.58 \pm 62.59$  nmol/L. Serum vitamin D concentration was higher in women than men, but it is not statistically significant

**Discussion & Conclusion** This is the first report of vitamin D serum concentration in Iranian H1N1 patients. We found that 60.8% of this population are vitamin D deficient, as defined serum 25(OH)D below 35 nmol/L. The highest level reported by Hashemipour et al. which found vitamin D deficiency in 81.3% of healthy population of Tehran. Epidemiological studies indicate an inverse association between serum 25(OH)D level and respiratory infections. Probable mechanism may due to vitamin D effect on innate immunity in our study. Mean serum 25(OH)D level was  $39.29 \pm 27.14$  nmol/L in men and for women this level was  $52.58 \pm 62.59$  nmol/L. Serum vitamin D concentration was higher in women than men, but its not statistically significant Base on vitamin D deficiency definition (serum 25(OH)D level less than 35 nmol/l), 60.8% of the studied patients had vitamin D deficiency.

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**Keywords** influenza, Serum vitamin D concentration

## MI-32

### Physical and Chemical Stability of Taxotere® 1-vial (20 mg/ml) Infusion Solution Following Refrigerated Storage

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**Introduction** Taxotere 1-vial is expected to simplify preparation by no longer requiring the initial dilution step that was necessary with the 2-vial presentation, offering greater convenience with an easier and quicker preparation. Purpose: The physical and chemical stability of a new one-vial formulation of docetaxel (Taxotere® 1-vial, Sanofi-Aventis, Dagenham, United Kingdom) in a large number of infusion solutions was studied following refrigerated storage.

**Materials & Methods** Taxotere 1-vial infusion solutions were prepared by adding 200 mg of Docetaxel, using a single introduction of 10ml docetaxel concentrate (20 mg/ml) into 250 mL polyethylene bags filled with 0.9% saline. Infusion bags were stored under refrigeration at 5°C and removed after either 2 (n = 60 bags) or 7 (n = 60 bags) days and assessed immediately and at intervals after removal and storage for a further 24 h at ambient temperature (about 20°C). Crystallization was assessed by a careful visual examination. The chemical stability was assessed by determination of the docetaxel content and degradation impurities in several of the infusion bags used in the physical stability study by HPLC. The chemical stability was investigated on the same solution resulting from the physical stability study.

**Results** No visible crystallisation was observed in any Taxotere 1-vial infusion bags following refrigerated storage for either 2 or 7 days and subsequent storage for 24 h at approximately 20°C. There was no significant evolution of pH, docetaxel content, or degradation impurities in the infusion bags during this time.

**Discussion & Conclusion** The new Taxotere 1-vial formulation is associated with reduced risk of precipitation of docetaxel via elimination of the premix solution (required for the Taxotere 2-vial presentation) and a one-shot preparation technique (ie, only one intervention into the infusion bag). Moreover, refrigerated storage has been significantly shown to extend the physico-chemical stability for up to 7 days. However, only physico-chemical stability has been demonstrated in this study.

**Keywords** 1-vial, Chemical stability, docetaxel, Physical stability, Taxotere

## MI-33

### Characteristics of the drug-disease information service demanded from the community pharmacist

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**Introduction** Besides dispensing, the pharmacist conducts various professional services at the community pharmacy setting. The most common cognitive service provided at a typical community pharmacy in Turkey is provision of drug/disease information. The study aimed to assess the characteristics of “drug/disease information” services demanded directly from the pharmacist at the community pharmacy setting.

**Materials & Methods** The 5<sup>th</sup> year pharmacy students of Marmara University Faculty of Pharmacy (n = 108) spent a total of 12 days at different community pharmacies located in Istanbul, during their ‘Pharmacy Practice I’ course. The locations of the pharmacies were all urban; however, the patients served were both of urban and rural origin. The students were requested to record all questions directed by the clients only to the pharmacist during the 12 work-days. The questions that were directed to the other pharmacy staff and those spontaneously generated during a routine patient education were excluded.

**Results** During the 12 days period, 3462 questions were directed to the pharmacist. Of these questions, 1520 questions were analyzed for now. According to this analysis, the most frequently (11.9%) encountered questions were related to the “dermatological preparations- cosmetic products- hair-care products” class. This was followed by the “analgesics- muscle relaxants” (9%); “cold remedies and lozenges” (8.6%); dietary-supplements- vitamin products” (8.2%); “gastro-intestinal system drugs” (7.8%) and others. When the type of the questions was analyzed, it was seen that majority (n = 880) of the questions were on “seeking advice for treatment” and this was followed by questions on “present or potential adverse effects” (n = 140).

**Discussion & Conclusion** The intensity of queries and the characteristics of the questions documented in this study suggest that there is an extensive public demand for the “drug/disease information” service from the pharmacist at the community pharmacy. It was also observed that the public seek treatment advice for their complaints first from the pharmacists before visiting a physician. The public seems to trust the pharmacists and seek treatment advice for their complaints. The identification of the most frequent “drug/disease information” questions would help the pharmacists regularly get updated on these topics to provide a better service.

**Keywords** Community pharmacy, counseling, drug Information

## MI-34

### Vertebroplasty: what device for what technique?

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**Introduction** Vertebroplasty technique consists in injecting cement at high pressure into a fractured vertebral body, to consolidate the vertebra and obtain an analgesic effect. Because it is invasive and risky, vertebroplasty is not yet much developed in France. Nevertheless, competition in medical devices (MD) grows and the aim of this work was to obtain a consensus of choice of medical devices for the 38 Paris University Hospitals.

**Materials & Methods** An expert panel (interventional radiologists and orthopedic surgeons) was convened to discuss about their needs of MD, from an inventory of the French market and about indications developed in the future. This work was based on devices specifications, consumptions in AP-HP and literature analysis.

**Results** Vertebroplasty represents an annual 250 000 euros expense in AP-HP (with 9 manufacturers). Only few teams practice

vertebroplasty but techniques differ from one to another: local or general anesthesia, percutaneously or during a surgical intervention; unilateral/bilateral and transpedicular/posterolateral approach. Technical specifications vary depending on characteristics such as length, gauge, tip of the needle especially in specific situations such as sclerotic bone tissue or lytic lesions. Patient-related factors like corpulence, vertebral level and number of vertebra treated may also influence the choice. Finally subjective criteria related to physician have to be taken into account: injection mode, kit's contents, MD ergonomics, or cement viscosity.

All of these elements explain difficulties to reach a consensus of choice of devices and the high connection existing between physicians and devices. Furthermore, manufacturers regularly develop new devices that are supposed to be more effective but only few clinical studies with poor methodology are published and rarely comparative.

Regarding use and indications, vertebroplasty is more used in AP-HP to treat vertebral metastases with an aim of pain relieve, than osteoporosis or traumatic fractures. But what about long-term tolerance? And which place of balloon kyphoplasty, which seems to be more safe but much more expensive?

**Discussion & Conclusion** Vertebroplasty is still in development, as shown by the variety of techniques. Expert panel has allowed to review the needs of devices, and to discuss possible evolutions waited in the future. Another meeting will be planned before 2 or 3 years, to re-discuss products, techniques and indications.

**Keywords** medical devices, vertebroplasty

## MI-35

### Impregnated dressings: role of an assessment committee in choice and decision making

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**Introduction** Prevention strategies have become a major issue in the quality of care to reduce catheter-related infections (CRI), including the use of new medical devices which is supposed to confer further advantages. The central COMAI has evaluated chlorhexidine impregnated dressings to assess their interest in AP-HP and to compare the various marketed products.

**Materials & Methods** The central COMAI, consisting of physicians, pharmacists and hygiene specialists of AP-HP hospitals, is regularly convened to make decisions about anti-infective agents applicable to all of AP-HP hospitals. Analysis was based on technical specifications, antimicrobial activity and clinical studies, and decision was made during a plenary session with all of these elements compared to the clinical practice.

**Results** Two chlorhexidine impregnated dressings were identified in the french market: Biopatch® (Janssen Cilag) and Tegaderm CHG® (3M Health Care).

Costs are similar for both products and higher than the one of classical dressings (6 to 7 euros per unit). However, chlorhexidine concentrations are different (25% and 2% w/w respectively), and the structure discriminates Biopatch® (non-transparent polyurethane foam) against Tegaderm CHG® (transparent hydrogel). Clinical data supporting their effectiveness are not equivalent. Biopatch® clinical report is the most supported, especially with a clinical study selected by the committee for its good methodology[1] (1636 patients).

Despite Biopatch® non-transparency, the experts supported its admission in hospitals in the absence of other alternatives (lack of clinical data related to Tegaderm CHG® at present).



The COMAI emphasized the importance of such devices for reducing CRI but decided to broadcast recommendations in AP-HP to limit their use and avoid any drift. These ones are not restricted to Intensive Care Units (ICU) because CRI rates in ICU are today equivalent to others unit rates, and recall major rules such as dressing substitutions or hygienic conditions. Besides, the committee avoids systematic use of Biopatch®, that has to be restricted to high-risk patients or in units where CRI are known to be high despite adherence to other strategies of prevention. Finally, the COMAI reminds that Biopatch® is indicated to enhance other strategies and not to replace them.

**Discussion & Conclusion** The COMAI guidelines will be widely broadcasted in medical units of Paris University Hospitals and a consumption analysis is programmed. Multidisciplinary cooperation including local pharmacies and care units is primordial to ensure an appropriate use. However, this example shows the necessity of such objective committees in a hospital setting.

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**Keywords** Anti-Infective Assessment Committee, catheter-related infection, chlorhexidine impregnated dressing

## MS-1

### The effect of a pharmaceutical care process on medication related hospital admissions in the elderly in an integrated primary care setting: results of the PHARM study

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**Introduction** Previous studies have shown an increased risk of hospital admissions with a medication related cause especially for elderly patients.<sup>1</sup> Regular review of pharmacotherapy has been recommended to prevent hospital admissions and to improve pharmaceutical care. Therefore we designed the PHARM, (Prevention of Hospital Admissions by Reviewing Medication), study to investigate the effectiveness of the pharmaceutical care process on medication-related hospital admissions, survival, adverse drug events and quality of life in collaboration with the GP, the pharmacist and the patient in an integrated primary care setting.

**Materials & Methods** The PHARM-study is designed as an open, controlled, multi-centre intervention study. Patients with a high risk on a medication related hospital admission based on old age, non-adherence, type of medication used and polypharmacy, were included in the study. The intervention consisted of a patient-centred, structured, pharmaceutical care process, which was continuous and occurred over multiple encounters of patients and clinicians. The steps of this pharmaceutical care process were a pharmaceutical

anamnesis, a pharmacotherapy review, a pharmaceutical care plan combined with the monitoring and follow up evaluation. The patient's own pharmacist and GP carried out the pharmaceutical care process. The control group was included by another GP than the intervention GP and received usual care. The outcomes of the study were hospital admissions related to medication and also survival, quality of life and adverse drug events. They were analysed using mixed-effects Cox models.

**Results** 364 intervention and 310 control patients were included in 42 primary health care settings of at least one pharmacist and at least two GP's. More medication related hospital admissions were found in the control group than in the intervention group; respectively 10 and 6 admissions. The effect was dependent on the number of diseases. The effect of the intervention for 4 diseases was a Hazard Ratio(HR) 0.43 (95%CI: 0.093–1.20); for 5, HR 0.28 (0.056–0.73); for 6, HR 0.19 (0.033–0.53) and for 7, HR 0.14 (0.020–0.43). Between the intervention and control group no statistically significant differences were found on survival, adverse drug events and quality of life.

**Discussion & Conclusion** With the PHARM study we demonstrated that the pharmaceutical care process may prevent hospital admissions with a medication related cause.

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**Keywords** adverse drug event, elderly, medication review, pharmaceutical care plan, primary care

## MS-2

### Working on medication inappropriateness assessment: what's about underprescribing?

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**Introduction** Prescribing evaluation represents a major concern in clinical pharmacy. Overprescribing is a commonly used criterion in this task, but suboptimal prescribing also appears to be relevant when considering clinical experience and guidelines. We conducted a pilot study to assess the quality of prescriptions in our hospital. One item focused on underprescribing. The objective of this work was to present our results on this specific issue.

**Materials & Methods** We performed a cross-sectional study in a French general hospital with no computerized prescription. Adult inpatients were included on June 2009 in medical, surgical and obstetrical wards. Data were collected by a pharmacist from all available medical charts. Prescriptions were analysed using the Assessment of Underutilization of Medication (AOU, Jeffery et al, Consult Pharm 1999). Each condition was rated as: "no omission", "possible omission" or "confirmed omission".

**Results** Among the 115 included patients (mean age: 68.4 years; sex ratio: 1.05; mean number of prescribed medications: 7.4), 53 (46.1%) experienced an omission. "Confirmed omissions" occurred in 33 patients (28.7%): 11 cases with untreated anemia, 5 cases without secondary prevention of osteoporosis and 5 cases of untreated

diabetes. “Possible omissions” occurred in 31 patients (27.0%): 6 cases with untreated constipation, 5 cases with untreated diabetes, 4 cases with untreated depression and 4 cases with untreated anemia.

**Discussion & Conclusion** Underprescribing nearly occurred in one in two patients, what is much higher than the 25% observed by the AOU authors in 20 elderly patients. However, our findings are consistent with the results of a study using the START (57.9%), a 22 criteria tool developed to detect prescribing omissions in elderly patients. Finally, our results should warn us about the importance of underprescribing, a phenomenon which is dramatically underrated in France. In this purpose, the AOU could represent an interesting tool insofar as it is easier to use than the START with similar efficiency.

**Keywords** clinical pharmacy, medication appropriateness, prescription quality assessment, underprescribing

## MS-3

### A simple tool to improve medication reconciliation at the emergency department

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**Introduction** A large prospective study, conducted at the Emergency Department (ED) of the University Hospitals Leuven, demonstrates that medication histories acquired by physicians are very often incomplete [1]. Sixty percent of medication histories obtained by physicians are discrepant from those obtained by pharmacists, with drug omissions as the leading cause of discrepancies [1]. A structured form along with a limited list of questions, further referred to as ‘limited questions list’, helps in completing medication histories. We investigated the impact of the “limited questions list” used by physicians during medication reconciliation on the frequency of drug omissions.

**Materials & Methods** A prospective controlled study of 260 consecutively recruited patients admitted to the ED of the University Hospitals, Leuven was conducted. The control group received standard medication reconciliation. In the intervention group, the physicians of general internal medicine were obliged to use, besides the standard care, the ‘limited questions list’ for acquiring medication histories. The clinical pharmacist re-obtained medication histories of the patients in both groups on a structured manner with the same ‘limited questions list’.

**Results** The number of drug omissions in relation to the total number of registered drugs in the intervention group was 0.09 (=84/982) in the intervention group compared with 0.174 (=141/806) in the standard care group, which is a reduction of 49.3% in drug omissions when physicians are using the ‘limited questions list’ ( $p < 0.001$ ). When comparing the omission rate per medication history in both groups, we observed an average of 1.1 for the standard care group, which is reduced to 0.6 in the intervention group ( $p < 0.037$ ). The highest rate of discrepancy was recorded for antithrombotics in the standard care group and for dietary supplements in the intervention group, but there were no significant differences in discrepancy regarding to the type drug classes in both groups.

**Discussion & Conclusion** This study with an accurate design showed a significant improvement in quality of medication histories between control and intervention group. A few barriers for implementation can be expected. Usefulness of this tool if used by other disciplines than general internal medicine remains unclear. In our study we have learned that obligatory use and persistent motivation of physicians are important for successful implementation.

This study has demonstrated that a standardized list of simple questions, used by physicians, improves the accuracy of medication histories. Widespread use of the tool by physicians and also other health care professionals acquiring medication histories, should be considered.

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**Keywords** Implementation, medication reconciliation, Tool

## MS-5

### Quality of prescribing for elderly patients linked to hospital admissions

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**Introduction** A randomized, controlled study of 400 patients aged 80 years or older was conducted at the University Hospital of Uppsala, Sweden (the “80+ study”). The intervention consisted of a comprehensive clinical pharmacy service. The primary outcome measure was the frequency of hospital visits during the 12-month follow-up period. A 16% reduction in all visits to the hospital was seen in the intervention group and drug-related re-admissions were reduced by 80%. These results were published in May 2009<sup>1</sup>. The next step was to evaluate the quality of prescribing in our study subjects and to relate this to the actual level of re-hospitalisation in the follow-up year. The STOPP/START criteria, developed by Gallagher et al<sup>2</sup>, is a relatively new explicit tool that can be used both to identify inappropriate prescribing and to identify untreated indications. The tool has proven easy to use and the criteria are relevant in a Swedish setting.

**Aims** To measure the effectiveness of pharmacists’ interventions aiming in improving quality of prescribing, in a previously performed RCT, using the STOPP/START criteria.

To test the ability of the STOPP/START criteria to predict future hospitalisation.

**Materials & Methods** The STOPP/START criteria were applied to the 400 patients in the previously performed RCT, on admission and on discharge, for the intervention- and control group patients. The scores for each patient were then linked to the actual incidence of drug-related hospital admissions and visits to the Emergency Department during the follow-up year.

**Results** STOPP: The Intervention group ( $n = 182$ ) were prescribed 268 potentially inappropriate medicines (PIMs) on admission (mean 1.5) and 182 on discharge (mean 1.0). The control group ( $n = 186$ ) were prescribed 277 PIMs on admission (mean 1.5) and 317 on discharge (mean 2.2). START: The intervention group had 69 omitted drugs on admission (mean 0.4) and 14 on discharge (mean 0.1). The control group had 78 omitted drug on admission (mean 0.4) and 85 on discharge (mean 0.5). The combined scores for STOPP and START were significantly higher ( $p = 0.03$ ) on discharge for patients with drug-related admissions during the follow-up year. The same relationship could not be shown for visits to the Emergency Department.

**Discussion & Conclusion** The results suggest that the intervention in our previous study was effective in improving quality of prescribing

as defined by the STOPP/START criteria and that STOPP/START can predict drug-related hospital admissions

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**Keywords** Elderly Patient, hospital admission, Hospital Pharmacy, Intervention, Implementation, quality of prescribing, STOPP/START

## MS-6

### Vitamin B12 levels in type 2 diabetic patients receiving metformin

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**Introduction** Metformin is the first line treatment in type 2 diabetes mellitus. However long term metformin intake is associated with vitamin B12 deficiency, which should be considered in differential diagnosis of diabetic neuropathy. The purpose of this study was to compare B12 levels in type 2 diabetic patients on long term metformin treatment with patients who do not have metformin in their regimen in a primary care clinic population.

**Materials & Methods** We conducted a case-control study of 50 type 2 diabetic patients attending to a diabetes clinic in Shariati teaching hospital of Tehran University of Medical Sciences. There were 25 age and sex matched patients in each group. Cases were on metformin for at least one year (11.8 ± 7.2 yrs). Patients who were taking calcium or multivitamin supplements, histamine receptor blockers or proton pump inhibitors were excluded. Vitamin B12, folate and homocysteine concentrations were measured. Serum B12 levels <150 pmol/L were considered as deficiency.

**Results** Two patients in cases and one in controls had B12 deficiency. There were no significant difference in B12 levels between cases and controls (389.6 pg/mL vs 430.5 pg/mL;  $p = 0.58$ ). Results were the same for folate (7.4 ng/mL vs 7.8 ng/mL;  $p = 0.75$ ) and homocysteine (11.3 μmol/L vs 14.3 μmol/L;  $p = 0.06$ ) levels.

**Discussion & Conclusion** In contrast to other studies, our results did not show any significant difference in B12 levels in diabetic patients taking metformin. The contrary may be in part due to excluding the patients who were taking histamine receptor blockers or proton pump inhibitors which impair the absorption of B12 and contribute to the development of B12 deficiency. Difference in metformin doses or course of treatment and small sample size may be the other reasons for different results. Our study reveals that B12 deficiency is not very common in our study population and routine measurement of B12 levels in patients taking metformin is not needed. Although healthcare professionals should be aware of this adverse consequence.

**Keywords** metformin, type 2 diabetes, vitamin B12

## MS-7

### Improving drug dose calculation skills among nurses: does choice of didactic method matter? A randomized controlled trial

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**Introduction** Insufficient skills in drug dose calculation may increase the risk for medication errors. Nursing students and trained nurses, as well as medical students and physicians, ascertain that this is a difficult subject.<sup>1</sup> Different didactic methods are available for training purposes, and e-learning is increasingly used in health professions' education.<sup>2</sup> Learning flexibility and cost considerations make E-learning an interesting alternative to ordinary classroom teaching for nurses in working situation. The aim was to compare these didactic methods in drug dose calculation.

**Materials & Methods** Nurses from hospitals and community health-care were invited to participate in a course in drug dose calculation, and randomized to either two days e-learning or one day classroom teaching combined with one day self study with text book. Before and after the course the nurses underwent a multiple choice test in drug dose calculation consisting of 14 tasks with four alternative answers (score 0–14), and asked how certain they were in each answer (score 0–3). High risk of error was defined as being certain that incorrect answer was correct. Demographical, educational and work related information were recorded. The results are given as mean (SD).

**Results** Sixteen males and 167 females participated in the trial. Age and working experience were 42.0 (9.5) and 12.3 (9.5) years, respectively. Total score improved from 11.1 (2.0) to 11.8 (2.0) ( $p < 0.001$ ), and the difference in improvement in favour of the classroom group was 0.3 (ns,  $p = 0.35$ ). Classroom teaching was significantly superior to e-learning among participants with low score (<9) at inclusion ( $p = 0.02$ ) (post-hoc analysis). Mean certainty score increased from 2.0(0.6) (=relatively certain) to 2.2(0.6),  $p < 0.001$ , with no difference between the groups. Mean no. of answers with high risk of error increased from 1 (range 0–6) to 1.2 (range 0–7) of the 14 tasks (ns,  $p = 0.13$ ). Factors associated with high score after training were: high score at inclusion, working in hospital and postgraduate specialization.

**Discussion & Conclusion** The prior knowledge as well as the learning outcome were judged as unsatisfactory, and were without significant differences between the didactic approaches. The possibility for individual advice in the classroom could explain the benefit of classroom teaching for nurses with insufficient prior knowledge, and the short course (2 days) might explain the overall low learning outcome. Some individuals showed high risk of error both before and after course.

To improve the skills among nurses in drug dose calculation it seems necessary to individualize the didactic methods, and reconsider the content and regularity of the courses. Regular recertification of nurses should be considered.

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**Keywords** Drug dose calculations, Learning methods, Risk of medication errors

## MS-8

### Identification of problems and solutions in seamless care: a qualitative study

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**Introduction** Seamless care is the desirable continuity of care delivered to a patient in the health care system across the spectrum of caregivers and environments. Despite the desirability of such continuity, patients often experience drug-related problems as a result of discontinuity of care [1–2].

The objectives of this study were to make an inventory of: a) the main problems in medication management at transition between settings of care, as experienced by health care professionals (HCPs) and patients; b) solutions to improve medication management, as proposed by HCPs, patients and stakeholders

**Materials & Methods** Two sets of focus group discussions were organized between December 2009 and February 2010; nine focus groups with HCPs and patients, and two with stakeholders. Focus group discussions were tape recorded, transcribed and analyzed using the thematic framework approach.

**Results** The focus groups provided a long list of problems related to discontinuity of care, that could be summarized in five different clusters, according to the phase in the transition process or the people involved:

(1) problems at admission, e.g. an incomplete list of medicines; (2) problems at discharge, e.g. a patient not (sufficiently) informed; (3) problems as to professions, e.g. GP's opinion different to that of the specialized physician; (4) problems as to patients and family, e.g. failure to understand treatment; (5) problems as to processes, e.g. documents difficult to read.

There was overall agreement about the need for a comprehensive package of solutions. Important parts for this package, are: (1) a national information campaign; (2) an up-to-date (paper-based or electronic) medication list / plan; (3) a comprehensive discharge file; (4) a centralized national electronic patient file including medical, pharmaceutical, care and social information; (5) electronic prescribing; (6) reimbursement for assisting patients in their medication management; (7) therapeutic education for patients; (8) clinical pharmacy; (9) local consultation to enhance cooperation between settings of care and HCPs, and (10) coordination of medication management.

An important factor mentioned in most groups was the need for responsibility on the part of the various care providers involved. When coordination is required, the GP was often mentioned as the most appropriate health care provider. The participants to the focus groups also agreed on the necessity of seamless care with regard to medications for every patient. However, they stressed that certain vulnerable groups require special attention.

**Discussion & Conclusion** Important problems exist as to medications at transition moments. The involved healthcare professionals identified feasible and desirable solutions, that are multifaceted and multileveled, incorporating the input of many professionals and organisations.

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**Keywords** Drug-related problems (DRPs), focus groups, medication management, seamless care

## MS-9

### Injectable sodium benzoate: uses in France and future prospects

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**Introduction** The Pharmaceutical Establishment of Paris Hospital group manufactures a solution for infusion of sodium benzoate (NaB) 1g/10ml and makes it available as an hospital compounding on the French territory. This drug is indicated in hyperammonemia of hepatic decompensations which is a rare and severe disease. Feed back from the field revealed that this preparation was also used orally for the chronic congenital hyperammonemia. The aim of this work was to specify in the hospitals ordering this drug, the therapeutic uses and assess the need or not to develop an oral form and its relevant dosage strengths.

**Materials & Methods** In September 2009 a standardized questionnaire has been sent by email to pharmacists of 66 hospitals. The questionnaire included three main issues: indication and posologies of the injectable NaB? Future prospects: appropriate oral pharmaceutical form? Appropriate oral unit strengths?

**Results** 30/66 hospitals provided answers. For 12/30 responders, the questionnaire was left blank as they considered to have a very limited use of this product. 18 hospitals completed the survey.

- Indications: hyperammonemia attacks in congenital deficiency of the urea cycle (12), chronic treatment of congenital hyperammonemia (12), organic aciduria and deficient  $\beta$ -oxidation of fatty acids (1), nonketotic hyperglycemia (1), hepatic encephalopathy (1), rare metabolic disease (unspecified) (1).
- Daily doses:
  - infusion (14): loading dose 250 to 500 mg/kg during 90-120 min; maintenance dose 250 to 500 mg/kg/d. Duration of treatment: 1 to 5 days depending on the clinical outcome.
  - Oral (16): child 50 to 500 mg/kg/d; adult 8 to 20 g/d. 2-6 times/d; it is a lifelong treatment.
- Procedure for oral administration:
  - pure: injectable solution drunk (4); capsules especially prepared (2);
  - mixed with food or beverages (7).

The taste is an important obstacle to treatment compliance for 3 responses.
- Future prospects:
  - Appropriate oral form: capsules (7); tablets/powder (9); syrup (12).
  - Appropriate oral unit strengths: 0.5 g (12); 1 g (4); 2g (1); 100 mg (1); 250 mg (2)

**Discussion & Conclusion** All the hospitals who contributed to the survey appeared to be satisfied with the solution for infusion APHP of NaB 1g/10ml for the treatment of acute episodes of hyperammonemia and considered this drug as essential. However, the survey confirmed that for treatment of congenital hyperammonemia there is a need for a daily intake of NaB. Few patients used orally the injectable solution whereas for most of them, the local hospital pharmacy prepare oral capsules. Because of the very unpleasant taste the drug is mixed with food and beverages. Compliance is a real concern (2–6 adm/d).

On the basis of these results, EP HP decided to start the development of an NaB oral form (granular or syrup, with taste modifier or



edulcorant) in order to promote a safety treatment and improve the patient compliance.

The interest of a sustained release form could be envisaged.

**Keywords** hospital preparation, hyperammonemia, orphan drug, rare disease, sodium benzoate

## MS-10

### Optimizing chemotherapy bags homogenisation

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**Introduction** In French hospital system, chemotherapy treatments preparation (CT) is centralized in hospital pharmacies. In application of Health Authorities recommendations on these hazardous drugs, quantitative quality controls (QC) of CT became mandatory prior to their administration. Performing such QC needs sampling operations from prepared bags. Extracted samples in aseptic conditions should be representative of the exact composition of the bags contents. Hence, bags homogenisation represents a crucial step that should be optimized to insure representative samples in routine practice. The objective of this study was to assess, between 2 homogenising techniques (bags reversals [BR] or premix syringes filling/expelling [F/E] repetitive cycles) the most suitable one to obtain representative samples.

**Materials & Methods** *Chemicals:* 2 anticancer drugs were used in the experiments: 5-Fluorouracil (5FU<sup>®</sup>, Merck) and Irinotecan (IRT, Campto<sup>®</sup>, Pfizer) chosen respectively for their hydrophilic (logP = -0.57) and lipophilic (logP = 3.2) properties.

*Homogenising protocols:* CT were prepared in saline (Fresenius<sup>®</sup> bags) with either 5FU (500 mg/250 mL) or IRT (200 mg/250 mL). A part of the bags was returned 1, 3, 5 or 7 times (3 bags/molecule and number of BR cycles). In the other part, premix syringes (BD-LL<sup>®</sup> 10 mL) connected to bags while preparation, where filled then expelled 0, 1, 2 or 3 times (3 bags/molecule and number F/E cycles).

*Homogeneity assessment:* Each bag were vertically suspended and its tubing clamped and cut downstream. A first CT sample (S0) was extraction from the syringe orifice. Then the bag tubing was unclamped and samples were then collected when the bag volume was emptied at its 1/3rd, 2/3rds and about 100%. Samples (1 mL minimum volume) were analysed by FTIR/UV multispectral analysis using Multispec<sup>®</sup>Module (Microdom, France). Analytical quantitation methods were previously validated according to ICH guidelines within 0.05–10 mg/mL and 0.05–3 mg/mL ranges respectively for 5FU and IRT.

*Statistics:* Results were expressed as mean  $\pm$  SD and compared with a one-way ANOVA test ( $p < 0.05$ ).

**Results** CT bags homogenisation was not met with the BR technique. With both drugs, even following seven reversals, samples obtained from connectors remained about 4 times more concentrated than the other samples:  $12.6 \pm 0.6$  mg/L and  $2.8 \pm 0.7$  mg/L in S0 samples vs.  $1.8 \pm 0.1$  mg/L and  $0.6 \pm 0.2$  mg/L in S3 samples, respectively in 5FU and IRT bags. However, bags homogenisation was rapidly met with the F/E technique. No significant differences were found with 5FU and IRT following 2 F/E cycles:  $1.9 \pm 0.1$  mg/L and  $0.77 \pm 0.02$  mg/L in S0 samples vs.  $1.7 \pm 0.1$  and  $0.78 \pm 0.01$  in S3 samples, respectively in 5FU & IRT bags.

**Discussion & Conclusion** The F/E technique appears as the most suitable for CT sampling prior to QC. F/E technique permits also to improve patient safety and to avoid side effects such as extravasations, partly linked to CT high concentrations during infusion.

**Keywords** Chemotherapy, FTIR, Homogeneity, Patient safety, Quality control

## MS-11

### Impact of clinical pharmacist on antimicrobial consumption in Cardiac Surgery Department

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**Introduction** A review showed an increase in antimicrobial consumption in both intensive and conventional units of cardiac surgery department in the year 2005. This prompted chef of cardiological department to ask pharmacist help and to allocate a clinical pharmacist with experience in infection diseases and antimicrobial therapy to those two wards. A multidisciplinary meeting drafted protocols for antimicrobial treatment, which was reviewed daily by the designated pharmacist and physician of ward to discuss the antimicrobial choices. The aim of the study was to evaluate the impact of integration of pharmacists in conventional and intensive units of cardiac surgery department on antimicrobial consumption from 2005 through 2009.

**Materials & Methods** The pharmacist daily activities included: (1) discussing with physicians antimicrobial choices in accordance with the protocol. (2) Reviewing treatment after 48–72 h when the bacteriological results become available. (3) checking the treatment duration, conversion from intravenous to oral form and adaptation of treatment dosage with specific laboratory findings. Specific monitoring forms was used for this goal on which patient data (identity, age, sex, weight), clinical diagnosis, antimicrobial therapy details (dose, route and frequency of administration), laboratory data (Blood Urea and Creatinine levels, Full Blood Count, Procalcitonin and C Reactive Protein levels, results of different bacteriologic cultures) are mentioned.

**Results** Since the involvement of clinical pharmacist in Cardiac surgery department in 2005, 281 and 555 patients hospitalised in intensive and conventional cardiac surgery units respectively were observed. There was a decrease in average duration of stay from 47,8 to 28,9 days in intensive cardiac surgery unit and from 42,9 to 28,1 days in conventional cardiac surgery unit. Concerning antimicrobial consumption expressed as Defined Daily Doses per 1000 inhabitants per day (DDD/1000 inhabitants) there was a steady decrease from 2005 through 2009 as 1180, 961, 910, 867 and 794 DDD/1000 inhabitants per day in intensive cardiac surgery unit and over all decrease as 600, 543, 554, 732 and 515 DDD/1000 inhabitants per days within the same period in conventional cardiac surgery unit.

**Discussion & Conclusion** The implication of clinical pharmacist is appreciated of medical team especially for patients transferred from intensive to conventional unit. It contributed to streamlining of antibiotic treatment and allowed decrease antimicrobial consumption.

**Keywords** antimicrobial, clinical pharmacy

## MS-13

### Computerized drug prescribing and administration: physicians and nurses perceptions. About a survey in a non-teaching French hospital

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**Introduction** Since 2007, a computerized drug prescribing system has been implemented for Inpatients of our hospital. In 2010, 331 beds have computerized drug-prescribing system. Pharmacy and Information-Organization Departments have realized, between 1–12

March 2010, a survey to know physicians and nurses' opinion about this computerized system

**Materials & Methods** The aim of this study was to evaluate physicians and nurses' attitudes toward the following points: the use of the software, the safety for the patients, the workload in comparison with handwriting system and the relation with the pharmacy department.

An answer-sheet with 9 items for prescribers and 8 for nurses has been mailed. One reminder action has been realized after the deadline.

**Results** The global answer rate was 23/72 for physicians and 69/300 for nurses.

Of the 23 prescribers, the use of software is excellent or easy for 13, acceptable for 8 and uneasy for only 2; prescribing a drug into Hospital Formulary is excellent or easy for 10, acceptable for 7 and uneasy for 6. The pharmacological analysis proposed by the software is judged very useful or useful by 13 physicians and useless by 8 (No Answer [NA] = 2). Thirteen physicians answered that computerized drug prescribing improve the safety of prescription, 9 that it does not add more safety (NA = 1). The workload has been evaluated as more important for 12 and similar or less important for 10 (NA = 1). Eleven physicians judge the relationship with Pharmacy Department better. The same number of physicians (11) considers that their relationship with the Pharmacy Department is the same that before the implementation of the software (NA = 1)

Sixty-nine nurses answered. Of these respondents, the use of software is excellent or easy for 46 (66.6%), acceptable for 18 (26.1%) and uneasy for only 4 (5.8%) The understanding of drugs order is improved by computerized drug prescribing system in comparison with hand-written system for 48 nurses (69, 7%) similar for 16 (23.2%) and less for 4 (5.8%) (NA = 1). Thirty-six nurses (52.2%) consider the drug administration to patient easier. The workload is less important for 20 (29%), similar for 33 (47.8%) and more important for 14 nurses (20.3%) (NA = 2).

Of the overall, 92 respondents, 62 (67.3%) do not want a comeback to handwriting system, and only 13 (14.1%) preferred anterior system (NA = 17).

**Discussion & Conclusion** In our user survey, a majority of physicians and nurses considered that the system is an improvement on handwriting system and the implementation has been well received. Most nurses reported satisfaction with computerized prescribing probably due to more complete and legible prescriptions. These results are comparable with published data. Computerized prescribing system well accepted by physician and nurses, however, the implementation is not straight forward and is a constant "work in progress"

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**Keywords** Computerized prescribing, Physicians behaviour, Nurses behaviour, prescribing safety

## MS-14

### The safety of anticoagulation on admission and discharge to secondary care

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**Introduction** Nearly 500 cases of patient harm from anticoagulants have been described in the UK recently. Out of 120 deaths reported,

77% were related to warfarin. The National Patient Safety Agency (NPSA) issued a patient safety alert in 2007, to minimise the risks associated with anticoagulants, to which all Trusts needed to demonstrate compliance. Poor documentation, unsafe arrangements at discharge, poor communication between patients and clinicians, were identified as a possible sources of errors in the last NPSA document. By auditing one aspect of warfarin management, documentation on admission and discharge, from University College Hospital (UCH) in June 2009, an insight into the quality of documentation has been presented for this high risk area.

**Materials & Methods** The study had elements of prospective and retrospective design. Admissions were highlighted by pharmacists from the Acute admission unit; discharges were identified using the electronic prescribing system. UCH has approved specific criteria regarding warfarin documentation, which are expected to be followed in order to improve patient safety. Using a data collection forms, the details regarding warfarin therapy were collected from the study participants' medical notes, drug charts and electronic discharge summaries. Whether the healthcare professionals completing the documentation are pharmacists or medical staff was assessed.

**Results** 71 admissions and 57 discharges were evaluated. Only 50% of the sample was compliant with 90% or more of selected parameters. 50% of admission documentation was more than 90% compliant with UCLH standards compared to 45% of discharges. *Admission Checklist* was completed in 3.0% of cases, and it was done by a pharmacist only. 45.6% had a *Discharge proforma* done; specifically, for 38.5% it was completed by both physician and pharmacist; 30.8% by the physician only; 19.2% by the pharmacist only; 7.7% by the physician, pharmacist and nurse; 3.8% by the physician and nurse. A *Warfarin counselling record* was completed for 3 out of 5 newly established patients, by the pharmacist only.

**Discussion & Conclusion** The set standards were not achieved for the majority of data, hence anticoagulation documentation at University College Hospital, London, needs to be improved. Our findings imply a significant pharmacist's impact on improving patients' safety and ensuring the continuity of care, by documenting relevant data, filling the gaps, and creating a bridge with primary care. Pharmacist do not usually repeat information already provided by the doctor in the discharge summaries. Hence, what information would be recorded by doctor, without any pharmacist input is hard to evaluate. This might lead to a conclusion that pharmacist have even a greater impact in documenting anticoagulant data than reported in the audit. Mutual efforts with significant pharmacist input will lead to better patient care, as a goal that we all aim for.

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**Keywords** Documentation, medication safety, pharmaceutical intervention, Warfarin

## MS-15

### Investigating clinical practices: management of acute community-acquired pneumonia

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**Introduction** The Acute Community-Acquired Pneumonia in adults (ACAP) is the first cause of infection leading to hospitalization in the Emergency Medical Service (EMS). As a predominant bacterial etiology, diagnosis has significant prognostic and therapeutic implications. Antibiotherapy guidelines have been developed at St Joseph-St Luc Hospital in 1998, revised in 2003 and 2005, according to current recommendations. To verify the adherence to the current guidelines, a Professional Practice Assessment (PPA) was conducted as part of the certification V2.

**Materials & Methods** This evaluation was conducted in prescriptions from EMS by a multidisciplinary team of clinicians, biologists and pharmacists. The method of focused clinical audit, validated by the Haute Autorité de Santé, has been applied. With a grid of nine items, a first audit analyzed, retrospectively, the medical records following inclusion criteria: admission by EMS with a diagnosis of ACAP and minimum stay > 3 days. A second audit was then conducted.

**Results** After the first audit, the results were as follows: on 45 cases selected, 30 were consistent with inclusion criteria. Five of nine items specified in the grid were considered satisfactory. Among the defects of care were identified: starting antibiotic therapy too late (13%), antibiotics non-adherent to guidelines (30%) with excess of bitherapies, lack of reassessment on 3<sup>rd</sup> day of treatment (34%) and excessive duration of treatment (37%).

**Discussion & Conclusion** The improvement measures undertaken were the following: determining the Fine score by using the intranet site (bitherapy being justified if Fine  $\geq$  4), actualizing guidelines focusing on the speed of care and clarifying the clinical situations, setting up a request at D3 and D7 in the prescription software, communicate PPA results to prescribers. Analysis of the results of the second audit should assess the impact of improvement actions. The harmonization of recommendations for the management of ACAP, which should be published in June 2010, will generate a future update guidelines.

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**Keywords** Acute community-acquired pneumonia, Antibiotherapy, Professional Practice Assessment

#### MS-16

##### Place of drug-induced occult inputs in intensive care patients

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**Introduction** Drug administrations participate in the occult inputs in various components such as sodium, potassium, glucose, alcohol, and mannitol, used as excipient. These inputs may be relevant when drugs are administrated at a high dose, in unstable patients, i.e. in Intensive Care Unit (ICU) patients. The aim of our study was to evaluate, in a

prospective cohort of intensive care patients, the importance of these occult inputs ignored by physicians, compared with the known prescribed inputs.

**Materials & Methods** Eighty-two consecutive patients were enrolled in this prospective study. Inclusion criteria were as follows: patient hospitalized in ICU during 72 h or more. For each patient, all inputs (unknown and known) in sodium, potassium, glucose, alcohol, and mannitol were identified.

**Results** Average patient age was 61.4 years ( $\pm$ 13.2), sex ratio (M/W) was 1.65, average length of stay was 13 days ( $\pm$ 9.2). Patients included showed co-morbidities and/or risk factors, mainly hypertension (45%), cancer and autoimmune diseases (37%), cardiopathy (27%), smoking (24%), alcoholism (23%). Reasons for hospitalization were mainly cardiovascular (41.5%), respiratory (21%), or neurologic (35%) disease. The average value of the index simplified acute (IGSII) was  $53 \pm 21.5$ , reflecting the severity of patients.

Respectively, 100%, 90%, 45%, 40%, 30%, 21%, and 7% of patients received occult sodium, glucose, mannitol, potassium, lipids, ethanol and dextrose administration. Moreover, 7, 5, and 2 patients received respectively more sodium, glucose or potassium secondary to occult rather than prescribed inputs.

Mean rate occult/total daily inputs ( $\pm$ SEM) were respectively  $21.2\% \pm 17$  for sodium,  $20.2\% \pm 16.1$  for glucose,  $14.1\% \pm 10.5$  for lipids,  $2.9\% \pm 2.8$  for potassium, and 100% for mannitol or alcohol.

**Discussion & Conclusion** Our prospective study had initially measured the real importance of occult input in a large population of unstable and severe patients in the ICU. Since the presence of excipient in drug formulation is known by most of physicians, occult inputs due to drug administration are not considered by physicians and frequently underestimated. It is essential to identify the most common drugs responsible for occult inputs and to propose a practical tool to take into account these occult inputs during prescription.

**Keywords** Drug induced occult inputs, Excipient, Intensive Care Patients

#### MS-17

##### Investigating a new method to improve impact measurement in clinical pharmacy

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**Introduction** Impact measurement in clinical pharmacy mostly uses indirect indicators (e.g. acceptance rate of pharmacist opinion) because of the difficulty to retrieve direct criteria (e.g. lengthening in hospitalization duration). We conducted a pilot study to assess the quality of prescriptions in our hospital. This project included the development of a new method for the identification of SPADE: situations with a potential adverse drug event (ADE). The objective of this work was to present our results on this specific issue.

**Materials & Methods** We performed a cross-sectional study in a French general hospital. Adult inpatients were included on June 2009 in medical, surgical and obstetrical wards. Data were collected from all available medical charts and reviewed using the SPADE method which consists in the systematic research for specific events known to be hardly associated with ADEs: 1) sentinel events (SE, Joint Commission on Accreditation of Healthcare Organizations, 2005); 2) signs and symptoms suggesting an adverse drug event (SSSADE, Laroch 

et al, Br J Clin Pharmacol 2006). A SPADE is defined by the occurrence of 1 SE and/or 1 SSSADE or more.

**Results** Among the 115 included patients (mean age: 68.4 years; mean number of prescribed medications: 7.4), 92 (80.0%) experienced a SPADE: 86 patients (74.8%) experienced at least 1 SE and 92 (80.0%) at least 1 SSSADE. 130 (58.3%) of the 223 detected SE were biological abnormalities. 195 SSSADE were identified: main events were hematologic disorders (32.8%) and renal or water-electrolyte imbalance disorders (20.6%).

**Discussion & Conclusion** SPADE prevalence in our study was consequential. SE and SSSADE both occurred with a high frequency. These findings were expected when considering age and polymedication in our study population. SPADE method has some limitations: SE deal with iatrogenic events in a large sense and not only with ADEs; SSSADE specifically focus on ADEs but with too much sensibility, which decreases its interest for daily analysis; neither of the two takes into account drug-drug interactions. Nevertheless, SPADE method is a first step towards a formal identification of ADEs. This work should be continued by the adaptation and the matching of SE and SSSADE in a single fitted tool.

**Keywords** clinical pharmacy, impact measurement, sentinel event, signs and symptoms suggesting an adverse drug event, situations with a potential adverse drug event

## MS-18

### ADVISE: adverse drug reactions in children international surveillance and evaluation—results from three countries

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**Introduction** Safety of paediatric pharmacotherapy is of major concern. Although advances have been made, systematic observations of adverse drug reactions (ADRs) are essential to further improve the safety of medicines used in children.

**Objective:** To investigate the incidence and characteristics of adverse drug reactions in hospitalised children in different European and non-European countries.

**Materials & Methods** A prospective multicentre cohort study (ADVISE) was conducted in paediatric hospitals in Germany, UK and Australia to investigate the occurrence of ADR in hospitalized children. Data were collected over a three month period using a web-based data entry tool. ADRs were identified by intensive chart review and evaluated by a team of experts using standardised algorithms.

**Results** A total of 835 patients relating to 877 admissions were included [Australia n = 146 (149), Germany n = 376 (407), UK n = 313 (321)]. The mean age was 4.9 years (SD  $\pm$  5.1, range 0–18 years) and 55.7% of the children were male. Patients received a total of 4101 drugs (mean  $4.8 \pm 4.7$ ,  $p < 0.01$ ) and stayed in hospital on average 5.8 days (SD  $\pm$  8.0,  $p = 0.16$ ). The main classes of prescriptions in all three countries were antibacterials for systemic use (21.3%), analgesics (16.9%) and drugs for obstructive airway diseases (6.8%). A total of 297 ADRs were identified in 144 patients. Using WHO ADR classification, gastrointestinal-system disorders (35.5%) were most common, followed by metabolic and nutritional disorders (11.1%) and heart rate and rhythm disorders (9.8%). The overall ADR

incidence was 17.2%, 95% CI 14.6–19.8, varying significantly between the three countries ( $p < 0.01$ ).

**Discussion & Conclusion** Systematic observation of ADRs in hospitalised children has shown that the incidence of ADRs varied across countries. More detailed information about the nature of ADRs and associated risk factors in different paediatric populations is needed.

**Keywords** Adverse drug reactions, Cohort studies, Hospitalised children, Paediatric medicine

## MS-19

### Characterization and modelling of aluminium transport through the bladder for safe monitoring of intravesical alum irrigation

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**Introduction** The use of alum, potassium aluminium sulphate dodecahydrate, to control severe urinary haemorrhage was reported in the last two decades. Although, the efficacy and safety of intravesical instillation of 1% alum solution were reported in cases of hematuria of vesical origin, several studies detailed alum toxicity, encephalopathy and death following intravesical alum irrigation in patient with renal impairment. In the present study, aluminium transport was investigated ex vivo through porcine bladder in order to characterize penetration and permeation parameters derived from well-known Fickian diffusion model.

**Materials & Methods** Three samples of porcine bladder provided by slaughterhouse were mounted between both the donor and the receptor compartments of three vertical static diffusion cells. The bladder membrane was hydrated for 12 h by filling distilled water in the receptor compartment. Therefore, the internal face of the bladder membrane was exposed to 1% alum sterile solution prepared by the hospital pharmacy. An aliquot of receptor fluid was withdrawn from the receptor compartments at regular intervals of time for 3 h, and replaced by fresh distilled water. Assays of aluminium and potassium contents were achieved by atomic absorption spectrophotometry. Sulphate dosage was carried out by turbidimetry.

**Results** Time-course profiles of cumulative aluminium, potassium and sulphate dose absorbed through bladder specimens were fitted to a non-steady-state solution to Fick's second law. Therefore, steady-state permeability coefficient  $P$  and steady-state flux of electrolytes through the bladder were calculated from the fitted permeation curve. High  $P$  values of aluminium confirmed the minimal barrier function of the bladder to metal transport. Furthermore, a built-up of aluminium in bladder was evidenced by direct analysis of metal content in bladder specimens showing ten-fold higher concentration in tissues (about  $6 \text{ mg.g}^{-1}$ ) than in alum solution (about  $0.6 \text{ mg.g}^{-1}$ ). An algorithm for the prediction of aluminium blood concentration as a function of volume and time of alum irrigation and renal status was developed. Predicted and clinical data were successfully correlated.

**Discussion & Conclusion** Predicted and clinical values were found in the range of harmful aluminium blood concentration confirming the relevance of mathematical predicting approach. An algorithm based on the volume and time of alum irrigation was suggested for clinical safety. The relevance of a mathematical approach for monitoring of safe alum irrigation was successfully developed and analysed in a case-report.

**Keywords** Hematology, Methods, Pharmacology, Therapeutics



## MS-20

**Iloprost administration in a cohort of 30 patients with digital ischemia: determination of criteria for good tolerance**

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**Introduction** Iloprost use in the management of digital ischemia is a common practice in internal medicine. However, many adverse effects may limit its administration as an outpatient. The aim of this study was to define the criteria of good tolerance of treatment to better define which patients could safely receive treatment at home.

**Materials & Methods** A retrospective cohort study was carried-out involving all consecutive digital ischemias using Iloprost (January 2005 to January 2008). The administration of Iloprost followed professional recommendations, major and minor adverse effects were consistent with the published reference summaries and product features.

**Results** A total of 30 patients were included, 18 men (60%) and 12 women (40%), median age 49 years ([22–82]), who received a total of 48 treatments. Etiologies of ischemia were: Buerger's disease (40%), systemic scleroderma (27%), severe Raynaud's disease (10%), hypothernar hammer syndrome (10%), cryoglobulinemia (10%), and Werner's syndrome (3%). Among the 48 Iloprost courses studied, 30 were first courses (62.5%). The average duration of treatment was 13.6 days for Buerger's disease, 4.6 days for Raynaud's disease, and 7.3 days for scleroderma. A prior hemodilution was performed for 28 courses. Forty courses (83.3%) were concerned by the appearance of one or more adverse events. Headache (54.2%), flushing (31.3%), and nausea (29.2%) were the most frequent minor adverse effects. The major side effect most frequent was tachycardia (62%), defined by a heart rate greater than 100/min, followed by hypotension (20%), chest pain (18%) and vomiting (15%). Major adverse effects occurred more frequently in women (62.5% versus 20.6%;  $p < 0.008$ ), in Raynaud's disease (1.2 versus 1.6;  $p = 0.04$ ), and in patients treated with a calcium channel blocker (0.71 versus 0.21;  $p = 0.042$ ). In contrast, during the dose-finding period, all patients who went beyond the dose limit (i.e. 3 mL/h) had less major adverse effects (14% versus 54%;  $p = 0.004$ ). Prior hemodilution did not reduce the number of major or minor adverse effects (0.61 versus 0.50;  $p = 0.54$ ). Similarly, the existence of a cure in the three months preceding the new treatment did not alter the frequency of occurrence of major adverse effects (55.6% versus 33.3%;  $p = 0.14$ ).

**Discussion & Conclusion** Three criteria of good tolerance of treatments (male, no treatment by calcium antagonists, high doses the dose-finding) and one of lower tolerance (Raynaud's disease) were identified. The identification of these criteria is important because it defines a group of patients eligible for safe home infusions.

**Keywords** Digital ischemia, Iloprost, Safety home treatment, Tolerance

## MS-21

**Use of acid suppressive medication after a multi-approach strategy in a hospital in Qatar**

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**Introduction** Usage of acid suppressive medication (ASM), namely proton pump inhibitors and histamine 2 receptor antagonists, to medical inpatients without justified indication is a worldwide problem<sup>1</sup>. A 2-month survey performed in our institution in 2007, revealed an unjustified consumption rate of 66%<sup>2</sup>.

This study was conducted to evaluate the impact of a multi-approach strategy to improve the appropriate usage of ASM in medical inpatients and compare the results with the baseline clinical audit performed in 2007.

**Materials & Methods** Prospective evaluation of ASM usage pattern 1 year after a multi-approach strategy (i.e. implementation of an ASM guideline and logarithmic chart on the proper usage of ASM from admission to discharge in combination with awareness lectures to the medical and pharmacy staff). All medical patients admitted between May and June 2009 and receiving ASM were included. Data about ASM usage were collected upon and during admission, at discharge and at the next follow up visit. Justified indications for the usage of ASMs were based on the approved product information and on evidence based literature recommendations. Data were compared to the findings of the baseline clinical audit done between May-June 2007. Setting: Five general medicine wards in a 600-bed teaching hospital in Doha (Qatar).

**Main outcome measures** The usage of ASM in justified and non-justified indications upon and during admission, at discharge and at the next follow up visit.

**Results** A total of 414 patients were admitted during the study period and 208 patients (50%) were receiving ASM compared to 53% in 2007 (206 patients out of 389). Seventy four patients (36%) were using ASM upon admission compared to 48 patients (23%) in the 2007 clinical audit. Inappropriate ASM use decreased with 55% during admission (66% to 30%,  $p < 0.0001$ ), 65% at discharge (34% to 12%,  $p < 0.0001$ ) and 67% at the next follow up visit (15% to 5%,  $p = 0.0008$ ).

**Discussion & Conclusion** Despite the higher number of patients receiving ASM upon admission, the multi-approach strategy used in our institution resulted in a significant improvement in the appropriate usage of ASM in medical inpatients.

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**Keywords** Acid suppressive medications, General medicine wards, Prescribing pattern, Qatar

## MS-22

**Pharmaceutical analysis of hospital medical orders: are our practices homogeneous?**

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**Introduction** Pharmaceutical analysis is a growing activity in clinical pharmacy. Homogeneity of practices is mandatory to guarantee efficiency and relevance in spite of this increase. In the absence of real standardisation, we put together this research in order to summarise the situation and its outcomes. The main objective was to evaluate

pharmacists' homogeneity and their practices. We then attempted to bring to light possible factors of heterogeneity.

**Materials & Methods** This prospective study contains 2 phases and deals with 100 prescriptions selected at random from our computerised prescriber order entry (CPOE) software IMAGE™.

Phase 1: Pharmacists had 5 weeks to analyse prescriptions with similar conditions. For each prescription 2 actions were allowed: to make only one pharmaceutical intervention (PI) and to block or not the dispensation. For either criterion, we calculated frequencies and coefficients of concordance ( $\kappa$ ). The same parameters were evaluated, taking into account the pharmacists' experiment and whether pharmaceutical analysis was a common activity (business sector).

Phase 2: (5 months later) Pharmacists were split in two groups: juniors and seniors. They took part in pharmaceutical analysis sessions in similar conditions to phase 1. Adequate step of action was decided upon for each prescription after a collective discussion. Frequencies and concordances were evaluated for PI and blocking prescription. We also studied frequencies of each type of detected problems.

**Results** Phase 1: 20 pharmacists included. Mean frequencies for PI and blocking prescription were respectively 45% and 11%. Concordance evaluation showed that pharmacists didn't act on the same prescriptions ( $\kappa$  means: PI = 0,19; blocking = 0,3). It hasn't been possible to put forward the evidence that pharmacists' experiment and their business sector could influence the final outcome.

Phase 2: 8 juniors and 7 seniors included. PI frequencies: 49% for the juniors and 45% for the seniors. They blocked respectively 7% and 8% of the prescriptions. They didn't do PI on the same prescriptions ( $\kappa = 0,24$ : low concordance); however, their blocking concordance was good ( $\kappa = 0,78$ ). The juniors did more PI than the seniors regarding dosage (10% vs 7%), non-prescribed recommendations (6% vs 2%) and overdoses (35% vs 2%). The seniors did more PI with non indicated drugs (9% vs 6%) and inappropriate administration (49% vs 35%).

**Discussion & Conclusion** Pharmacist's practices were heterogeneous but with similar judgment for problems with a superior gravity. Frequencies for types of detected problems showed that juniors and seniors didn't have the same approach: more conventional for juniors, more centered on guidelines for seniors. We conclude that a standardisation work is necessary to guarantee continuity and improve the relevance of this activity. This evaluation will give us data to create tools for analysis and to perform our CPOE (warning signals).

**Keywords** evaluation of practices, Pharmaceutical analysis, Standardisation

## MS-23

### Integrated pharmacovigilance system for CM induced adverse reactions

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**Introduction** The Pharmacovigilance System is a highly valid tool for identifying the hazards of a drug, particularly if newly available on the market, and to ensure adequate mass information. However the system is poorly effective in terms of mitigating the risk to which patients are exposed if they have risk factors for Contrast Media (CM)-induced Adverse Drug Reactions, (ADR). Any minor clinical manifestations due to non-severe reactions that may be significant indicators of a risk of anaphylaxis or anaphylactoid reactions following subsequent exposure.

In practice, System monitor a drug in relation to its danger level in inducing full-blown severe reactions, but do not tackle the prevention of any sensitization conditions for repeated treatments that may result in life threatening reactions, assessing minor symptoms caused by an ADR. They do not draw attention to the patient-drug relationship, ignoring possible individual risk factors in each patient that may cause or facilitate ADR.

**Materials & Methods** We designed a paper form -Risk Assessment and Informed Consent- and the corresponding computer form to collect the information deemed important to define the risk of an adverse reaction to CM.

Information to be collected includes family and personal history with particular attention to any previous atopic reactions to drugs, past asthma attacks, angioedema, urticaria; positivity to one or more factors increasing the risk of CM-induced adverse reaction, such as arterial hypertension, diabetes, current viral disease (Herpes), Lupus, alcohol abuse, renal insufficiency, cardiac insufficiency; drugs currently or recently used.

We plan to create a net of Radiology Departments in the whole Friuli Venezia Giulia Region, Italy, in which each Department will have access to the above-listed relevant information on all the patients exposed to CM within the net.

**Results** As of June 2010, a first draft of the paper and electronic forms has been prepared and is being tested by the Department of Radiology of the University Hospital of Udine.

**Discussion & Conclusion** The integrated system for the prevention of CM-induced ADR must aim to establish an effective partnership in monitoring the use of CM, highlighting all adverse reactions, even clinical *minor* responses, reactions caused by drug interactions and errors in drug storage and use.

In an integrated pharmacovigilance system patients will have an individual clinical-pharmaceutical card giving the doctor detailed information of clinical and pharmaceutical interest and thereby allowing them to adopt measures to mitigate the risk of ADR.

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**Keywords** CM safety, contrast media ADR

## MS-24

### Urinary tract infections treatment: current practice versus guidelines

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**Introduction** Antibiotic therapy (AT) for urinary tract infections and colonisations have been analysed to evaluate their conformity with guidelines.

**Materials & Methods** A 2 month prospective study was conducted in 8 neurological rehabilitation clinical units by pharmacist and physician. Data collection included information about patient (age, weight, creatinine clearance, urinary catheterization use), infection (symptoms, bacteriological data) and AT (drugs, dosage, duration). Clinical

practices were compared to local guidelines: (a) antibiotic choice matched recommendations and antibiogram results, (b) dosage schedule was conform, (c) for empiric treatment, initial AT was reevaluated after 48 h, (d) written on patient medical file; (e) if it was possible a de-escalation was realized. (f) The AT duration was adequate: cystitis: 7–10 days, pyelonephritis: 10–21 days, prostatitis: 3–6 weeks, urinary colonization treatment previous an invasive act: 7–10 days or previous indwelling catheter: 48–72 h.

**Results** 31 AT were reported corresponding to 28 patients (44 ±19 years old). 71% of patients were urinary catheterized. 52% were treated for bacterial colonization mostly before catheter removal or urodynamic testing. 26% had prostatitis and 22% cystitis. Antibiotics combinations were used for 32% cases. (a) 45% AT presented deviations to guidelines: inadequacy with local ecology (53%), AT not adapted to antibiogram (23%), empiric AT not justified (18%) and inadequacy with infectious site (6%). Fluoroquinolones were prescribed for 75% of empiric therapy. (b) 94% patients received the right antibiotic dose. (c) 92% empiric treatments were reevaluated after antibiogram results; (d) this reevaluation was written on the patient medical file only for 42%. (e) De-escalation hasn't be done for 43%. (f) For 52% AT, treatment durations were not respected whose 69% too long. 25% duration discordances were related to cystitis (5 to 15 days) and 25% to AT previous indwelling catheter removal (3 to 10 days).

**Discussion & Conclusion** Antibiotics were often prescribed to asymptomatic bacteriuria before an invasive act. Even if most of prescriptions match guidelines, deviations were notified. Three main points have to be improved: treatment duration, de-escalation and overuse of fluoroquinolone. Adequate AT duration and de-escalation minimized the risk of emerging resistance. Prescribing a fluoroquinolone as an empiric AT is not recommended due to the resistance rate. Gap in current local guidelines have been identified especially for AT before indwelling catheter removal and urodynamic testing. This study has lead to create a multidisciplinary group to manage correction actions and redefine local guidelines to improve antibiotics use and quality of care.

**Keywords** Antibiotics, Drug use, Guidelines, Medical care, Urinary tract infection

## MS-25

### Potential drug interactions in adult cancer patients

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**Introduction** Cancer patients are particularly at high risk for drug interactions (DIs). The principal reason is due to the numerous medications they receive<sup>1</sup>, including different cytotoxic agents and other drugs to treat comorbid conditions. Therefore, DIs are an important point to consider in daily medical practice of cancer therapy. The primary objective of this study was to assess the frequency of potential DIs in adult cancer patients admitted to the medical oncology department of Paris Saint Joseph Hospital, France.

**Materials & Methods** This prospective study was conducted between August and September 2009 in ambulatory patients receiving systemic cancer-therapy. They completed a questionnaire including information about medications taken, herbal remedies used, grapefruit juice and tobacco consumption. Antineoplastic therapy of subjects was recorded by Chimio Software. The Theriaque Drug Interaction software (version of June 2009), Guide 2010 Prescribe and review of literature were used to identify potential DIs and to classify them by level of severity (contraindication, warning, precaution or to

consider). Summary statistics were used to describe patient characteristics and logistic regression to identify risk factors associated with potential DIs.

**Results** A total of 69 patients were included in the study with a median age of 67 years (range 34–92), and 28 (41%) were women. The most common cancer type was colorectal. The median number of drugs per patient (except chemotherapy drugs) was 4 (range 0–16). A total of 261 potential DIs were identified in 53 patients (77%). Of the potential interactions, 4 (2%) was classified as warning, 53 (20%) as precaution and 204 (78%) as to consider. Most potential DIs (86%) involved non-anticancer agents and 14% involved antineoplastic agents. Four (6%) patients had taken grapefruit juice and among them 3 patients had possible interactions with their antineoplastic treatment by inhibition of cytochrome P450 enzyme system (CYP3A4). Furthermore, nine (13%) patients are smokers and there were also possible interactions between tobacco and ondansetron for 7 patients via CYP1A2. The number of drugs per patient was an increased risk of potential DIs ( $p < 0.05$ ) but there was no relationship between age, type of cancer and risk of DIs.

**Discussion & Conclusion** Potential DIs are common among cancer patients<sup>2</sup>. In our study, DIs are observed but no clinically relevant interaction was noticed. DIs are mostly of low severity and like usually involve non chemotherapeutic drugs. Nevertheless, the implications of chemotherapeutic DIs can be serious and take account of them is important to improve the quality of the prescription and to avoid potential drug side effects. DIs need to be identified and a better knowledge of individual's current drug therapy has to be improved via collaboration between clinician, clinical (hospital) pharmacist and out-hospital pharmacist.

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**Keywords** drug interactions, cancer patients, risk factors

## MS-26

### Risk of bleeding after therapy with standardised Ginkgo biloba extracts: systematic review

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**Introduction** Study Objective: To determine the effect of standardised Ginkgo biloba leaf extracts (GBE) on outcomes of haemostasis associated with risk of bleeding

**Materials & Methods** Design: Meta-analysis of 18 randomised controlled clinical trials (RCTs). Inclusion criteria were standardised Ginkgo biloba leaf extracts (GBE) as study medication, and oral administration for at least one week. Patients: A total of 1979 adults, with a majority (87%) of diseased patients (dementia, peripheral artery disease, or diabetes), receiving GBE or placebo.

**Results** Measurements and Main Results:

The Medline, Embase, Cochrane CENTRAL and SciSearch databases were searched from inception to February 2009 to identify all RCTs measuring parameters of primary or secondary haemostasis. The following haemostatic outcome parameters were included: Blood flow, blood viscosity, adenosine diphosphate (ADP) induced

thrombocyte aggregation, fibrinogen concentration, partial thromboplastin time (PTT), prothrombin time (PT). Reference values for all parameters were taken into account when assessing clinical relevance of statistically significant treatment effects. The quality of each study was assessed using the Jadad-score and risk of bias was assessed using the Cochrane collaborations “domain based evaluation” tool. Statistical analysis was performed using the software RevMan® 5. According to the included continuous data three statistical methods was used: Weighted mean difference (WMD), standardised mean difference (SMD) and generic inverse variance (GIV). Random-effects models of effects on baseline change or mean difference showed a positive effect of GBE on blood flow (shown in reduction in blood viscosity: WMD -1.03 mPa sec, 95% CI -1.29 to -0.78), but no evidence of any effect on ADP-induced thrombocyte aggregation (WMD -0.35%, 95% CI -15.16 to 14.46), fibrinogen (GIV -1.32 mg/dL, 95% CI -10.66 to 8.01), PT (SMD 0.00; 95% CI -0.09 to 0.09) and PTT (WMD -0.42 sec, 95% CI -0.92 to 0.09). Subgroup analyses showed a statistically significant reduction in PTT for subgroups receiving high-dose GBE of  $\geq 240$  mg/d (WMD -0.45 sec, 95% CI -0.83 to -0.08) and for studies only including patients (vs. healthy volunteers) (WMD -0.61 sec, 95% CI -0.95 to -0.27), respectively, without clinical relevance.

**Discussion & Conclusion** Conclusion: Based on meta-analyses of outcomes of haemostasis, comparison of study results between treatment and placebo groups did not indicate a higher risk of bleeding associated with standardised Ginkgo biloba leaf extracts, ultimately contributing to an informed evaluation of (self-)medication in patients.

**Keywords** Drug use, bleeding risk, Ginkgo, haemostasis, standardised GBE

## MS-27

### Operation life: medication reconciliation in a hepatology/gastroenterology ward

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**Introduction** Operation Life was a national campaign for patient safety at hospitals launched by the Danish Society for Patient Safety. The campaign was inspired by the American “100,000 Lives Campaign” and the concept was to apply the newest evidence based knowledge into everyday procedures. The goal was to prevent deaths through the implementation of six interventions, each of which describes the best practice in six selected clinical areas. One of the campaigns six interventions was medication reconciliation. Medication reconciliation is an important mean to prevent many of the most common medication errors. Experience has shown that poor communication of medical information at transition points is responsible for as many as 50 percent of all medication errors in hospitals.

**Materials & Methods** The project was to implement medication reconciliation in a hepatology/gastroenterology ward

Primary goal: For a minimum of 95 percent of all patients the ward should comply with all of the six following process indicators:

- Presence of an admission medication reconciliation list
- Presence of a current medication list (medication administration record)
- Presence of a medication orders in the discharge summary
- Medication reconciliation of the patients home medication list and the discharge medication orders

- Medication reconciliation of the current medication list and the discharge medication orders
- Medication reconciliation of admission medication reconciliation list and the discharge medication orders

In addition, one hundred percent of patients should have their medications reconciled at transfer or discharge.

The team tested and implemented the following initiatives:

- An SOP and a doctor’s pocket guide to medical reconciliation
- Regularly information and training of the physicians in the principles of medical reconciliation
- A chart to document medication errors or unreconciled medication
- Pharmacist review of medication charts (only the last 3 months of the project)

Each month, fifteen patient records were randomly selected and reviewed for compliance to the six process indicators.

**Results** During the nine months project period the overall compliance to the six process indicators increased from the baseline of twenty percent to eighty percent of all patients, and eighty five percent of all patients had their medications reconciled at transfer or discharge

**Discussion & Conclusion** Implementation of medication reconciliation is complex and challenging. It requires continuously training of staff and review of patient records in order to keep on track. The increase in compliance during the last three months suggests that regularly medication reviews by a pharmacist can offer an important contribution to the process.

**Keywords** medication reconciliation

## MS-28

### Transfer of prescription task from physician to pharmaconomist with medication safety as a goal

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**Introduction** In September 2008 the Orthopedic Department of Horsens and Brædstrup Hospital, Denmark inquired the possibility of pharmacist prescription of patients’ usual medicine when these patients are hospitalized for planned surgery. The department’s goal was to release doctor resources and improve medication safety. The latter regarding the fact that the medicine often not was prescribed by the physician on time. A pilot project conducted by the hospital pharmacy concluded that a pharmacist was able to prescribe the medicine correctly in the electronic patient record but not always on time. Furthermore it was assessed that the task was suitable as daily work for pharmaconomists from the hospital pharmacy. The pharmacist’s experience from the pilot project enabled a detailed contract to be drawn up with the department. The contract included a precise task description as well as the description of the physicians’ overall responsibility for the prescriptions. Before engaging in the task the pharmaconomists were trained in the electronic patient record system and in October 2009 the pharmaconomists began the task. This study was conducted in order to control prescription correctness after the task has been implemented as daily work for pharmaconomists

**Materials & Methods** For two weeks in June 2010 all prescriptions made by the pharmaconomists were controlled by a pharmacist for prescription correctness. Prescription correctness included prescribing the medicine correctly in the electronic patient record (correct drug, correct dosage and correct administration time) and prescribing the medicine on time (before anesthesia). Furthermore following was registrated: number of patients, number of drugs prescribed and number of contacts to patients/caregivers



**Results** 19 of 27 medication lists were prescribed on time. The 6 lists not prescribed on time were due to the pharmaconomists not beginning the task on time. 93 of the 94 individual drugs prescriptions were prescribed correctly in the electronic patient record. The one drug not prescribed correctly was characterized as a minor fault as it concerned administration time and not incorrect drug or incorrect dosage.

**Discussion & Conclusion** The control of prescription correctness shows the need for continuous attention to the time factor of the task. Furthermore it shows that pharmaconomists are able to prescribe usual medicine correctly in the electronic patient record. The hospital pharmacy will continue to conduct regular audit periods in order to assure the quality of the pharmaconomists' work. Despite the prescriptions not always being on time the department has expressed contentment with the task being delegated to the pharmaconomists.

**Keywords** Pharmaconomist, Prescription of usual medicine

## MS-29

### Pharmaceutical analysis of prescription during six months in a geriatric SSR: impact of pharmacist's interventions

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**Introduction** Clinical pharmacy consists of optimizing the use of pharmacist's advice and biomedical knowledge in order to improve efficiency, safety and accuracy of medications administration. In order to assess the impact of this practice we have traced out and assessed pharmaceutical interventions during six months in a short-stay geriatric unit through a standardized collection.

**Materials & Methods** From 02/01/2010 to 02/06/2010, all prescriptions of drugs in the geriatric unit (14 beds) have been validated by a pharmacist. Pharmaceutical interventions were carried out either through the prescription software (McKesson Pharma) displaying a comment for the prescriber, or directly at the weekly medical staff where a pharmacist is invited. The collection of interventions was implemented on the model sheets of the "Société Française de Pharmacie Clinique".

**Results** Among the 137 patients who were present during the study, 154 interventions were carried out.

70% of those were accepted by prescribers and led to a change in patient therapy.

21% of interventions involved the omission of the ambulatory treatment renewal and also other omissions like anticoagulation or correction of a vitamin deficiency.

20% of comments are caused by incorrect dosing, that required a dose adjustment or a cessation of treatment (antibiotic prescriptions to be adapted to creatinine clearance, adjustment to senior population). We also observed that 15% of interventions concern nonconformities to guidelines powered by prescription of drugs not available at the hospital and IPP prescription without real indication. It is noteworthy that four classes of drugs (nervous system, digestive tract, cardiovascular system and antibiotics) account for 80% of interventions.

The doctor-pharmacist partnership seems more effective when the pharmacist is physically present in the unit, 67% of interventions occurred during medical staff and allow to better monitoring and immediate correcting if necessary. Awareness-raising oral actions have been carried out on the most involved medications (IPP, hypnotics...) and it would be interesting to present them to teams of caregivers formation focused on these classes of drugs. The analysis allows us to target in real time the abnormalities of prescriptions and so to adapt a relevant formation program.

**Discussion & Conclusion** With the help of this inventory, we can check that of the validation of prescriptions by a clinical pharmacist is an important asset for a safe treatment of hospitalized patients. We see malfunction in the loop ambulatory-hospital; it is the reason why we plan to carry out a study that incorporates a "clinical pharmacy" approach. Finally, we note that a physical presence of a pharmacist is more efficient than a computing validation; natural evolution of the profession seems to be most like a bedside clinical pharmacy.

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Pharmaceutical analysis of prescriptions in care units using the French Society of Clinical Pharmacy's intervention sheet. *Journal de Pharmacie Clinique*. Volume 26, Number 1, 45–52, 2007

**Keywords** Clinical pharmacist interventions, computerization, analysis prescription, clinical acceptance

## MS-30

### Drugs' circuit audit within an internal medicine unit: analysis and proposals of actions

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**Introduction** Every day, nurses devote a considerable part of their time to prepare and distribute drugs to in-patients. These very delicate tasks touch a significant field of the assumption of responsibility for the patients. Therefore they must be achieved under the best possible conditions in order to minimize potentially serious errors.

**Materials & Methods** The team of an internal medicine unit, wishing to improve their practices, decided the installation of an internal audit on this topic. At various times during two days, a pharmacist student observed preparation of the pill boxes and distribution of the drugs. During the investigation, some elements were noted: time spent to carry out the action, causes and durations of task interruptions, "incidents" related to drugs delivery (falls of tablets, package opening...), pill boxes aspect. Each nurse was also interviewed.

**Results** This audit could highlight some major problems of organization:

- preparation of drugs: interruptions were too frequent and long (15 to 30 min minimum), due to various causes (phone calls, families visits...), likely to generate drugs confusion and an important loss of time. In 9% of pill-boxes, there were tablets residues. 83% of them were dirty and 30% damaged.
- distribution: correct identification of the preparation cannot be allowed to 39% of the patients because of divided tablets or cut out blisters (90%). 25% of personal pill-boxes were dirty. To identify drugs, nurses had to: throw the doubtful tablets and turn over directly to the medicine chest to take the good product or find by deduction the probable name of the tablet, using its color or form or identifying the drug using some letters or figures present on the blister.

Errors of preparation were highlighted (7%), all corrected during dispensation. Another point eventually concerns the schedules of preparation, which seem to be an obscure phase. For all these reasons, preparation tasks could be as long as 2 h.

**Discussion & Conclusion** Ideally, drug preparation and dispensation could be achieved by the staff of the pharmacy. So, at least, it must be carried out in a reserved, closed and clean room and not in an important crossing point. Nurses had proposed solutions. For

example, in some medicine units, trolleys allow simultaneous preparation and dispensation. These trolleys consist of a drawer a patient, with his usual treatment under blister. So, the treatment is prepared in front of the door of each room, and then dispensed at once to the patient, three times a day. A test of simultaneous preparation/distribution was set up in the unit to minimize errors and optimize time. After a short time of use of this new system of dispensation, the carriage was definitively adopted. With this method hygiene rules and risks of drug properties modifications were optimized.

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**Keywords** drug compounding, medication errors, nursing audit, professional practice evaluation study, risk management

## MS-31

### Optimization of the drugs prescriptions in geriatric CRU and link "Hospital-City"

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**Introduction** Make better prescription to the elderly is a public health problem, to which is added frequently, while returning home, to a break in the continuity of the health care due to faulty communication between health professionals. An optimization task of drugs prescriptions of the elderly, based on a collaborative medico-pharmaceutical, has been undertaken in a geriatric Care and Rehabilitation Unit (CRU), having a continuous pharmaceutical presence since November, 2007. At the hospitalization discharge, a synthetic tool for explaining therapeutic modifications has been created, aimed at the regular doctors and pharmacists to include them in the discussion led on every required specialty. This work has two objectives: to analyze the differences between the prescriptions at the entrance and those at the discharge of the hospital, to highlight the reassessment work done, and to see the impact of the bounding tool "hospital-city".

**Materials & Methods** The drugs prescriptions at the entrance and at the discharge of the hospital were collected prospectively and analyzed. A phone call, after a month from the discharge of the patient, with the city pharmacists allowed to know the changes made by the regular doctor after returning home.

**Results** On 83 patients, 66% are women, with an average age of 85 years old. In 60% of cases, a return at home was completed.

The treatments of 77 patients (6 deaths) were studied: the average number of specialties at the entrance and at the discharge is respectively  $6.8 \pm 2.8$  vs  $8.5 \pm 2.8$  medications. The difference between the treatments at the entrance and discharge is significant ( $p < 0.05$ ).

Three therapeutic classes are mainly found at the entrance: medication of the cardiovascular system (91%), of the central nervous system (76%) and those of the digestive tract and metabolism (75%).

The average number of prescription lines added and ended, during the hospitalization, is respectively  $4.3 \pm 2.4$  lines and  $2.7 \pm 2$  lines. Treatments the most frequently added are laxatives, vitamins, mineral supplements, antithrombotic, analgesic, antiepileptic and

psychoactive. The ended treatments include cardiology treatments and diuretics.

For 41% of the patients, the treatment at the discharge from the hospital has been changed by the regular doctor, after an average of 36 days after hospitalization.

**Discussion & Conclusion** The originality of this work is based on the collaboration "city-hospital" and "hospital-city" based on the presence of a pharmacist.

This study confirms the concepts of fragility and polymedication of the elderly patient. The "quantitative" relief of the prescriptions is required but difficult to obtain due to an associated "qualitative" reflection.

The need of a systematic multidisciplinary work of prescriptions questioning is confirmed. The collaboration patient-doctor-pharmacist is at the heart of the optimal use of drug treatments.

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**Keywords** clinical pharmacist, Elderly Patient

## MS-32

### Pharmaceutical notifications in anticancer drugs +production unit

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**Introduction** Softwares are helpful for prescription, pharmaceutical analysis and drug preparation. We use one of them (CHIMIO®, Computer Engineering) to produce cytotoxics in order to enforce safety and traceability. Pharmacists routinely analyse prescriptions and emit pharmaceutical notifications (PN) in case of detection of prescription abnormalities. Nevertheless, these PN were not systematically traced. In 2010, our cytotoxic reconstitution activity strongly increased (from 20 000 to 30 000 units per year). Thus, anticancer drugs production for pediatric departments began in april 2010. Moreover, we produced cytotoxic preparations for the adult oncology department of the neighbour hospital as subcontractor since may 2010. In this context, in june 2010, we activated and used a specific functionality of our prescription software to systematically trace these PN. The aim of this study is to retrospectively analyse these PN over 1 month and to study their relevance and their impact.

**Materials & Methods** PN were emitted during the validation of the prescriptions by pharmacists and transmitted by phone to clinicians and/or nurses. The pharmaceutical analysis of the prescriptions concerned the patients characteristics (body area, weight,...), the nature of the drug, posology, delay between courses and relevance of the prescription but also the nature of the vehicle, volumes and medical devices. These PN concerned all our clinical departments (medical, digestive, neuro-oncology, pediatric haematology, pediatric oncology and onco-hematology). PN analysis was based on the nature of the problem, the interlocutor, and the final decision after information and the potential risk for patients.

**Results** 82 PN were emitted in one month on 1501 analysed prescriptions (5.5%). Our interlocutors were mainly clinicians (87%), and nurses (4%). 61 protocols, as well adult as pediatric, were concerned by our PN. The main problems were related to abnormal posology (37.4%), dilution volumes (16.6%) misuse of protocol

(14.2%), delay between courses (13.7%), patients characteristics (8.5%), medical devices (5.0%), nature of the dilution solvent (4.6%). Our PN led to a modification of the prescription in 19.6% of the cases. Thus, we prevent iatrogenia by detecting 4 over-dosing (cetuximab, docetaxel, mitoxantrone, carboplatine), 1 under dosing (cardioxane) and 1 over hydration in child.

**Discussion & Conclusion** Our PN conducted to a limited number of prescription modifications. It can be explained by the computerized prescription that avoids the risk of calculation error. Nevertheless modifications obtain from our PN permit to prevent iatrogenia as well as ineffectiveness of treatment in 7 patients in 1 month. The further step will be for us to maintain this systematic NP analysis to better identify the origin of currently observed abnormalities in prescription. Moreover, we will also evaluate more precisely the economic impact of these PN.

**Keywords** pharmaceutical notifications, anticancer drugs, patient safety

## MS-33

### Analysis of clinical pharmacists' interventions in a university teaching hospital in Oman

A. Al Mahrizi<sup>1,\*</sup>

**Introduction** Objectives: To analyze clinical pharmacists' interventions and determine classification types as well as clinical relevance. This was a 12-month (January to December 2009) retrospective intervention study conducted at a 500-bed tertiary teaching hospital in Muscat, Oman. A standard manual documentation form was used to capture the interventions. Interventions were classified into five groups, namely; drug choice, drug regimen, monitoring, information, and prescribing issues. Clinical relevance was related to whether efficacy or toxicity was either improved or reduced. The outcome of each intervention was categorized as accepted, rejected or unknown according to the prescribing physician's response. The pharmacists evaluated the clinical significance of the interventions based on their own clinical judgments followed by a peer review of the evaluation. Analyses were performed using descriptive statistics.

**Materials & Methods** This was a 12-month (January to December 2009) retrospective intervention study conducted at a 500-bed tertiary teaching hospital in Muscat, Oman. A standard manual documentation form was used to capture the interventions. Interventions were classified into five groups, namely; drug choice, drug regimen, monitoring, information, and prescribing issues. Clinical relevance was related to whether efficacy or toxicity was either improved or reduced. The outcome of each intervention was categorized as accepted, rejected or unknown according to the prescribing physician's response. The pharmacists evaluated the clinical significance of the interventions based on their own clinical judgments followed by a peer review of the evaluation. Analyses were performed using descriptive statistics.

**Results** A total of 677 interventions were documented over the 12-month study period. The most common interventions performed were on drug regimen change (n = 402; 59%), drug choice (n = 164; 24%) and drug information issues (n = 54; 8%). Dose change (n = 230; 34%) and frequency change (n = 75; 11%) were the most frequent interventions performed in the drug regimen change. Toxicity risk was reduced and efficacy was improved in 40% (n = 269) and 33% (n = 224) of the interventions, respectively. Death, major permanent injury, or organ damage was avoided in 3.25% (n = 22) of the cases while interventions of major significance was recorded in 25.11% (n = 170) of the interventions.

**Discussion & Conclusion** The data show that clinical pharmacists play an important role in drug safety and efficacy to optimize

pharmaceutical care as part of the multi-disciplinary team approach in the hospital.

**Keywords** Interventions

## MS-34

### Analysis of clinical pharmacists' interventions in a university teaching hospital in Oman

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**Introduction** To analyze clinical pharmacists' interventions and determine classification types as well as clinical relevance.

**Materials & Methods** This was a 12-month (January to December 2009) retrospective intervention study conducted at a 500-bed tertiary teaching hospital in Muscat, Oman. A standard manual documentation form was used to capture the interventions. Interventions were classified into five groups, namely; drug choice, drug regimen, monitoring, information, and prescribing issues. Clinical relevance was related to whether efficacy or toxicity was either improved or reduced. The outcome of each intervention was categorized as accepted, rejected or unknown according to the prescribing physician's response. The pharmacists evaluated the clinical significance of the interventions based on their own clinical judgments followed by a peer review of the evaluation. Analyses were performed using descriptive statistics.

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**Discussion & Conclusion** The data show that clinical pharmacists play an important role in drug safety and efficacy to optimize pharmaceutical care as part of the multi-disciplinary team approach in the hospital.

**Keywords** prescription intervention

## MS-35

### Evaluation of the implementation of automated medication-dispensing system in an intensive care of Pneumology

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**Introduction** The development of the implementation of automated medication-dispensing system in French hospitals is the main aim, defined in the recent "Good Use" Contract (new rules in 2005). The purpose was to improve the safety and the organization around the drug dispensing by nurses. The objective of this work was to evaluate this implementation.

**Materials & Methods** Setting: Pneumology intensive care unit (10 beds) in the Pitié-Salpêtrière Hospital (GHPS), a large teaching hospital.

**Methods** Evaluation of a new organization with automate: before implementation, pharmacy was ordered by chief nurses; afterwards drugs order and arrangement was done by a chemist assistant. This evaluation concerned:

- The working time and the role of chemist assistant in clinical care with automate,
- The follow up of emergency order (number during one year),
- Costs study of drug consumption and drug storage,
- Analysis of the results from the questionnaire that nurses complete on their own about fulfillment of their needs.

**Results** Organization: Implementation generate a transfer of activities between chief nurses and chemist assistants, the management of the pharmacy rely on chemist assistant (=14h/Week). Automated device allowed a better division of activities and decreased the number of emergency orders (-69%). Satisfaction: 59% of nurses preferred the automated system and especially because they think that this system was safe and practical. In the same time, 100% of them appreciate the new relationship with the Pharmacy Department. Costs Study: a huge decrease of the drug storage in clinical care: -53% of cost (16767€ versus 7838€) and -63.5% of references numbers (617 versus 225).

**Discussion & Conclusion** This automated system allowed a safety access to drugs (biometric system). The other great interest was the real involvement of the pharmacy in the clinical wards. The presence of the chemist assistant ensured a better management of drug storage, a direct follow up and allowed a contact with nurses. Besides, with the new distribution of working hours, nurses devote more time caring patients.

**Keywords** automated medication-dispensing system, management of drug storage, safety

## MS-36

### Evaluation of professional practices on the preparation of parenteral nutrition admixtures

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**Introduction** The pharmacy of the University Regional Maternity of Nancy prepares admixtures for pediatric parenteral nutrition. 6300 bags were prepared in 2009. The service has been equipped with Baxa MicroMacro 12 compounder since november 2008. A quality assurance program has been developed by updating the operating modes. The aim of this work was to realize an evaluation of professional practices including manipulators who manufacture admixtures for parenteral nutrition.

**Materials & Methods** We realized an audit based on an observation of practices. We audited five pharmaceutical manipulators who participate in the preparation of bags. We created four collected forms from the operating modes. They concerned the four key stages of the process of new organisation: hand washing and dressing, assembling and disassembling of the compounder, preparation of materials, manufacturing of a bag. The forms included 156 criteria classified according to the type of impact on the preparation: microbiological, physico-chemical or other.

**Results** The process of preparation had a global rate of conformity of 81.7%. Gestures were in accordance with 95% to the reference table for the assembling, the starting and the disassembling of the compounder. On the other hand, the hand washing and the preparation of materials are the domains for which the rates of conformity are the lowest with respectively 67% and 79%. In addition, 81% of mistakes had a potential microbiological risk on manufacturing. They

concerned principally the hand washing and the installation of the compounder.

**Discussion & Conclusion** The manipulators mastered globally the process and respected the current operating modes. We decided to take corrective actions firstly on mistakes which leded a microbiological impact. So we carried out a revision of hygiene procedures, and a formation on manipulation in aseptic environment.... Their implementation will allow us to reach a global rate of conformity of 95% at the next evaluation and to make our strong points permanent. This evaluation established an assessment of preparation process of parenteral nutrition admixtures, but it was really time-consuming and represented approximately 30 h of observation. So for the next evaluation, we must define new criteria in order to better target critical points. This initiative was perceived by manipulators as a means of evolving and improving their practices. The evaluation of professional practices is essential in order to control the manufacturing process and to guarantee the quality of the sterile preparations.

**Keywords** evaluation of practices, Parenteral nutrition, quality assurance

## MS-37

### Interest of prescription analysis by the pharmacist in hospital

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**Introduction** Emerging from the 60's in the United States and widely applied in Anglo-Saxon, clinical pharmacy aimed at using the pharmaceutical expertise in order to improve efficiency, safety, economy and precision of the drug therapy. Health care institutions must pay special attention to the prevention of iatrogenic drug. This prevention is achieved by optimising the drug circuit: computerized prescribing, pharmaceutical intervention and daily distribution Dispensation. At the Military Hospital Laveran, 200 orders are analysed and validated daily by two pharmacists.

The aim of our work was to study these pharmaceutical interventions.

**Materials & Methods** Analysis was done retrospectively by reviewing data from the Pharma<sup>TM</sup> software. The selected period extends from August 2008 to August 2009. The study focused on the type of pharmaceutical intervention (substitution, choice of route of administration, discontinuation ..) and the drug classes involved.

**Results** 91,196 prescription lines were analysed. 4612 pharmaceutical interventions have been issued (an intervention every 20 lines of prescription), thus distributed:

- Substitutions: 71%
- Treatment stops: 8%
- Adjustments in dosage: 6%
- Reminders of therapeutic monitoring: 6%
- Optimisation of administration mode: 5%
- Others: 4%.

Cardiovascular system drugs was the class to which the largest number of pharmaceutical advice was made (37%). On the other hand, have been detected 175 major drug interactions, 65 warnings against the occurrence of an adverse event and 16 underdosing events.

**Discussion & Conclusion** Previous studies show similar results, both quantitatively and qualitatively (1, 2).

The presence of a large population of elderly patients in our hospital is consistent with the share occupied by cardiovascular drugs. The considerable number of substitutions is primarily due to the continuation of the personal treatments, not listed in the therapeutic booklet. Analysis of these data will be presented during a Committee



of Medicines and Sterile Medical Devices (COMEDIMS) as a tool of communication with medical staff on the value-added analysis of the pharmacist. Moreover, a closer examination of these data must be performed to identify and correct any abuse of prescriptions.

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**Keywords** pharmaceutical interventions

## MS-38

### Medication reconciliation in a French University Hospital

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**Introduction** Medication management in health care is a complex process requiring communication among physicians, pharmacists, patients and families across different settings. This complexity can lead to medication errors such as omission, incorrect dose and duplication resulting in adverse drug events. EUNetPaS (European Union Network for Patient Safety) is a project developed by the European Commission within the 2007 Public Health Programme. This program will provide validation of good practices garnered within the network in order to decrease preventable harm to patients and to improve the quality of healthcare. This project, coordinated by HAS (French National Authority for Health), aims to evaluate the feasibility of a good practice: medication reconciliation in a medical unit.

**Materials & Methods** During a 6-month period, we conducted a prospective single-centre observational study in the Immunology department (19 beds). The unit used a computerized physician order entry system. Usually, hospitalized patients followed therapeutic patient education (TPE) program with nurses. At admission, patient usual treatment was collected by the physician using medical file. This treatment was compared by the clinical pharmacist with the computerized regimen prescribed the day after admission. Information concerning TPE (existing of TPE, knowledge acquisition evaluated by nurses and need of further meeting) was collected too.

**Results** From July 2009 to January 2010, 216 patients were eligible. We excluded 79 patients: 16 were hospitalized before the beginning of this study, 5 died, 38 didn't have usual treatment, 14 were transferred in another unit, 2 were mentally ill and 4 were still hospitalized during the end of the study. No error medication reconciliation was observed. Among the 137 patients included, 89 had TPE (65%). Among these patients: 62 totally acquired knowledge, 17 partially acquired knowledge (among these, only 4 patients had a second meeting), 7 patients did not acquire knowledge (and none had a second interview) and for 3 patients, we lacked information.

**Discussion & Conclusion** Main admissions in immunology department are patients with chronic diseases who often come back and have extensive knowledge about their treatment. These specific patients, nurses' knowledge and skills about these specific medications and involvement of clinical pharmacist in this unit seem to

improve patient safety. The main difficulties of this study were: collection of patient usual prescriptions at admission and information about ETP, justification of treatment modifications, time spent to searching information.

EUNetPaS is a challenge but a real opportunity to improve patient safety at the european level. A greater involvement of clinical pharmacist in the medication reconciliation, at admission and at discharge and in other units, will improve the daily practice of pharmaceutical care.

**Keywords** medication reconciliation

## MS-39

### Non-formulary drugs. Analysis of the useless requests

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**Introduction** In our institution, only drugs approved by the Drugs and Therapeutics Committee are registered in the hospital formulary. Only formulary drugs can be ordered from the central pharmacy and stocked in the hospital pharmacy. However non-formulary drugs can be ordered from a local wholesaler when needed to treat a specific disease. Before ordering from the local wholesaler, all non-formulary drug requests are analyzed by a pharmacist in order to determine if the request is justified. According to each situation, the pharmacist can order the drug, offer an alternative drug, or refuse to deliver the drug if he considers that the prescription is not justified or if the status of the drug doesn't allow him to order it. For all requests, the decision is notified on the prescription sheet to inform the physician and the nurse of the situation. In order to help the pharmacist evaluate the prescription, a guideline summarising frequent non-formulary drug requests and associate decisions was elaborated. This particular process for non-formulary drugs is time-consuming, both for healthcare professionals and pharmacy practitioners. So it is necessary to ensure that all requests are justified. The aim of this study is to determine the proportion of non-formulary drug requests that should not have been made.

**Materials & Methods** During a six months period, all requests for non-formulary drugs were classified in several categories: hospital formulary drugs, combination drugs composed of drugs referenced in the hospital formulary, drugs without proven efficacy, drugs unauthorized in hospitals, drugs for patients who are not hospitalized anymore or who are leaving the hospital, illegible requests, requests which have been made twice, requests without a prescription.

**Results** During this six months period, 3647 non-formulary drug requests were made. Among these, 880 (24.1%) can be considered useless. Indeed, 325 (8.9%) concerned drugs referenced in the hospital formulary (same dosage, same galenic form, with the same trade name or with a generic name), 219 (6.0%) concerned combinations of two active ingredients referenced in the hospital formulary or drugs referenced in the hospital formulary in a different dosage. 161 (4.4%) concerned drugs unauthorized in hospitals or drugs which have not shown efficacy. 34 (0.9%) requests were made for patients who were not hospitalized anymore or for patients leaving hospital the same day. 39 (1.1%) requests were illegible and 81 (2.2%) were made twice. 21 (0.6%) requests concerned drugs which were in fact not prescribed.

**Discussion & Conclusion** In this study, almost one-quarter of non-formulary drug requests were useless. Useless requests represent time loss for both medical practitioners and pharmacists. It also underlines the fact that some physicians and nurses do not use or do not know

how to use the hospital formulary although it helps promote rational drug therapy for optimal patient care quality.

**Keywords** Non-formulary drugs

## MS-40

### Frequency and type of medication errors from admission to discharge in a French hospital

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**Introduction** Accurate medication histories at the time of hospital admission are an important element of medication safety. We have investigated the risk of medication errors on admission to discharge treatment in a teaching hospital. The aim of the study is to compare the patient medication before, during hospital stay and at discharge in a French internal medicine ward.

**Materials & Methods** All French speaking patients hospitalized in the 31 beds ward with home medications orders are included during the study period (February to March 2010). Medication history is obtained through interview and home medications orders by clinical pharmacist and compared to admissions orders and to discharge prescriptions. We have observed all changes in drugs therapy and classified them in two groups: appropriate (intentional change related to the disease) or not appropriate (medication history error, therapeutic or generic substitution without reintroducing initial ambulatory treatment at discharge, and omission at discharge).

**Results** Of the 40 patients included, 39 (98%) had at least one appropriate modification and 31 (78%) at least one inappropriate modification medication. Of 39 appropriate modifications, 35 concerned a new treatment, 19 discontinuation drugs, and 17 substitutions for pharmacologic reasons. Of 31 inappropriate modifications, 18 concerned medication history errors, 20 therapeutic or generic substitutions and 5 omissions at discharge. The inappropriate modifications have the potential to cause harm: for example, patient was taking 400 mg 2 times daily before admission but was ordered 400 mg/d on hospital prescription.

**Discussion & Conclusion** The numbers of inappropriate medication are important (78%) and at the same level on admission than on discharge. The clinical pharmacist could improve continuity of care and patient safety by ensuring an accurate medication history at the time at the hospital admission and at the time at discharge (1). Development of computer systems that allow transfer of medication histories and prescription information between hospitals and community pharmacies has also the potential to improve this process.

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**Keywords** continuity of patient care, medication errors, medication history, patient discharge

## MS-41

### Retrospective evaluation of dose reductions for chemo-induced neuropathies

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**Introduction** Neuropathy induced by anticancer drugs leads to burning sensations and paresthesia. This may conduct the clinicians to reduce the dose of the drug administered. Dose reductions causes are mentioned by the prescriber through our Computerized Prescribing Order Entry System (CPOE).

**Materials & Methods** In this context, we led a retrospective evaluation of dose reductions for chemo-induced neuropathies (all NCI-CTC (National Cancer Institute, Common Toxicity Criteria) grade included). This study set up at the Georges Pompidou European Hospital during five months (from September 2009 to January 2010). Using the statistics tool of our CPOE system (Chimio, Computer Engineering), we extracted the number of patients for whom a dose reduction related to neuropathy was performed, the drugs involved and the total amount of patients treated by these drugs. We used the Theriaque on-line drugs database in order to establish the list of the drugs that induce neuropathy with their respective frequency (multi-criteria search: anticancer drugs and neuropathy adverse event).

**Results** Eight drugs, among 19 daily prescribed, required a dose reduction due to neuropathy during these 5 months. 2 336 patients were treated during this period by these 8 drugs. 57 (2,5%) patients saw their drug doses reduced due to the occurrence of neuropathy. Depending from the molecule, the frequency varies from 0,2% to 15,5%: Oxaliplatin (42/272, 15,5%), Bortezomib (1/26, 3,8%), Paclitaxel (5/216, 2,3%), Vincristine (1/44, 2,3%), Docetaxel (4/456, 0,9%), Vinorelbine (1/120, 0,9%), Fluorouracile (2/554, 0,4%), Carboplatin (1/648, 0,2%).

**Discussion & Conclusion** These results are in line with those mentioned by Theriaque (1 to 10%) except for Oxaliplatin, for which we noticed a higher rate in our study. The withdrawal of Calcium and Magnesium supplementation in the chemotherapy protocols, following the results of the Hochster et al study (ASCO 2008), that suggested a negative impact of these ions on the overall survival, might explain this result for Oxaliplatin. Hochster's results were not confirmed by other studies. The results of our retrospective study led us to reintroduce Calcium and Magnesium before and after the administration of Oxaliplatin in our protocols. Monitoring the dose reduction operated by the clinicians allows us to follow the occurrence of adverse events and be proactive in the amendment of the protocols consecutively.

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**Keywords** Clinical outcomes, Drug-related problems, Prescribing, Protocols

## MS-42

### Use of a prospective risk analysis method to improve safety in emergency medication supplies

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**Introduction** Inpatient pharmacies are primarily involved in the preparation and dispensing of medications. These processes occur in different steps: interpretation of medical prescription, preparation, and delivery. Each step is accomplished by a staff performing different tasks at the same time. Medication dispensing is a source of error and potential adverse drug events. These errors are common and

often preventable. The aim of this study was to identify risks related to medication supplies in the setting of emergency to improve safety.

**Materials & Methods** We used a proactive risk analysis approach. In a first step, a multidisciplinary team composed of pharmacists, pharmacy students and pharmacy technicians have identified potential risk factors of manual emergency medication supplies. Secondly, criticality indexes were calculated by multiplying two components—occurrence, severity—estimated data for each risk.

**Results** Twelve potential dispensing errors were identified. The criticality index was high (IC = 12) for drug inversion, dispensing of a narcotic drug or a plasma derived product. Identified factors associated with these potential dispensing errors are communication failures, problems related to package labels, work overload, the working environment, disturbance, and ignorance of pharmaceutical staff.

**Discussion & Conclusion** This study illustrates the value of a prospective risk analysis method to improve safety. To prevent potential dispensing errors in the setting of emergency, we will use a phone answering machine, we will enhance knowledge of pharmaceutical staff by training and we will learn from past experience (feedback experience). Multidisciplinary teamwork is a key for the success of this analysis. The prospective analysis method will be applied in other medication supply processes in our inpatient pharmacy hospital: minimizing risk in the production of paediatric parenteral nutrition solutions or chemotherapy.

**Keywords** prospective risk analysis, medication supplies, safety

## MS-43

### Risk factors of dental dyschromia under amoxicillin-clavulanic acid: a review of pharmacovigilance reports

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**Introduction** A case of tooth discoloration under amoxicillin-clavulanic acid in a 7 year-old child was notified to a French regional pharmacovigilance center. Because of this, we sought to determine the risk factors for the onset of tooth discoloration during the use of amoxicillin-clavulanic acid, and also advanced some potential reasons for this adverse effect.

**Materials & Methods** A study was made of safety reports involving dental discoloration following the use of all drugs (generic or not) containing either amoxicillin alone or in combination with clavulanic acid. These notifications were obtained from the French National Pharmacovigilance Database (FNPDP). The study focused on the population affected by this adverse effect and the different drug formulations involved. The reasons for the appearance of these blemishes were then identified and analyzed.

**Results** Thirty-two cases of tooth discoloration have been recorded in the FNPDP since these medicinal products have been on the market. Based on population studies, this adverse effect was more common in children (44% between the ages of 3 and 15 years; median age: 6 years). It was also more frequently reported with the use of oral suspensions (87%) or other formulations such as dispersible tablets which remain longer in the mouth. These findings led to an analysis of the excipients used in the formulation of oral suspensions. The low concentration and the presence of the excipients in other formulations raised doubt as to their involvement. Another hypothesis was then put forward, suggesting that the active substances might be responsible for an imbalance in oral flora if they remain longer in the mouth. According to the activity spectra

of these two related molecules, most commensal bacteria in the oral cavity are destroyed. Only *Actinomyces* are likely to grow in the presence of these antibiotics. *Actinomyces*, which are sometimes resistant to amoxicillin-clavulanic acid, are involved in the formation of dental plaque. This may explain the occurrence of dental discoloration in children using this antibiotic. A modification to the oral pH, caused by changes to the commensal population in the oral cavity, may also be a factor that influences the development of stains induced by decalcification.

**Discussion & Conclusion** This study demonstrated the importance of pharmacovigilance notifications in the event of adverse reactions occurring in children, because few tests are performed in this population during clinical trials. Because of post-marketing data, tooth discoloration was included in the Summary of Product Characteristics as an adverse effect that can occur after use of an oral suspension. In light of the present findings, it may be useful to advise patients to rinse their mouths and ensure intensive tooth brushing after using these antibiotics, in order to prevent prolonged contact with commensal flora in the oral cavity.

**Keywords** Amoxicillin-clavulanic acid, Dental dyschromia, Drug safety

## MS-44

### Risk management of continuous infusions of high-alert medications in ICU

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**Introduction** Continuous infusions of high-alert medications (e.g., heparin, insulin, opiates, sedatives,...) are essential in the treatment of critically ill patients. These medications have a heightened risk of causing harm when they are used in error. Nevertheless, delivering continuous infusion is a complex process including dose calculation, evaluation of drugs or diluents compatibility, and simultaneous infusion through a single line. Since 2009, we have been putting in place preventive strategies to reduce the risk of error with continuous infusions of high-alert medications in a medical-surgical ICU.

**Materials & Methods** Information about current practices was collected via an independent double-check. Risk assessment was performed by a multidisciplinary team (clinical pharmacist, physicians, and nurses). In accordance with the recommendations of the Institute of Safe Medication Practices (2008), organisational and clinical changes were implemented. The ordering, storage, preparation and administration of the drugs were standardized. Data regarding solvents, drug compatibility and drug stability were collected from the drug monograph and from literature. The drugs were grouped according to their medical indication, pH, chemical structure and similar compatibility (V Kahman 2003). All data were summarized in reference documents, and pre-printed labels.

**Results** A daily independent double-check was conducted. Drug concentrations were adapted to the treatment needs, to the standardized expression of the dose and for the facilitation of the calculation of flow rate. Abbreviations were excluded. A drug manipulation chart of 34 drugs was created with the following topics: route of administration, drug concentration, modalities of dilution, conservation, stability, protection from light, a flow rate chart and the range of usual dosage. Drugs were separated into four groups: cardiovascular drugs, opiates and sedatives, miscellaneous drugs, and incompatible drugs. Intragroup incompatibility were excluded and drugs that belonged to

the same group were infused simultaneously through the same line. A complete table of drug compatibility was established. Drug delivery devices were identified by pre-printed labels including drug name, drug concentration, modalities of dilution, drug compatibility group, date and hour of preparation.

**Discussion & Conclusion** A multidisciplinary team partook in the process improvement. Interventions were implemented to prevent harm from high-alert medications. Clinical pharmacist provided drug and compatibility information. To facilitate the procedure for nurses, the drug manipulation chart and pre-printed labels were adapted in observance of their suggestions. The clinical team approved all policies. After education and training, the ICU team easily adopted the new practices.

**Keywords** High-alert medications, ICU, Risk management

## MS-45

### Medication order validation: reproducibility inter-pharmacists

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**Introduction** In French hospitals, pharmacists contribute to preventing drug-related problems during medication order validation, and formulating pharmaceutical interventions (PI). PIs identify, prevent, and resolve drug-related problems. Analysis of medication order should be reliable for the proposed PIs to be credible to the prescriber. The aim of this study is to evaluate the interobserver agreement, pharmacy analysis of the medication order, and the formulation of PIs.

**Materials & Methods** A prospective study of medication order validation is conducted in the pharmacy. Sixty randomised medication orders are validated by five pharmacists. Validation status (validated or not validated) and the formulation of PIs (PIs or not PIs) are recorded. PIs are coded according to the classification of SFPC<sup>(1)</sup>. Statistical test of concordance Kappa is used to evaluate agreement medication order validation, and PIs delivered by five pharmacists.

**Results** Out of the 60 medication orders analysed, on average 88% of prescriptions are validated. The overall agreement obtained between pharmacists is “mediocre” (kappa = 0,3). The five pharmacists formulated PIs for 35% (n = 105) of prescriptions. The overall agreement is “mediocre” (kappa = 0,22). One third (n = 35) of PIs concerns hypnotics, drugs for Alzheimer’s disease, an other third (n = 28) concerns anticoagulants and one quarter (n = 23) concerns potassium salts and laxatives. A third (n = 31) of the pharmacists recommendations are related to the need for drug monitoring (potassium salts and anticoagulants), one quarter (n = 24) for the optimisation of administration (precise schedule, dosage) and one quarter (n = 27) for dosage adjustment.

**Discussion & Conclusion** In our study, the PIs concern the same classes of drugs (psychotropic drugs, anticoagulants, digestive and metabolic drugs) as another multicenter study<sup>(2)</sup> evaluating clinical PIs in French hospitals. Medication order validation and PIs formulation are not homogeneous among pharmacists. The experience, knowledge and personal practice of the profession of a pharmacist can influence the decision. Some focused on more drug interactions or on more patient characteristics (age, laboratory test,...).

To improve the reliability of medication order validation and PIs formulation, it is necessary to establish a validation protocol and to know the expectations of prescribers on the PIs to better target them.

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**Keywords** pharmaceutical intervention, pharmaceutical validation, prescribing safety, reproducibility

## MS-46

### International overview of initiatives to promote continuity of care

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**Introduction** Medication management is an essential component of continuity of care. Patients’ transition between hospital and community is a high-risk period for the occurrence of drug-related problems [1, 2]. These problems are the subject of growing concern around the world. The objectives of this study were (1) to make an overview of initiatives that have been implemented in 7 selected countries at regional or national levels and that aim at improving continuity of care focusing on medications and (2) to synthesize the factors contributing to the success and failure of these systems.

**Materials & Methods** A structured search of relevant websites was performed for each selected country (Australia, Canada, Denmark, France, The Netherlands, UK, US). Selection of countries was based on the observation, from a systematic literature review, that seamless care initiatives had been developed in these countries. In a first round, a list of the titles and sources of relevant information was shared with experts identified in each country to confirm representativity of the information and to add references. In a second round, a structured description of the initiatives was performed and validated by experts.

**Results** Initiatives have been identified in all selected countries. Most initiatives have been implemented since the early 2000 and are still ongoing.

The principal actions include: the development and implementation of guidelines for healthcare professionals (HCPs), national information campaigns, education of HCPs, and the development of information technologies (IT) as to share patient and prescription data between settings of care.

All approaches involved different healthcare professionals from different settings of care (ambulatory and hospitals). Positive results have been reported in terms, for example, of intake into practice, or number of medication discrepancies. However, additional data are needed to confirm their impact on relevant clinical, economic and humanistic outcome measures. Critical success factors identified are: requirement of leadership to convey national and local forces and commitment, the adaptation of initiatives to local settings, the development of a regulatory framework (accreditation system, financial penalties), and IT support.

Contributing failure factors identified are: lack of human and financial resources, questions relative to responsibility and accountability of HCPs, lack of training of HCPs, lack of agreement for security solutions.

**Discussion & Conclusion** Although not all initiatives are applicable as such to a particular healthcare setting, most of them convey very interesting data that should be used when drawing recommendations for optimizing continuity of care. Critical success and contributing



failure factors should be taken into consideration. Their feasibility should be explored in a broad spectrum of HCPs and stakeholders.

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**Keywords** Continuity of care, international perspective, medication management

## MS-47

### Evaluation of a computerized system for medication errors reporting

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**Introduction** A generic computerized system for Adverse Events (AE) reporting has been set up in our hospital. Specific items for Adverse Drug Events (ADE) were added in 2009. The objective is to check the suitability of this tool in terms of Medication Errors (ME) analysis.

**Materials & Methods** Each computerized report of ADE that occurred during 2009, has been analysed using the “Société Française de Pharmacie Clinique (SFPC)” tool: types, causes and consequences in order to know if our generic computerized tool was suitable and adapted to our practice.

**Results** During 2009, 24 ADE were reported (10.5% of AE). They increased mainly by the end of the year, 8 during the 1<sup>st</sup> three quarters, 16 in the last three months. A report of adverse drug reaction was excluded of the analysis (23 ME).

Compared to the SFPC tool, our computerized system was suitable for 30.4% of reports (7/23) in terms of types, causes and consequences.

Using the SFPC tool, it was possible to describe the type of ME in 13/23 reports: medication not given at the right time (5/23), medication not given (3/23), medication given to the wrong person (3/23), wrong medication given (1/23), wrong route of administration (1/23). It was not possible to define the type for 7 cases. For the 3 last reports, the specific items of the SFPC tool were not adapted to answer.

We were also able to describe the causes of 13/23 ME: errors of drug delivery (3/23), human performance deficits (3/23), written or verbal mis communications (2/23), transcribing errors (2/23), knowledge deficits (3/23). For 10 reports, the computerized reports show causes that were not describe by the SFPC tool: computerized order entries (5/23) and organization failures (5/23).

Describing patient outcome severity using SFPC tools was adapted for 10 cases: circumstances or events that have the capacity to cause errors (3/23), ME occurred that reached a patient but did not cause patient harm (3/23), ME occurred that reached the patient required monitoring to confirm that it resulted no harm to the patient (2/23), ME occurred that may have resulted in temporary harm to the patient (2/23). For 13 reports, data didn't allow to assess patient outcome severity.

**Discussion & Conclusion** In our hospital, the use of a generic computerized system induced an increasing of voluntary reporting that continues today. This can be explained by the fact that, in terms of risk management, our hospital set up teaching sessions to invite

professionals to report. The low rate of suitability to the SFPC tool led to modify different items of our system. Another evaluation will be performed in order to know if adding other items will increase the suitability of reporting without decreasing the reports number. However, our system allows showing causes unclassified by the SFPC tool that are specific to our hospital (organization failures). Those causes are currently studied in our hospital task group.

**Keywords** computerized reporting system, medication errors

## MS-48

### Optimisation of pharmaceutical interventions (PI) in a geriatric care unit

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**Introduction** Computerized Physician Order Entry (CPOE) is a priority process of the new French accreditation procedure. Organizing and securing the medication process (prescribing, dispensing and administration) is a major public health issue in the prevention of medication error. Elderly patients are the population most concerned. Because of the rapid development of CPOE and because of the iatrogenic risk, we need to be more efficient in PI. The aim of this study is to optimise PI in geriatric care unit.

**Materials & Methods** Geriatric care unit of 54 beds (Short-Stay) use the CPOE system IMAGE PHARMA<sup>®</sup>. PI were recorded in a national database (SFPC (French Society of Clinical Pharmacy): patient characteristics, medication, intervention type, type of problems and PI's issue.). The SFPC guidelines were used to classify PI (Non-compliance with medical guidelines and contraindication, overdoses, inappropriate administrations, monitoring follow up, etc.). The “before - after” study was carried out during 16 weeks with 6 weeks for each data collection period. After the “before period”, the PI analysis led to five improvement actions (education, software settings, clinical information, shift Intravenous/Oral and organisation of a weekly meeting with the medical team). Chi square test was used for statistical analysis.

**Results** The Intervention rate was reduced from 2.9% to 1.6% ( $p < 10^{-3}$ ). 63 and 46 PI were identified respectively in the “before” and “after” periods over 5.000 orders analysed. The interventions of non-compliance decreased during the period defined as the “after period” (1.3% vs. 0.4%;  $p < 10^{-3}$ ), while overdoses increased (0.3% vs. 0.5%;  $p < 0.5$ ). Interventions defined as “inappropriate administrations” go from 0.8% to 0.6% ( $p < 0.3$ ). Finally, interventions defined as “monitoring follow up” were not identified in the “after period” (0.2% in first period;  $p < 0.025$ ). Interestingly, more than a third of the intervention in the “after period” ( $n = 16$ ) was centralized during the weekly meetings with the medical teams. The acceptance rate of PI by the medical team has not significantly increased (63.5% vs. 67.4%;  $p < 0.9$ ).

**Discussion & Conclusion** The setting of simple improvements could reduce intervention rate of the pharmacist and relevance of PI is demonstrated by the acceptance rate of the medical team. Organisation of a weekly meeting with medical team facilitated an exchange between pharmacist and physician. So, its activities would be more focused on relevant issues that have clinical impact for the patient on one hand (i.e. overdoses), and less focused on issues relative to patent medicine and ordering errors in software on the order hand. This study has allowed to know therapeutic protocols of the unit. So medication orders are reviewed more efficiently by pharmacists.

**Keywords** Computerized Physician Order Entry, Elderly Patient, Improvement, Pharmaceutical Intervention

## MS-49

**Falls in the elderly and use of hypnotics: a neural network analysis**

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**Introduction** Falls are very common in the elderly and contribute to morbidity and mortality [1]. The role of drugs, especially hypnotics, in the occurrence of falls has been often questioned. Recommendations to reduce consumption of these drugs were published by National Regulatory Authorities (AFSSAPS). The multifactorial origin of falls may make difficult the prediction of the consequences of such measures. The objective of the study was to evaluate the validity of the link between use of hypnotics and occurrence of falls, and the potential interest of reducing hypnotics use.

**Materials & Methods** A retrospective multicenter study was undertaken, aimed to collect the number of falls reported (spontaneous reports) and the monthly amount of hypnotics used (total amount and amount by drug presentation) for each geriatric care units of five hospitals. The reporting period was 24 months. Two statistical tests were conducted to identify a link between these variables: a classical analysis involving calculation of the correlation coefficient, and analysis using a Bayesian neural network. For the neuronal analysis, the relative weight of each variable was calculated, and the variables values minimizing the risk of falling.

**Results** A total of 1020 months of observation have been considered, and 1565 falls were reported. The statistical analysis conducted through the correlation coefficient did not find a link between the number of falls and monthly consumption of hypnotics ( $r^2 = 0.058$ ), or amounts of each drug ( $r^2$  ranging from 0.002 and 0.029). The neural network identified a link between a low hypnotics use (especially the high dosage of zopiclone and zolpidem) with a lower occurrence of falls (positive changes for the modality “no falls” of 18.8% and 19.75% respectively).

**Discussion & Conclusion** Analysis of risk factors of falls is a major issue in geriatrics. The decisive role of hypnotic drugs in the occurrence of falls has not been fully established yet. The use of conventional statistical methods did not enable to establish a link between their consumption and the risk of falling. With a different methodological approach, based on the use of a neural network, we identified the variables linked with that event and the modalities that minimize the occurrence of falls. Prevention of falls is a constant concern in geriatrics. The knowledge of the clinical pharmacist is of great interest because of the part of responsibility of drug iatrogenesis in these events. However, the complex and multifactorial nature of these events requires the use of advanced statistical techniques to identify actions needed, and reduce the drug use risks.

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**Keywords** Elderly Patient, falls, hypnotics, iatrogenia

## MS-50

**Inappropriate medications in the elderly: data from the literature and clinical practice**

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**Introduction** The elderly are at major risk of drug adverse events: physiological alterations related to age, multiple illnesses, increased sensitivity to some drugs ... Some medications especially at risk are now considered to be inappropriate in the elderly, and various lists of such inappropriate drugs have been published in medical journals (1, 2). The dissemination of such information in medical practice remains to be evaluated.

The objective of this study was to analyze the use of these drugs in five geriatric structures (1,400 beds) of a University Hospital over a four-year period.

**Materials & Methods** Based on the list of inappropriate medications in the elderly proposed by Laroche et al in 2008 (adapted to French practice), consumption data of these drugs were retrieved (excluding those non available in the hospital) over a four-year period. A categorization by ATC class was applied. A linear regression over time of the consumption of these drugs was done, then a statistical analysis of observed variations was performed by comparing the slopes of the trend lines, through a Chi2 test. The overall exposure of patients to these drugs was measured by the ratio between amount of drugs used and number of hospital days for this period.

**Results** 98 drugs were considered, clustered into 18 classes (level 3 of the ATC classification). The analysis of the trend lines slopes during this period showed a decrease for 59% of the drugs, and an increase for 41% of them. The most important decrease was for anxiolytic drugs and cerebral vasodilators. The hypnotic drugs and calcium channel blockers, however, were found growing.

As the Chi2 test result did not allow to reject the null hypothesis ( $p = 0.248$ ), the consumption of these drugs can not be regarded as generally declining.

The overall use of these drugs was important, since the ratios between the amount of drugs used and the number of hospital days for this period spread between 0.7 and 0.8 on these four years.

**Discussion & Conclusion** The statistical analysis performed did not show a reduction of the use of these inappropriate drugs in geriatrics. Conversely, some of these drugs appear to be of increasing use, and the level of overall utilization remains high. This study clearly demonstrates the lack of clinical application of national and international guidelines on the use of these drugs at risk in geriatrics.

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**Keywords** Beer’s criteria, Elderly Patient, iatrogeny

## MS-51

**Medication reconciliation of domestic treatment in a traumatology service**

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**Introduction** To detect and avoid mistakes in drug prescription in inpatients at a traumatology service by:

1. The identification and classification of discrepancy between domestic and hospitalary treatment.
2. Pharmacist intervention on the non-justified discrepancy detected.

**Materials & Methods** A Prospective study over 7 months at a Traumatology service in a general hospital provided by 420 beds. Daily, the pharmacist checked new inpatients' medical prescriptions at that service. Domestic treatment were registered during the first 24 h, or 72 h when the admission was on the weekend. Data was obtained from clinical stories made by nurses, general practitioner and the information given by the patient and/or family. The variables analyzed included demographic data, main diagnosis, co morbidity and number of detected discrepancies between ambulant and hospitalary treatment.

**Results** 155 inpatients (age range: 60, 4+–19, 65 years, 44, 5% males, 45, 2% urgent admissions and 54,8% scheduled) during the period that the study took place.

All Drugs registered in conciliations informs were 496 (3.2 drug per inpatient). 158 discrepancies were detected (1.01 per inpatient), from those 104 were not justified (63.3%). 10% inpatients presented 4 or more discrepancies. Significant statistical difference discrepancies were found between inpatients over 70 years and inpatients under this age ( $p = 0,0001$ ).

Not justified discrepancy classification:

Treatment omission: 55.7%

Treatment commission (drug prescription not justified by the clinic): 6.7%

Wrong dosage: 28.9%

Pharmaceutical duplicity: 2.9%

Others: 5.8%

Acceptance of the pharmaceutical interventions was 98%.

**Discussion & Conclusion** Discrepancies's high percentage detected justifies the implementation of a conciliation process on inpatients at the traumatology service. Higher percentage corresponds to the treatment omission, so it may be very useful to have inpatients' complete clinical history available.

Pharmaceutical intervention acceptance related to treatment conciliation has been excellent (98%).

Pharmacist participation on treatment conciliation facilitates its incorporation on a multidisciplinary team reducing medication mistakes and improving assistential quality to inpatients during their admission time

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**Keywords** discrepancy, intervention, medication reconciliation, traumatology service

## MS-52

### Potential drug interactions in older inpatients

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**Introduction** Drug interactions can increase the risk of adverse drug reactions. Elderly patients are considered to be especially endangered by their unwanted effects. The aim of the survey was to analyze administered medication and to identify potential drug interactions and determine their severity in geriatric patients.

**Materials & Methods** The followed cohort involved 100 inpatients of the Department of Geriatrics. Analysis of medical records was used to obtain the medication data. Potential drug interactions were identified and scored by potential severity to 5 grades (1–mild to 5–most severe). Mann-Whitney, Shapiro-Wilk and Spearman tests were used for statistical analyses performed by SPSS software.

**Results** Age of patients of the cohort ranged from 65 to 100 years, with the average of 81.76 years; 77% were females and 23% males. The mean number of drugs used in one patient was 8.82 (range 4 to 18). The number of used drugs was not significantly dependent on the age or gender of the users. The most common indication groups were anticoagulants (11.3%), antihypertensives (10.3%), vasodilators (8.4%), diuretics (7.8%), analgesics (6.9%) and antacids (6.2%). In 64 (64.0%) patients no potential drug interaction was found. Only one potential drug interaction was detected in 20 (20.0%) hospitalized patients; 2 simultaneously occurring interactions were identified in 4 (4.0%) patients, 3 in 6 of the patients (6.0%). In 3 (3.0%) patients four drug interactions were recorded, and 6 potential drug interactions were found in 2 (2.0%) patients. Seven co-occurring potential drug interactions were found in 1 patient (1.0%). The majority of interactions was classified by grade 2 or 3 (42 and 35%), no interaction of grade 5 (most severe) was found. The number of drug interactions in individuals was significantly dependent on the number of used drugs (Shapiro-Wilk,  $p < 0.001$ ), as well as their severity (Spearman,  $p < 0.001$ ). The most common potential drug interaction in the cohort was caused by the combination of furosemide and digoxin (incidence 12.9%). Warfarin was found to be a drug with the highest interaction potential: it produced nine types (9.2%) of revealed potential drug interactions.

**Discussion & Conclusion** Drug interactions are important causes of serious adverse drug reactions in the elderly. Although the risk of interaction does not mean an occurrence of adverse reaction, there is a strong need of screening risks in medication records. Our results show the high incidence of potential risk in hospitalized older patients, with both the frequency and potential severity significantly dependent on the number of administered drugs.

Supported by grant MSM 6198959216.

**Keywords** drug interactions, Elderly Patient, inpatients

## MS-53

### Physicians' and nurses' perception on oral chemotherapy use process: survey in a French hospital

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**Introduction** The objective of this survey is to assess the perception of physicians and nurses regarding oral chemotherapy safety practices and to define a policy to prevent medication errors.

**Materials & Methods** Design: All prescribers and nurses working in units concerned by the use of oral chemotherapy; face-to-face interviews with physicians; recording and transcription of interviews; written questionnaire survey of nurses; simple thematic analysis of

responses to open questions; tabulation of responses to closed questions.

**Setting** Gastroenterology, pneumology, otorhinolaryngology, gynecology wards and palliative care unit in a French teaching hospital.

**Main outcomes measures** Awareness and knowledge of oral chemotherapy with regards to medication errors, current safety practices, perception of risks.

**Results** Of 28 physicians reached, 23 (82%) were interviewed by a pharmacist (mean duration of interviews 24 min; 10 to 45 min). Of 69 nurses concerned, 33 (48%) completed the questionnaire.

A 48% of prescribers encountered a medication error related to oral chemotherapy while no nurse reported any. The main errors mentioned by the interviewees are prescribing errors (26%), adverse drug reactions (22%), administration errors (13%), drug-drug interactions (13%) and patient non-compliance (9%).

Few physicians (22%) and most of nurses (73%) were familiar with oral chemotherapy use system however 53% of physicians and only 48% of nurses declared that they had used oral chemotherapy. The survey also showed a great variability of prescribing and administration practices.

Half of the respondents believed that oral chemotherapy compared to intravenous chemotherapy induce fewer side effects and over half (55% of prescribers and 65% of nurses) viewed that patient monitoring are the same. Adverse drug reactions are the main risk reported by the respondents (65% of prescribers and 58% of nurses). Physicians also listed compliance, drug-drug interactions, prescribing errors. Strictness of drug regimen and patient monitoring were also quoted by nurses. To improve oral chemotherapy use process, physicians suggested pharmaceutical consultation (39%), double checking of the prescription by a pharmacist (22%), personal drug dispensing (13%).

**Discussion & Conclusion** These results highlight the importance of continuous safety improvement of oral chemotherapy use system. Through this survey, the health care professionals were alerted of the potential risks resulting from medication errors. A consensus on preventing these errors appears to be essential. Measures to require the same safety controls on oral chemotherapy as on intravenous chemotherapy should be applied. Moreover, compliance is a new parameter to consider as the patient becomes an actor of the drug use process. Therapeutic education for patients with cancer should be a high priority for the clinical pharmacist.

**Keywords** Drug use process, Medication error, Oral chemotherapy, Perception

Pharmaceutical team is made of an assistant to dispensing chemist, a chemist student and a pharmacist. The pharmacist controls and validates the medical prescriptions, to take part in the follow up of patients, supervises the chemist student and dedicates a full day to advices and information about their drugs to patients in the four units and in the daily hospital. The chemist student inventories all their treatments when patients enter hospital, takes part to the information and the follow up of osteoporotic patients.

**Results** 1-Pharmaceutical validation: From 01/01/2008 to 01/05/2009, 1862 hospitalizations (out of 1897) were controlled and validated at least once by the pharmacist. The pharmacist left 1743 messages to the rheumatologists who prescribed. The rheumatologists who prescribed took the messages into account (accepted and/or changed) in 393 cases, didn't take into account (not read and/or confirmed the prescription) in 745 cases, or gave an explanation in 605 cases. 18 types of messages can be formulated and quantified: contraindicated associations (7 accepted), overdosing (31 accepted), adaptation or contraindication according to the ground of patients (38 accepted), none prescribed treatments (27 accepted), etc.

**2-Therapeutically validation:** The pharmacist left a message of follow up (N = 198: INR, renal function ...). Starting from results of "Fardellone" questionnaires (quantification of alimentary supply in calcium), 19 (/39) patients were daily supplied with an association of vitamin D and calcium, whereas 4 patients had their treatments stopped.

**3-Advice and information:** Documents to help to the observance of treatment have been realized: they were explained to patients during their hospitalization or during consultations (Ex: Bisphosphonate, Strontium Ranelate, Biologic agents ...). The pharmacist took part to the multidisciplinary take care of the patients suffering from inflammatory rheumatic diseases and/ or osteoporosis (N = 117 during 12 months).

**Discussion & Conclusion** This partnership between the clinical and pharmaceutical teams *does* improve the take care of patients by a decrease of risks and a better organized follow up. The consequence of advice and information about their drugs to patients is still to be assessed.

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**Keywords** Advice and information about Drug, Medical Care and Pharmaceutical care in Hospital

## MS-54

### An experience of clinical pharmacy within a rheumatology service

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**Introduction** In order to improve the take care of patients who come to hospital (hospital patients or consulting patients) in the Rheumatology service, we have tested a partnership with the Pharmacy Service, concerning the prescription, the therapeutic follow up and the advice and information about their drugs to patients.

**Materials & Methods** The Service of Rheumatology consists of 4 units: 2 units of hospitalization in the long course (N = 20 beds) and 2 units of weekly hospitalization (N = 20 beds), the four of them computerized with the Phedra prescription-validation software. The

## MS-55

### The clinical pharmacist to prevent the misuse of dressing, over wound care management

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**Introduction** Hospital Center Pierre Oudot has developed an approach to observe and evaluate the medical practices about primary dressings used, such as dressings composed of hydrocellular, hydrofibre, alginate or hydrocolloid. Due to the nominative prescription of treatments, the pharmacist evaluates the accordance between the indication and the sort of dressings according to the hospital's protocols. This approach leads us to underline side effects of adhesive tape: the applying of this strip after hip surgery causes wounds which need to be treated by special dressings. Such side effects would be linked with a misuse of the dressing chosen.

The aim of the study is to estimate prevalence of wounds, to know the overcost generated, and then to identify the origin of misuse. The



interest is to establish a preventive action against misuse, in order to spread recommendations of uses to medical care teams.

**Materials & Methods** A retrospective study (01–2009; 05–2010) was implemented by identifying individual prescriptions of special dressings for which an adverse event occurs following the use of adhesive tape. All kind of wounds were notified as well as the time to onset, the sort of dressings used, the duration and cost of treatment.

**Results** 30 prescriptions where a cutaneous side effect is appeared, were inventoried. They concerned 25 patients who have undergone hip's surgery to install implantable medical devices (total hip prosthesis 28%, gamma nail 28%, intermediate hip prosthesis 20%, retaking on hip prosthesis 12%, hip fracture 12%). The prevalence of side effects is 7.9% of hip's surgeries. The average age of patients was 82.27 years old, the average duration of care dressing during hospitalisation is 14.3 days. Wounds observed were: phlycten 80.2%; irreversible flush 3.3%; skin abrasion 3.3%; desepidermisation 3.3%; dry and infected phlycten 3.3%; deep, dry and infected wound; 3.3% and one prescription without indication. 93.3% of dressing used are composed of hydrocolloid to treat simple wounds, and 6.7% are composed of hydrofiber and hydrocellular for infected, dry and deep wounds. The average overcost per patient for the coverage of wounds is 17.2 euros. All studied records are in accordance with our guidelines of wound care management.

**Discussion & Conclusion** Dialogue with surgeons confirms the choice of adhesive tape for aged and weak patients after hip surgery. A corrective act was undertaken to advise again medical team about adhesive tape application and educate about the interest to declare side effects, misuse consequences for the patients. The study highlighted the role of the pharmacist during the validation of prescriptions of special dressings in order to analyse both the conformity with protocols, detecting redundancy treatment of adverse reactions occurring in a care earlier and educate caregivers notifiable side effects, which allows the pharmacist to act accordingly.

**Keywords** adhesiv tape, Medical device use, misuse, wound care

## MS-56

### Nonconformities (NC) of prescription: analysis over three years in a unit of preparation of antineoplastic agents (UPA)

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**Introduction** In the Limoges university hospital, the prescription of antineoplastic agents is computerized in 94% since 1997. The UPA notes the entire NC, prescription to administration, in an IT database since 2007.

The pharmaceutical team wished to analyze all the NC of prescription and evaluated the impact of the pharmaceutical work at this level.

**Materials & Methods** The retrospective study concerns the NC of prescription detected between 01/01/2007 and the 12/31/2009. They were distributed in 5 categories (classification of Schmitt<sup>(1)</sup>): NC of information, NC of pharmacological choice, NC of drug, NC of monitoring and followed-up prescription and statutory and procedural NC. An analysis of the NC (service, level of detection, potential gravity, implementation and cost) was realized with the aim of improving the prescription and making the number of NC decrease.

**Results** 1,925 NC of prescription was noted (66% of all NC) by prescription. They are divided up according to the following descending order: NC of information, (49,9%), NC of pharmacological choice (33,6%), NC of drug (7,0%), NC of monitoring and followed-up prescription (5,2%) and statutory and procedural NC (4,3%).

The service of hematology and oncology are responsible for 86% of the NC. But these 2 services, the prescription of which is computerized, present rates of NC by prescription low by comparison to the not computerized services: 0,05 against 0,10.

More than 90% of the NC is detected by the UPA, mainly at the time of the pharmaceutical validation (89%). The remaining 10% are by the prescribing service.

40% of the NC are potentially considered serious: not adapted dosage (37%), error of size or weight (19%), error of protocol (13%), error of patient (1,1%).

To resolve these NC, the pharmacist had to call in services for rectification of the prescription (55%) or modify the labeling for the errors of unit of hospitalization (38%). In 6% of the cases, the non-conform preparations were returned to the UPA: 52% were destroyed and 26% made new.

Over 3 years, the cost of the NC of prescription amounts to €32,317: 90% of this sum is due to NC of prescription of molecules except diagnosis related group: pemetrexed (€5,200), trastuzumab (€4,600), bevacizumab (€3,800).

**Discussion & Conclusion** The role of the pharmacist in the detection and the stop of the NC of prescription is major: 630 NC potentially serious was so avoided thanks to his pharmaceutical analysis (80,7%) and his presence in the multidisciplinary consulting meetings of the services. The prescribers are made sensitive every quarter by the pharmacist who presents them the assessment of the NC of prescriptions, their costs and the necessary tracks of improvement. The efforts to improve the prescriptions have to continue, especially since the economic assessment of 2010 already amounts to more than 7,600€ with 147 NC potentially serious for the first five months of the year.

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**Keywords** antineoplastic agents, non-conformity of prescription

## MS-57

### Establishment of a prescriptions validation with distant access

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**Introduction** In Toulouse hospital, the Pharmacy department is committed to increase management of patients' medication. By 2012, 1,000 beds will be equipped with computerized prescription and automatic nominative drug delivery. To anticipate the validation of these prescriptions, the cardio vascular and metabolic (CVM) pharmaceutical team (PT) has decided to create a comprehensive and daily validation tool, with distant access, within the department of Cardiology. This work comes as a complement as the Pharmacy already deals with management of entering patient medication in this department

**Materials & Methods** Our organization depends on a fifth year pharmacy student, who is in clinical training in hospital and is in charge, of collecting data necessary for prescription analysis. Daily, the resident validates the prescriptions, via distant access from the pharmacy, and if necessary gives pharmaceutical advice. The student transmits pharmaceutical interventions directly to the medical team for acceptance, thus contributing to avoid iatrogenic events. The tools developed in order to implement this work were:

- a structured Excel spreadsheet to gather data concerning patients and prescription. This document is networked to allow the resident or pharmacist to access and validate from the Pharmacy.
- Written procedures, for the student, presenting the objectives and methods, with information on the use of the Excel spreadsheet.

**Results** The implementation was simple and quick, since it has caused no additional cost in terms of staff or equipment. The work was carried out during two months, on 12 beds. CVM PT validated 83 prescriptions and helped prevent 21.7 iatrogenic events per 1000 days of hospitalization, or four times the average rate achieved in 2009. Moreover this project is compatible with the already operational entering patient prescription analysis. Two months after its establishment, we have improved the Excel spreadsheet to allow for better assessment of pharmaceutical interventions. It allows to list the number of pharmaceutical validations and advices. In addition it allows to classify the interventions according to the codes of the SFPC (French Society of Clinical Pharmacy).

**Discussion & Conclusion** The principle limit lies in the risk of error in prescription re-transcription. However, the physical presence of the student, along with the resident's advice, increases the number of accepted pharmaceutical interventions. Moreover, this tool allows us to easily compare patient treatment on admission and on discharge, and can easily lead us to provide support to patients leaving hospital. CVM PT has decided to extend this validation in three other departments that also employ pharmacy students. This pharmaceutical support, beyond the "entering patient", already well established, can increase the fight against preventable iatrogenic events and anticipate integration of the pharmacy to medical teams (2012) in the overall patient care.

**Keywords** Iatrogenic drug event, Pharmaceutical analysis, pharmaceutical intervention

## MS-58

### How to improve the appropriateness of the prescription of Prothrombin Complex Concentrate

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**Introduction** The purpose was to improve the appropriate use of Prothrombin Complex Concentrate (PCC) through clinical practice assessment. Benefiting from a first retrospective study realized in 2007 (*pre*) which showed inappropriate use of PCC, corrective actions are proposed by the Drug Committee, as introducing a prescription form, training and communicating. A second study (*post*), performed two years later, enables us to assess their impact.

**Materials & Methods** All the prescriptions of PCC from Emergency and Intensive Care units during the defined periods (first quarter of each year) were retrospectively reviewed by a pharmacist and an emergency physician. Appropriate use was assessed by comparing practice with guidelines. The criteria were the adequacy of indication, dose, co-prescription of vitamin K, and control measure of international normalized ratio (INR) within 6 h. These criteria were compared between first and second study with the Pearson chi2 test.

**Results** Fifty three PCC prescriptions were analyzed before the consensus, from January to March 2007, and 32 prescriptions from January to March 2009.

The rate of adequate indications improved from the first to the second period (pre 72% vs post 91%,  $p < 0,04$ ).

There was no statistical difference between the two groups concerning the conform dose (pre 45% post 39%), the Vitamin K co prescriptions (pre 64% post 67%).

Monitoring INR in the 6 h after administering PCC was more often performed during the 2nd study (pre 30% vs post 53%,  $p < 0,04$ )

**Discussion & Conclusion** That kind of practice evaluation may reduce PCC misuse. Nevertheless other actions should be developed for the PCC dose to be in adequacy with the guidelines in that case. For example, every prescription should be validated by a pharmacist before administering. From this practice evaluation, regular follow-up of prescription relevance associated with ongoing corrective actions promotes an improvement of the management of hemorrhagic complications of vitamin K antagonists.

**Keywords** practice evaluation, prothrombinic complex concentrate

## MS-59

### A medication adherence risk assessment tool (RAT) compared with medication adherence report scale (MARS)

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**Introduction** In the UK, 36% of patients aged  $\geq 65$  years take more than three medicines. As age advances physical and cognitive skills deficits place patients at risk of treatment failure due to non-adherence to prescribed medications. 'Compliance aids' are often used to help patients self administer medication; in spite of lack of good evidence to support their use. Compliance aids are often used without appropriate patient assessment or clear identification of the specific deficits. Most medication adherence assessment tools rely on patients self reporting their perceived compliance behaviour. We report from an ongoing study to develop compliance risk assessment tools. This study was conducted in sheltered housing organisations with a high functioning patient group some of whom were using 'compliance aids' supplied by their pharmacists.

**Materials & Methods** A 13-item scored risk assessment tool (RAT) has been designed as an administered structured questionnaire, modified from a previously validated RAT<sup>1</sup>. This version has 6 and 7 items covering the cognitive and physical domains respectively.

Each item is scored objectively by trained interviewers as '0, 1 or 2'; where zero = 'negligible' risk and two = 'high' risk (score range 0-26). Each patient was also rated by the established 5-item Medication Adherence Report Scale (MARS) of self reporting of types of medicine taking behaviours (possible score range 5-25)<sup>2</sup>.

The study offered a means of seeking to identify patients at risk of non adherence using the RAT and MARS by comparing patients highlighted as being in need of adherence support depending on the tool used.

**Results** Patients (80% female) had mean (SD) age 83 (7) years and on a mean (SD) of 7 (3) medicines.

To categorise a patient assessed as not requiring investigation of adherence problems, cut-off scores of RAT $<3$  and MARS $>23$  were used. RAT identified 53% (CI:39,67) and MARS identified 82% (CI:68,91). When decisions using those criteria were examined for individual patients there was 47% (CI:33,61) of patients where the application of the tools disagreed. The disagreements were more often due to the RAT identifying patients at risk (81% [CI:39,93] vs 19% [CI:10,45]). In two patients the RAT would have been

interpreted as indicating that the patient was unable to self administer their medication (scores > 10). In both cases MARS gave a score > 23.

**Discussion & Conclusion** The two tools have been designed for different purposes but the idea of using a self reporting system is questioned if our more time consuming RAT identifies specific barriers to medication adherence. There is an argument for tools to be designed to screen out patients without apparent risks to their adherence and for tools to target services to specific compliance problems in a two stage approach. Using these two tools, the MARS as a shorter screening tool would not have identified low RAT scorers reliably.

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**Keywords** Compliance, Medication adherence, Patient assessment

#### MS-61

##### Securing the cytotoxic circuit: evaluation of secure sterile medical devices (SMD) and economic impact

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**Introduction** In July 2009, the opening of the new centralized chemotherapy unit of the hospital was accompanied by an approach of securing the cytotoxic drugs circuit. Our objectives were to reduce exposure to cytotoxic for the staff handling antineoplastic drugs, to ease and reduce time of purge for the pharmacy technicians, to enable the patient to receive the entire cytotoxic dose by removing the dead volume of the infusion set. New SMD, specifically designed to allow the oncology security, are available on the market. The objective was to evaluate and compare two systems of protective SMD and to measure the economic impact.

**Materials & Methods** A test phase of 2 ranges of SMD (Codan\* and Hospira\*) has been organized jointly with the Hepato-Gastroenterology (HGE) unit: evaluation of SMD for the preparation of anti-cancer drugs (needleless sampling device (NSD), short administration set (SAS)) and administration (administration tree (AT) with multiple channels) was performed. A questionnaire assessing the labelling, ergonomic and ease of use of different SMD was developed. A cost study was conducted to measure the economic impact of the deployment of the new SMD.

**Results** The evaluation was conducted in July and August 2009. 4 pharmacy technicians (PT) evaluated the NSD and the SAS, 5 nurses evaluated the AT for each range. Any criterion confused for a scale of 5, the average scores for the Codan's\* and Hospira's\* ranges are: NSD: 4.7 vs 3.6; SAS: 4.6 vs 3.8; AT: 4.4 vs. 4.3. The cost analysis was conducted for the HGE unit on May 2009 and compared the traditional operating cost to simulated cost operating with the protective SMD. The overcost was estimated at €1335 (Codan\* range) for a monthly production of 574 chemotherapy preparations and divided up in this way: Pharmacy unit: €485; Care Unit: €850.

**Discussion & Conclusion** The Codan's sampling device and administration set were preferred by PT on ergonomic criteria (grip), ease of collect, ease of use of integrated air intake and better sealing

connections. Nurses found the two AT similar. In the end, Codan's range was chosen. The benefit/overcost ratio was considered favorable. The deployment of this system was implemented in January 2010 in the HGE unit and is underway for the remaining oncology units. The SMD help in securing and standardizing the practices of cytotoxic circuit. They permit to eliminate the risk of bite, to reduce risk exposure and contamination with cytotoxic drugs. They allow the simplification of the preparation: they save time by reducing the purge period and the time of final control of preparations. They permit the administration of full drug doses to the patient. Nevertheless, they raise some issues: the cost, the need for staff training and less mastery of pharmacy for the conditions of administration.

**Keywords** cytotoxic circuit, securisation, sterile medical devices

#### MS-62

##### CPOE as a critical point in medications use system: a case of partial update of CPOE database

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**Introduction** Technology-based interventions have been recommended for reducing the likelihood of medication errors. Computerized physician order entry (CPOE) has been cited as one of the most effective ways to avoid medication errors caused by misinterpretation of handwritten orders, incorrect doses, wrong dose forms and inappropriate administration times. Moreover, they allow to limit orders to only drugs listed in the hospital formulary. However, CPOE efficiency is conditioned by the databases they use. The aim of this study is to assess the completeness of a CPOE database.

**Materials & Methods** In Saint Antoine Hospital (University Hospital, 762 beds) physicians prescribes directly with a CPOE called PHEDRA® (SIB). Drug stocks are managed through COPILOTE® software (Savart & Michel). As currently observed in most of european hospital, CPOE systems and drug stock managing system are not interfaced. Thus, we compare the list of drugs in COPILOTE® software with the database from PHEDRA software, in order to assess the completeness of CPOE database. Then we have added in the PHEDRA database, the missing drugs and remove those no longer registered in hospital formulary.

**Results** At baseline, there were 2,060 active drugs in the database. At the end, there were only 1660 actives drugs. Thus the number of active drugs was reduced by 19%. We had to manage 69 substitutions of a drug by another equivalent. We added in the PHEDRA database, 86 drugs that were not present. We inactivated 485 drugs deleted from the hospital formulary but which were still active in the database. Thus, we identified 49 drugs still active in PHEDRA database, although they are no longer manufactured. In addition, we have identified 19 errors covering prescription parameters such as route, dosage or dosage form. For example a detergent agent has been declared as an antiseptic for skin use; the 90 tablets box was declared like the default unit dosage for another drug; the intravenous route has been registered as the route of administration for a drug that is normally administered subcutaneously.

**Discussion & Conclusion** CPOE may increase adherence to hospital formulary. But this implies that the database CPOE is updated. Our study revealed a partial update of the CPOE database used at St Antoine hospital. This can lead to medication errors. Under different scenarios, a partial update of the CPOE may increase the time it takes a clinician to enter orders or to obtain medications. In all cases, there is an impact on the care of the patient. A CPOE is aimed to reduce the

frequency of medication errors. In order to keep this improvement, it is necessary to establish quality system to update CPOE database when there are changes in hospital formulary. CPOE is a way to reduce the frequency of errors. But it is also an additional critical point in the medication use system.

**Keywords** cpoe, drug safety

## MS-63

### Clinical pharmacy and improvement of pharmacist's interventions in an infectious disease department

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**Introduction** The implementation of a clinical pharmacy activity in a 13 bed-unit of an infectious disease department allowed pharmacists to evaluate their activity. The objectives of this study were to analyse the number and the type of pharmacist's interventions during 5 months.

**Materials & Methods** Prescriptions are entered on the software Phedra<sup>®</sup> (S.I.B) and validated daily by the pharmacy resident. Since September 2008, he has been involved with a pharmacist in the ward twice a week (0.2 FTE). The access to every part of the patient's files (such as biological and clinical elements) allows pharmacists to optimize their interventions in case of prescribing errors or physician's question. Each pharmacist's intervention has been recorded and classified, in accordance with the SFPC classification. Questions requiring pharmacist's opinions and declarations of adverse drug reactions to authorities have also been recorded.

**Results** 55 opinions requiring pharmacist's expertise after physician's questions were issued. For the most part, they concerned advice about side effects and drug use recommendations or special data, not mentioned in monographies. We recorded 38 interventions due to prescribing errors, including: modifying the dose: 9, discontinuing drug: 7, adding a new drug to patient therapy: 7, appropriate monitoring: 3, changing treatment: 9, other: 3. 82% of interventions were accepted by physicians. Only 32% of interventions were related to analysis of prescription alone (i.e wrong dosage or drug-drug interaction). 68% of interventions were then due to the presence of the pharmacists in the department. 52% of the pharmacists interventions were considered significant (i.e significant improvement of therapeutic care or avoidance of a significant medication error)

**Discussion & Conclusion** "Standard" analysis of prescriptions, even on a computerized physician order entry, is not sufficient to detect medication errors and risks of adverse drug events. In this unit, implementation of clinical pharmacy made it possible to enhance the role of the pharmacy resident, as shown by the substantial acceptance of interventions by physicians.

**Keywords** Drug-related problem, Pharmaceutical analysis, prescribing medication error

## MS-66

### Optimization of the prescriptions of antiemetic protocols in an University Hospital

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**Introduction** Nausea and vomiting are one of the most frequent side effects reported by patients treated with anticancer chemotherapy. The antiemetic therapeutic arsenal is very extensive and the

international learned societies guidelines regularly change. Since 2007, all chemotherapy protocols for adult patients are computerised in our University Hospital, sided with an antiemetic protocol. It seems important to analyse antiemetic protocols and identify if they meet the official recommendations.

**Materials & Methods** We collected all the chemotherapy protocols listed in our prescription writing software, as well as antiemetic protocols attached to them. We compared them with a synthesis of the official guidelines developed by learned societies like the National Comprehensive Cancer Network (NCCN), and the American Society of Clinical Oncology (ASCO).

**Results** 150 chemotherapy protocols were listed in 3 units. A large heterogeneity in the antiemetic protocols associated appeared. In fact, the antiemetic protocols are classified in four groups according to the emetogenic potential of the chemotherapeutic drugs used: very low, low, moderate or high, and then adapted notably to the patient's individual risks factors. We noted that no antiemetic protocols classification was made according to the emetogenic potential of chemotherapies, and that for some chemotherapies with the same emetogenic potential, different antiemetic protocols were applied. Serotonin and NK-1 receptors antagonists were generally prescribed in excess, especially with an association in prevention of delayed nausea and vomiting. In 75% of cases, they were prescribed in prevention of acute nausea and vomiting induced by chemotherapies with low emetogenic potential. However, we noticed that with the computerization of protocols and chemotherapies prescriptions, adaptation to patient's individual risks factors wasn't possible.

**Discussion & Conclusion** Those results are currently explained to the oncologists. With their approval, we planned a patient file analysis to validate the similarity between the antiemetic treatments prescribed with our prescription writing software and the treatments really gave to the patients, in order to evaluate the influence of the constraint made by computerization. In addition, we are working on an updating of antiemetic protocols, with a homogenization according to the emetogenic potential of the associated chemotherapy protocol.

Prevention of the chemotherapy-induced nausea and vomiting now represents a priority of the patients care in oncology. Given the number of available antiemetic therapeutic classes and the high cost of the most recent ones, standardizing practices is now essential to ensure the best care for patients while keeping associated costs under control. Moreover, though computerization of prescriptions is a big help for security and traceability, it shows some constraints which we have underlined here with the system's lack of flexibility.

**Keywords** antiemetic protocol, chemotherapy, emetogenic potential, nausea, vomiting

## MS-67

### Organization and evaluation of antimicrobial surgical prophylaxis in a general hospital (2000 beds and 16 kinds of surgery)

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**Introduction** Literature mentioned that antimicrobial prophylaxis in surgery reduce the incidence of surgical site infection (SSI). In our regional hospital, with a multidisciplinary staff we developed local consensus for every kind of surgery according to the guidelines published by the French society of anesthesia (SFAR). Since 2006, for every surgery, we designed a specific form which includes the order, the reminding of antibiotic regimen for each situation, patient



informations and an area for administration record. Medicines (vials or tablets) are set in a small box, each box containing only the amount of antibiotics required for a single prophylaxis. The pharmacy department prepares as many kits as a number of antibiotics regimens listed in the 16 orders forms. Thanks to an audit we try to assess the adherence to local guidelines and to evaluate practice of surgical prophylaxis and this specific organization.

**Materials & Methods** Audit has been performed, according to the French National Authority for Health (HAS in French) method, in 4 times (October 2006, September 2007, October 2008, March 2010) by reviewing retrospectively medical and anesthetic records of specific kind of surgery. The prescription of antibiotics was compared with the local hospital guidelines on the HAS criteria. All data were analyzed by using the software SPHYNX®.

**Results** 9 kind of interventions has been specifically chosen in 5 types of surgery. During the 4 times, 922 records has been evaluated (30 records studied per kind of surgery). Prophylaxis has been prescribed on specific document in 82%. Duration of antibiotic prophylaxis was longer than recommended in 20 cases (2.2%). 72% of patients received an appropriate dose. Essential criteria is the administration of prophylaxis in the hour before incision. In 83% of cases this timing is applied. Overall adherence to all aspects of the guidelines was 53.7% ( $n = 337$ ) at the first audit time and 71.8% ( $n = 145$ ) at the 4<sup>th</sup> time. At the 4<sup>th</sup> time, a new problem appeared; 11.3% of the administrations were not recorded on the specific document.

**Discussion & Conclusion** Thanks to this audit we observed an important adherence of local guidelines, and we approved the new organization. This evaluation permitted to give the clinical pharmacist a central role in the administration, monitoring and intervention of antimicrobial prophylaxis in order to improve the current practice.

**Keywords** Antimicrobial Surgical Prophylaxis, audit, evaluation

## MS-68

### How effectively are changes to patients' medication communicated upon transfer of care?

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**Introduction** Seamless patient care is assured by proper written and verbal communication of patients' medications at the interface of care. Eighty-five percent of errors across institutions are linked to communication failures. Charing Cross Hospital approved a policy that mandates from all doctors and pharmacists to communicate admitted patients' medication changes and their reasons before transfer of care to another hospital team or before discharge.

**Objective:** To evaluate the level of communication of medication changes and their reasons upon transfer of care.

**Materials & Methods Study setting:** The study was conducted on adult medical wards at Charing Cross hospital (CXH).

**Study design:** A retrospective approach was chosen to evaluate patients' medical notes (MNs), drug charts (DCs), and electronic To Take Away (eTTAs) prescriptions. All eTTAs from study wards were identified during the study periods.

**Results** A total of 89 patients' medical records were reviewed, of which 70 patients had 407 changes in their medical records. Patients' mean age (SD) is 68.14 ( $\pm 19.65$ ) years (range 16–97 years). The mean (SD) number of medications per patient in TTAs is 6.71 ( $\pm 4.54$ ). Actual changes 93.9% were communicated in MRs and 76.4% were communicated in eTTAs. The mean number (SD) of

changes per patient was 4.8 ( $\pm 3.8$ ), range (1–23). Moreover, reasons for changes found to be communicated in MRs for 55.5% cases and for 28.5% cases in eTTAs.

**Discussion & Conclusion** Although Charing Cross Hospital sit standards for communication of medication changes and their reasons, the results of this audit shows that such communication of changes to patients' medications during admission are below hospital standards. These results should alert all doctors and pharmacists to putting extra effort in this essential issue of patient care and improve intra-hospital communication as well as communication with General Practitioners (GPs) regarding medication changes and their reasons.

**Keywords** Communication, Documentation, Patients' medication

## MS-69

### How to improve adherence to cancer oral chemotherapy?

#### A French regional project for patients and primary care health professionals

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**Introduction** Oral chemotherapy represents an increasing proportion of cancer therapies. However, they are causing many side-effects not properly identified and managed by patients and/or local health professionals (general practitioners (GPs), community pharmacists, community nurses). Regional information on the proper use of these therapies, their iatrogenic effects, and their adverse events' prevention has started in September 2009 to improve patient adherence to treatment and experience at home.

**Materials & Methods** Supported by the Regional Health Observatory and the Regional Oncologists Group network, a multidisciplinary committee has been established, comprised of hospital pharmacists, oncologists, the Regional Health Agency. This working group also includes community pharmacists, GPs and community nurses, all members of the Order of different Regional Councils. Documents were written in order to improve the information given to patients.

**Results** Two types of drug leaflets (i.e. for professionals and patients) were created for each oral chemotherapy and are available at a free access website. This contains standard posology as well as advice on the occurrence of any side-effects, and basic instructions to patients. The list of various oral treatments for cancer is also available for health professionals. Training on different classes of oral anticancer drugs (pharmacodynamic properties, adverse effects), health professional awareness of non-adherence risks and practical use of drug leaflets was carried out. Therefore, 260 primary care professionals in the geographical region (GPs, community pharmacists and nurses) were able to complete the training. A complementary program of patient education has started, initially with 250 patients. A patient diary for treatment follow-up was developed to record, on a weekly basis, the administration, the adverse effects and the patient's comments, as well as pharmacist, GP and community nurse remarks. The diary is presented by the patient to the oncologist at each consultation. This should permit adherence evaluation of treatment (i.e. date of delivery recorded by the pharmacist). The community nurse is responsible for the patient education at home and receives a symbolic annual compensation for their patient follow-up.

**Discussion & Conclusion** This multidisciplinary project addresses a need for training nearby health professionals and should contribute to improve patient co-ordination of therapy, link oncologist and patients at home. For patients, better interface of all health practitioners should

increase successful adherence to treatment and therefore the odds of optimal treatment. The inclusion of patients in this project is currently ongoing.

**Keywords** cancer oral chemotherapy, Patient Education, training nearly health professionals

## MS-70

### Assessment of nursing practice on preparation and pill distribution

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**Introduction** Hospital drug distribution is a complex process involving many health professionals. It is important to improve each stage to ensure the quality of medication care delivered to patients. Medication errors can occur at different steps of the process, particularly during the pillbox preparation.

**Materials & Methods** An extensive audit was performed during 24 h in December 2009 in 76 hospital departments to evaluate practices in the preparation of pillboxes and subsequently to improve this stage and reduce errors. The study was conducted in two parts: interview of one nurse per department, and analysis of a dozen pillboxes per department.

**Results** A total of 59 departments (78%) use pillboxes. There is no specific nurse to carry out this task or written procedures for the preparation of pills. Pill control is not made by an independent person (14.5%) but a check is made regarding treatment administration. Nurses, 18.4%, remove the drug packaging and 80% identify these drugs without blister packs by experience, comparison or their appearance. More than 50% of nurses have difficulties with generic drugs, particularly in terms of therapeutic equivalence. Inaccuracies between prescription and pillbox contents were confirmed by 57.9% of nurses surveyed. The frequency of these errors is rare and corrected immediately by the nurse. The use of the pillbox was a time saver for 64.5% of nurses, but some nurses mentioned that the pillbox was a source of error (15.8%) or that the boxes were too small (13.2%). During the preparation, the nurses check the galenical form (59.3%), dosage (93.2%), integrity of packaging (71.2%) and preserving (37.3%). During the observation phase, 527 pillboxes were analyzed, 73% identified the patient's name, whereas 27% the room number. The day and time of preparation are rarely noted on the pillbox (1.9%). The name and dosage of the drugs are only visible for half of the pill. The expiry date is absent on 33% of drugs. One hundred unconfirmities (19%) were noted between the content of pillbox and the prescription. The presence or absence of one drug compared to the prescription was the most common error encountered.

**Discussion & Conclusion** Developing guidelines for the preparation of pillboxes would standardize practices and thereby prevent removing the packaging of drugs. It is important to remember the stages of pillbox preparation with all the checks. Drug identification until patient administration is a key point which must be underlined with the nursing team.

**Keywords** Assessment of practice, pillbox preparation

## MS-71

### Magistral preparations: what about pharmacovigilance?

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**Introduction** The purpose of pharmacovigilance is to monitor and prevent adverse reactions associated with the use of medicinal products for human use, so that any drug risks can be identified. The products concerned are specified in Article L.2121–1 of the French Public Health Code, and include magistral preparations. In this study, we sought to focus on the notifications concerning extemporaneous preparations.

**Materials & Methods** To achieve this, all adverse reaction reports related to magistral preparations since 1985 were identified by consulting the French National Pharmacovigilance Database (FNPd) and selecting cases that involved magistral preparations. The brief reports were then analyzed with respect to the population, type of declaration, severity of cases and the extemporaneous preparations concerned.

**Results** Of the 64 cases identified, only 35 actually involved a magistral preparation, the others being hospital preparations. This represented only a small proportion of all notifications, of which there have been more than 380,000 in the FNPd since 1985. Adults were involved in 63% of cases and children in 37% of cases. The proportion of pediatric was particularly high because of the lack of appropriate specialties. Most notifications reported a serious adverse event (69%) causing hospitalization, prolongation of hospitalization or other significant medical conditions. Three cases have even resulted in life-threatening conditions. These findings led to an analysis of the causes of these events. Thus, in 51% of cases, the adverse effect was due to the product itself. However, pharmaceutical errors such as inappropriate labeling or overdose of the preparation were responsible for 26% of notifications. Finally, in 23% of cases, the misuse of preparations by nursing staff or patients was involved. This meant that ultimately, 49% of the adverse events related to magistral preparations could have been avoided.

**Discussion & Conclusion** Given the small number of notifications recorded, should it be considered that there is a lack of information for healthcare professionals regarding the pharmacovigilance on such preparations. This study also reveals problems as to the human component in the management of magistral preparations. Indeed, nearly half the reports identified resulted from human error. It may therefore be useful to recall the importance of compliance with Good Manufacturing Practice guidelines in order to reduce pharmaceutical errors, and to implement regular in-house training. Similarly, the delivery of magistral preparations should be accompanied by explanations and advice to make up for the lack of instructions supplied with these preparations.

**Keywords** Drug safety, Magistral preparations

## MS-72

### Acute antimicrobials nephrotoxicity; one year experience in a referral infectious disease department in Tehran

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**Introduction** Despite the general opinion about antibiotics safety there is frequent occurrence about adverse drug reactions (ADR), which is due to frequent prescriptions, as well as to nonrational use.

The kidney is a common target for toxic xenobiotics, due to its specific capacity to extract and concentrate toxic substances, and to its large blood flow. Studies have shown that hospitalized patients who experience even modest alterations in renal function are at significantly increased risk of mortality, hospital length of stay, and hospital

costs even after adjustment for age, gender, chronic kidney disease, and morbidity upon admission. The aim of this study is to identify the frequency and characteristics of antimicrobial related acute nephrotoxicity and correlate predisposing risk factors with this ADR in the infectious disease ward in our hospital.

**Materials & Methods** All hospitalized patients in the adult infectious disease department in Imam Khomeini hospital from April 2007 to 2008 who received at least one antimicrobial agent as a part of their medical care, were evaluated in our study for antimicrobial related renal toxicity. Imam Khomeini Hospital is one of the oldest tertiary teaching hospitals especially in infectious disease in Tehran.

**Results** Among studied patients, 19.78% developed acute renal failure (defined as increase in SrCr of more than 0.5 mg/dL or more than 30% decrease in baseline ClCr) that was detected after  $14 \pm 8.2$  days of therapy. most widely used antimicrobials were vancomycin (54.9%), ceftriaxone (31.9%), gentamicin (29.7%), cefazolin (22%), amikacin (18.7%). The presence of diabetes or hypertension and other comorbidities and concomitant nephrotoxic drug use were not significantly related to development of nephrotoxicity.

**Discussion & Conclusion** Drug-induced acute renal failure is a commonly encountered mode of renal injury in the hospitalized patient. Currently there is clinical evidence showing ARF is an independent risk factor for mortality in hospitalized patients.

**Keywords** Antibiotic nephrotoxicity

## MS-74

### Assessment of infusion practices in a geriatric hospital. The limits of the professional practices evaluation (PPE)

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**Introduction** To reduce the infectious risk and protect the venous capital of elderly patients, a survey was realized in 2007 concerning the good use of infusion medical devices, the respect of hygienic measures to prepare drugs pockets and to manipulate intravenous infusion line. Further to the results, new guidelines dedicated to infusion were proposed to the nurses in every care unit. A new investigation was realized in 2010. The purpose of our study is to compare the results between both investigations and with data from literature.

**Materials & Methods** The survey was realized in all care units. The methodology used was the same for both investigations:

- The process of infusion was observed by a pharmacist and a hygienist nurse.
- The data were collected with a data collection form established from recommendations of good clinical practices.

A literature review was conducted.

**Results** The study lasted 3 months (January-march 2010). 30 observations were realized:

- Evolution of good infusion practices 2007/2010:
  - disinfection of the preparation area: 14%/34%
  - alcohol-based hands rub before preparing pockets: 23%/69%
  - checking of the blood back-flow: 40%/52%
  - drop count to regulate the infusion flow rate: 3%/34%
- Bibliography analysis: these practices are not fully described. Only data on the flow's regulation have been found in a general hospital: a questionnaire was submitted to nurses. 35% of them declare to count the drops.

**Discussion & Conclusion** The guidelines have contributed to improve the professional infusion practices. Nevertheless, this survey shows the limits of the PPE and the need to conduct another study on the nurses' perceptions to change behaviors. To further optimize the patients' safety, pharmacists have analyzed the intravenous prescriptions for one day to evaluate the need for intravenous infusion (14% patients). The corresponding drugs were mainly solutes (58%), antibiotics (24.7%), analgesics (6.2%), and antiulcer (3.7%). 40% of antibiotics are also oral: 50% have not been revalued. Likewise, 100% of antiulcer should have been prescribed by oral route. These results demonstrate pharmacists have, in a geriatric hospital, a key role to act in concert with physicians to improve the global patient care.

**Keywords** geriatric hospital, infusion practices, professional practices evaluation

## MS-75

### The role of a pharmacist in safe medication practices—Czech experiences

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**Introduction** The medication errors occur often and decrease quality of health care. To decrease risk of errors it's necessary to detect them, to understand their causes and to prevent them. Medication errors may be caused by many subjects from prescription to administration of drugs. Of all types of medication errors, prescribing errors are the most serious. In the Czech Republic there is a lack of evidences about medication errors and very poor awareness of safe medication practices. The aim of the study was to describe and evaluate pharmacist's role in detecting and solving of prescribing medication errors and discuss possibilities of building up safe medication practices in the Czech Republic.

**Materials & Methods** The pharmacists recorded the prescribing errors which they identified over a period of three weeks during dispensing of outpatient medications in community and hospital pharmacies. The following data were collected by web questionnaire: characterization and causes of errors, pharmacist's interventions, drugs concerning errors, consultation with subject making errors and patient's characteristics. The identified errors were classified. The clinical significance of the cases is evaluated and reviewed by group of experts. Then the cases of errors will be discussed during meetings of the pharmacists and the other health professionals in some Czech regions. Data were processed by descriptive statistics.

**Results** During a period there were carried out 447 interventions of 33 pharmacists, out of 31715 dispensed prescriptions. Basic characteristics of pharmacist's cohort: mean age 30 years; mean length of pharmaceutical practice 5.5 years; 17 of them worked in the hospital pharmacy. 10 of them got the first grade of attestation in pharmacy (by 4 years of working experience in pharmacy and by passing exams). More than 90% of pharmacist's interventions were evaluated as appropriate. The clinical significance of the cases will be presented after expert's group evaluation.

**Discussion & Conclusion** The study pointed out that pharmacists are able to identify and solve relevant prescribing errors. The mentioned research is unique in Czech health system and documents the possibilities of incorporation of safe medication practices into the

pharmacy services in the Czech Republic. The next actions should lead up to the initiation of discussion about long-time medication errors reporting system. It's necessary to keep a record of pharmacist's interventions and to discuss with the health care professionals about individual cases in order to prevent and minimize medication errors. The pharmacists should play an active role in the process of the implementation of safe medication practices.

**Keywords** Documentation, medication errors, Pharmaceutical Care

## MS-76

### Antibiotherapy: professional practices appraisal based on French national guidelines

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**Introduction** Increasing use and sometimes misuse of antibiotherapy has led to an increase in bacterial resistance. Its prevalence in hospital-acquired infection has become alarming in France.

For hospital certification, a professional practices appraisal on the proper use of antibiotics was performed using a methodology from the National Health Service (HAS), published in April 2008.

**Materials & Methods** This retrospective study included 39 patients hospitalized in 3 units over a 7 month period: 15 in oncology, 15 in haematology and 9 in Intensive Care Unit of haematology(ICU), identified from the medical records database (criteria: at least 7 days of antibiotherapy). Antibiotherapy was assessed for conformity using local guidelines, national reference books (POPI, PILLY) and HAS recommendations.

**Results** The antibiotherapy complied with guidelines in respectively 60%, 67%, 75% of cases in oncology, haematology and ICU. Antibiotherapy was adapted to microbiological results for all patients of oncology unit, 85% of ICU patients, but only 61% of haematology patients (one third of those continued a broad-spectrum antibiotherapy in addition to the antibiotherapy targeted to an identified bacteria). The reassessment of the treatment after 48-72 h was observed in oncology and haematology units respectively in 73% and 71% of prescriptions. In the ICU, the threat in these immunodepressed patients prompted prescribers to perform this reassessment several times a day but this revaluation was not constantly recorded in patients' medical files.

Estimated duration of antibiotherapy was only specified for half of haematology unit's patients and for no patients in the other units. In the Haematology Unit and ICU, accumulation of risk factors requires the introduction of a broad spectrum antibiotherapy. Therefore, the duration of this treatment is difficult to predict, particularly when confronting neutropenic fever where the duration depends on the end of aplasia.

The continuation of antibiotics beyond 3-4 days proved to be justified for all patients. When it was possible, de-escalation was routinely performed.

**Discussion & Conclusion** This professional practices appraisal has permitted to evaluate the antibiotic strategies and to identify criteria to be completed for antibiotherapy reassessment: i.e. exhaustive reassessment traceability at 48-72 h, expected antibiotherapy duration and guidelines conformity.

The pharmacist with the collaboration of clinicians and microbiologists play a major role in ensuring optimal efficacy and safety of this treatment, particularly through individual dispensing process and drug prescription analysis. Recent introduction of computerised order entry system at the centre and the willingness to establish a regular

pharmaceutical presence in units should allow a better use of antibiotherapy.

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**Keywords** Evaluation of work practices, Proper use of antibiotherapy

## MS-77

### Impact of a pharmaceutical care program in an emergency department

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**Introduction** To evaluate the results from the implementation of a Pharmaceutical Care Program in an Emergency Department (ED)

**Materials & Methods** Prospective observational study. The program was developed over a period of 5 months(August-December 2009). A trained pharmacist was present in the ED for 2 h a day, three days a week. Main activities included: medical prescription validation, detection and resolution of medication-related problems (MRP), medication conciliation for patients awaiting hospital admission, drug information, organization's medication storage. All the pharmacist intervention were documented. Followup date were collected: demographic data, home medications, ED-prescribed treatment, number of patients admitted, conciliation reports, type of MRP and pharmacotherapeutic and drug classification, number of pharmacist interventions (PI) and rate of acceptance by the physicians.

**Results** 793 patients reviewed performing PI in 313 patients, of whom 161 were women. Median age was 68,4. Interventions/patient ratio was 1,92 ± 0,30. Most fecuent MRP detected were: Regarding the addition of a drug: 21,35%, Drug application policy: 32,78%, Unsuitable administration schedule: 14,90%, Incomplete physician orders: 13,57%.

The predominant pharmacotherapeutic groups on PI were: Alimentary tract and Metabolism 21,99%; Cardiovascular System 20,44%; Blood and blood forming organs 17,87%; Nervous System 17,01% and Anti-infectives for systemic use 11,34%. The rate of PI acceptance were: 64,75% Accepted; 12,25% Rejected; 23,01% no values (PI where a result couldn't be established because patients were discharged or lack of resources for monitoring).

45% of analyzed patients were admitted, being candidates to medication conciliation 21,42%. Drugs per patient conciliated media was 7,53.

**Discussion & Conclusion** A high rate of avoidable MRP in emergency patients was detected during the study. With the introduction of a Pharmaceutical Care Program at ED, pharmacotherapy quality and safety were improved by decreasing medication and MRP; ensuring pharmacotherapeutic continuity between different levels of care through "Medication conciliation".

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**Keywords** Emergency Department, Pharmacist interventions



## MS-78

**What is the impact of three different formulas to estimate the renal function on the carboplatin dosage using Calvert equation?**

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**Introduction** Renal function assessment is mandatory for cancer patients treated by anticancer drugs. Carboplatin is an alkylating agent that is indicated in several cancer localisations. There is a close relation between its renal clearance and glomerular filtration rate (GFR). Best estimate of GFR is provided by direct methods (<sup>51</sup>Cr-EDTA or inulin measurement) which are difficult to manage in daily practice. In this context, serum creatinine (SCr)-based formulas are used to estimate GFR when calculating a dosage for carboplatin using the Calvert equation. We wanted to evaluate the impact of three different formulas (Cockcroft and Gault (CG), aMDRD [1] (Modification of Diet Renal Disease) and CKD-EPI [2] (chronical Kidney Disease–Epidemiology)) on carboplatin dosage and the influence of patients' age, sex and body mass index (BMI), knowing that CG is used in our center.

**Materials & Methods** We considered retrospectively 255 adult patients, receiving carboplatin AUC > 2 alone or in combination with other cytotoxic drugs whatever solid tumor's localisation or stage. We gathered the age, the height and the weight. Carboplatin dosage was calculated using Calvert equation. We performed variance equality tests, variance analysis and means comparison on our population at a risk of 5%. We established two line models for two dose ratios (carboplatin dose calculated with aMDRD/dose based on CG and CKD-EPI/CG) depending on patients' age.

**Results** Depending on the formula, carboplatin doses are statistically different for patients older than 65 years ( $p = 0,004$ ) and patients with BMI < 18,5 ( $p = 0,035$ ). The comparison of the matched means for these two population subtypes shows that carboplatin doses calculated with CG were inferior to those calculated with aMDRD (respectively  $p = 0,002$  and  $p = 0,020$ ) or CKD-EPI (respectively  $p = 0,008$  and  $p = 0,033$ ). However, no statistical difference was found between aMDRD and CKD-EPI ( $p = 0,547$  et  $p = 0,548$ ). Our line models confirm that among our population CG seems to underestimate carboplatin dose beginning from 50 years with aMDRD and 52 years with CKD-EPI.

**Discussion & Conclusion** Regarding patients older than 65 years, the difference noticed confirms the relevance of the aMDRD and CKD-EPI which use can permit to avoid a dose minimization normally expected. For cachectic patients with BMI < 18,5 CG should be used in order to reduce carboplatin toxicities. No statistical difference between the three formulas has been found for obese patients probably because of a too small number of patients among our population. According to our result, CG seems to be a convenient formula to estimate carboplatin dose with Calvert equation in our daily practice, for patients under 65 years. For none cachectic patients older than 65 years, aMDRD or CKD-EPI formulas should be preferred.

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**Keywords** Calvert equation, Carboplatin dosage, serum-creatinine based formula

## MS-79

**Chemical contamination and the benefits of a plastic film on cytotoxic drug flasks**

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**Introduction** To improve the cytotoxic medicine preparation process, hospital preparation units' chemical contamination is assessed using platin as a tracer of contamination.

This work evaluates flasks' chemical contamination and the impact of the plastic film on carboplatin flasks.

**Materials & Methods** First, different flasks are evaluated during hospital investigations: glass surface of oxaliplatin and cisplatin flasks and plastic film surface of carboplatin flasks. Then, other carboplatin flasks are studied because of a special packaging including a thermo welded plastic film around the flask glass surface. Surfaces are sampled with a moistened swab desorbed in water. Samples are dosed by graphic furnace atomic absorption spectrometry after preconcentration. The limit of detection and quantification are 2 ng and 6 ng of platin per sample respectively.

**Results** Investigations show a chemical contamination in 48% oxaliplatin flasks ( $n = 25$ , average 5 ng, maximum 50 ng), in 27% cisplatin ( $n = 27$ , average 4 ng, maximum 66 ng) and in 25% carboplatin flasks ( $n = 20$ , average 1 ng, maximum 4 ng). 8 glass surfaces out of 10 carboplatin flasks directly out from the firm, are contaminated (average 11 ng, median 4 ng, maximum 62,2 ng). The film surface directly on contact with the flask is less contaminated (4 flasks, average 3 ng, maximum 14,2 ng). The extern surface directly on contact with the manipulator is associated with a low contamination (7 flasks < 2 ng and 3 flasks < 6 ng).

**Discussion & Conclusion** Despite an industrial cleaning step, a residual contamination persists on the flask surface. The plastic film confines the chemical contamination and limits its propagation. The procedure of microbiological decontamination (soaking, swabbing) does not induce cytotoxic liberation. Samples coming from the extern packaging show lower rates than the limit of detection therefore, if possible flasks should be stored into their second packaging to prevent the chemical propagation.

To conclude, cytotoxic flasks are contaminated. The plastic film or another protection system is an asset to limit the exposure, and it can be an argument to buy this medicine. It's important that the staff should be aware of the chemical risks induced by cytotoxic flasks and their propagations during the decontamination procedure.

**Keywords** chemical contamination, cytotoxic drugs, flasks

## MS-80

**Stability of amiodarone in capsules for paediatric patients using a HPLC method**

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**Introduction** Amiodarone chlorhydrate is a class III antiarrhythmic agent shows  $\beta$  blocker-like and potassium channel blocker-like actions on the sinuatrial and atrioventricular nodes. It is given by

mouth in the treatment of all forms of atrial, junctional and ventricular arrhythmias. Capsules for paediatric patients are not commercially available and must be prepared in the pharmacy department. The aim of the study was to evaluate the stability of amiodarone at different dosages, 10, 60 and 100 mg, in capsules for paediatric patients stored in three primary packaging at ambient temperature and under dark conditions as per International Conference of Harmonization guidelines (ICH).

**Materials & Methods** European pharmacopoeia High-Performance Liquid Chromatography (HPLC) method was not performed because of worldwide shortage of acetonitrile at the beginning of the study. The HPLC method was adapted from an analytical method of Martin-Algara et al.<sup>[1]</sup> Specificity (with excipient and accelerated degradation), linearity, precision (repeatability and intermediate precision) and accuracy were performed to validate method for each dosage. For each dosage and for each primary packaging, three samples were analysed by HPLC on day 0 and at months 1, 3, 6 according to ICH recommendations. The physical stability of amiodarone chlorhydrate capsules was assessed by visual inspection (capsule and powder) at each analysis time.

**Results** The methods developed in this study are precise, linear, specific and accurate. The results are confirmed by statistical parameters.

The initial concentration of the drug was designated as 100%. All subsequent concentrations were expressed as percentage of initial concentration. Stability was defined by concentrations >95% of initial ones. Amiodarone content remained greater than 95% of the initial concentration in all capsules at all dosages. No change of organoleptic characters was observed throughout the study. No detectable degradation product was observed at any time.

**Discussion & Conclusion** The 10, 60 and 100 mg amiodarone paediatric capsules were stable for six months when stored in the three packages at ambient temperature and under dark conditions. There was no influence of primary packaging. This stability study will be extended during two years. Our HPLC method is easy to use and applicable for qualitative and quantitative analysis of amiodarone capsules.

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**Keywords** amiodarone, capsule, HPLC method, paediatrics, stability

#### MS-81

##### Crush or not crush: that is the question?

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**Introduction** Administration of tablets and capsules can be difficult for some patients with dysphagia especially in geriatric population, for paediatric patients and patients with a nasogastric catheter. Data about the possibility to crush a tablet or to open a capsule aren't always available in the Summary of Product Characteristics (SmPC) and medical staff doesn't always check that possibility with a pharmacist. In this context we were confronted several times to inappropriate crushing of tablets, especially extend release ones, susceptible to endanger patients' safety. The objective of this work was to elaborate a handy guideline indicating the possibility to crush tablets or to open capsules available in our hospital.

**Materials & Methods** For each oral drug referenced in our establishment, the possibility to be crushed, dissolved or divided were recorded. Further more, we collected data available in the SmPC about administration thru a nasogastric catheter. When information was not available, we contacted the pharmaceutical firm which commercialized the drug. If the drug couldn't be crushed, the reason why and the alternative available at the hospital were reported. All the data were synthesized in a table. After validation by the nutrition commission, data could be available in our intranet.

**Results** Six hundred and five oral route drugs available in the hospital were investigated. For thirty-two drugs data couldn't be found, they were considered as not crushable. Two hundred ninety-seven drugs couldn't be crushed, for eighty-seven of them an alternative was proposed. Two hundred seventy-six drugs could be crushed or opened, among those drugs two hundred sixty-three could be administrated thru a nasogastric catheter. For more visibility symbols understandable at first sight were used to represent the different cases.

**Discussion & Conclusion** Extend release tablets, drugs with low therapeutic index, drugs that could endanger medical staff during manipulation and drug instability at light, air or pH were the main reasons why tablets couldn't be crushed. An other reason is the lack of stability study. If the drug could be crushed but that a more convenient alternative was available it was systematically recommended. The validation and the wide diffusion of this guideline should make medical staff more aware of the oral route drugs administration problem in patient with dysphagia. This document easy to reach on the hospital network should enable doctors to prescribe more appropriate forms and nurses to know how to administrate properly oral route drugs in order to improve patients' safety.

**Keywords** dysphagia, guideline, nasogastric catheter, tablet administration

#### MS-82

##### Use of drugs in cirrhotic patients: an appropriate use is hard to fulfil

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**Introduction** Physiopathological modifications occurring in liver cirrhosis led to hepatic insufficiency, associated to a drugs metabolism alteration. Pharmacokinetics impairments are present at several areas (distribution, metabolism...), depending on the drug profile. Moreover, these impairments depend on the cirrhosis severity, which is known to be difficult to assess. The easiest and mostly used method is the Child-Pugh (CP) score, based on clinical and biological parameters.

We investigate how the therapeutic recommendations for hepatic impaired patients, if they exist, are considered by the physicians and which are its consequences.

**Materials & Methods** We reviewed the therapeutic recommendations in hepatic impaired patients from the French Summary of Product Characteristics (SPC) for the following drug classes: HIV antiviral, HCV antiviral, other anti-infective and psychotropic drugs. In order to assess how the physicians fulfilled the therapeutic recommendations in hepatic impaired patients, we conduct a retrospective study on hospitalized patients with cirrhosis due to chronic hepatitis C infection, from the Department of Infectious Diseases at the Hôpital Tenon (AP-HP, Paris, France). Prescriptions conformity was assessed for the specified drug classes, according to the therapeutic recommendations from the French SPC and the CP score, calculated for each patient.

**Results** 65 patients (including 42 co-infected with HIV) were included in the study, related to 712 lines of prescriptions. A third of the prescribed drugs in the co-infected group are HIV antiviral drugs. The second main drug class in this group, and the first in the mono-infected group, is represented by psychotropic drugs.

The studied drug classes represent 59% ( $n = 420$ ) of the prescribed drugs. Therapeutic recommendations in hepatic impaired patients are mentioned in the French SPC for 79% of them. The global rate of prescriptions conformity is 77%, and decreased according to cirrhosis severity (84% for CP A patients, 78% for CP B patients and 46% in CP C patients). This rate differs depending on the drug class and is particularly low for psychotropic drugs and for some HIV antiviral drugs.

**Discussion & Conclusion** A significant number of drugs have not been tested, and thus are contra-indicated, in hepatic impaired patients, mostly in CP C class, although certain drugs are widely used in these patients. Furthermore, therapeutic recommendations from the French SPC are unequally respected, especially for the HIV antiviral and psychotropic drugs, mainly because of the lack of therapeutic choice. These drugs can reveal serious adverse events in cirrhotic patients, for whom we must encourage the use of low hepatic metabolized drugs or fully tested drugs in this population.

**Keywords** cirrhosis, clinical pharmacy, hepatic insufficiency, Prescription evaluation

## MS-83

### A new computerized system for experimental products management in hospital pharmacy

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**Introduction** After an unsuccessful search for a commercial system that would accommodate our expectations in managing investigational medicinal products (IMP), we decided to develop our own system. The WEB technology used must interface with other pharmaceutical tools, and integrate with current hospital information systems, in order to enhance safety and efficiency. Here, we describe the approach we took.

**Materials & Methods** In association with 3 other partners (Besançon, Poitiers, and Rouen University Hospitals) we prepared a functional and technical specification document. This one described a computerized system to help hospital pharmacists in protocol management, regulatory requirements, IMP and medical devices dispensing, inventory, accountability, and billing. This system should also allow monitoring of easy-to-use quality and performance indicators.

We applied for a grant to cover the costs of the project. In June 2009, it was granted by CeNGEPS (Centre National de Gestion des Essais de Produits de Santé), and DHOS (Direction de l'Hospitalisation et de l'Organisation des Soins). This will allow us to develop a pharmaceutical tool, which will be linked to SIGREC (Système d'Information et de Gestion de la Recherche et des Essais Cliniques), an application for administrative management of clinical research. We issued a call for tenders in February 2010.

**Results** Two companies responded to the development of our project. We analyzed their proposals according to our set of predefined criteria

that we had detailed in the call for tenders. Then, we interviewed the two candidates in order to decide who was the most suitable company. We will present a table as "company #1" and "company #2" on the poster.

We chose the first one. We will use an iterative build-test-design process in the production of our system. As defined in our call for tenders, we planned for our system to be released in June 2011 (we will present reverse planning in a diagram on the poster).

**Discussion & Conclusion** This computer system, co-developed by pharmacists and computer engineers, will improve daily operations in IMP management, accountability and traceability. It will help to meet the stringent regulatory requirements for clinical trials. Our aim will be to offer this system for free to all pharmacies involved in experimental medications management.

**Keywords** Clinical trial, Computerized system, Hospital pharmacy, Investigational medicinal product

## MS-84

### Assessment of inpatient's personal drug treatments management

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**Introduction** The management of inpatient's personal drug treatment is not clearly defined (few available guidelines) and may cause medicamentous errors.

**Materials & Methods** We conducted a prospective observational study of patients' personal treatment management at their admission in an orthopaedic and traumatologic surgery ward. Patients were interrogated by a pharmacy student during one month, using two questionnaires (depending on whether the patient had brought or not his ambulatory treatment). A pharmacist resident questioned nurses and anaesthetists. Collecting forms, established from regulatory references, include questions about medical prescription, medicines management in the unit, preparation of medicines, administration and its validation.

**Results** 71 patients, four nurses and three anaesthetists were interrogated. 76% of patients have an ambulatory treatment. 35% of them have brought it at their admission to hospital. Concerning the medical prescription, the collect of informations about drugs taken by the patient before his admission is systematically performed. Nurses collect these informations from the patient, or his family, on their arrival. Doctors declare that they systematically revalue the personal treatment of patients. However, we noted a lack of traceability in the patient's file. Nurses declare to take away drugs from the patient most of the time, even if in a few cases, treatments can be left in the bedroom if a doctor writes the authorization on the prescription. However we observed that drugs are left in the patient's bedroom in 55% of cases. Practices of anesthetists may differ concerning the choice to let the patient manage his treatment or the way to give the agreement on the prescription. New prescribed medicines are never left in the patient's bedroom. Medicines taken away from patients are kept in nominative bags in the nursing office, but out of the medicine cabinet. 75% of nurses are not satisfied with this storage method.

A check of pill boxes is done by the nurse, before each administration. Nurses assert that they use patient's personal treatment for the preparation of medicines if drug isn't available at hospital.

Regarding the administration, nurses don't systematically check if the patient takes the drug he has in the bedroom. However, the validation of medicines administration is written down on the patient's file.

**Discussion & Conclusion** This work has allowed us to highlight several dysfunctions (incorrect traceability of the revaluation of personal treatment, no systematic authorization by doctors concerning

treatments left in the patient's bedroom, different practices between anaesthetists, a system of medicines storage not conform, no systematic check of personal drug intake...). This work has been made as part of an evaluation of the professional practices, in order to define the optimal organization and suggest improvements. It also raises the issue of the administration traceability responsibility in a surgery ward.

**Keywords** medicines management, personal drug treatment, surgery ward, traceability

## MS-85

### Effectiveness and toxicity of romiplostim in patients with idiopathic thrombocytopenic purpura

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**Introduction** Romiplostim was added for the last 9 months of hospital pharmacotherapy arsenal for the treatment of idiopathic thrombocytopenic purpura (ITP) after completing a clinical trial involving the hospital.

**Objective:** To evaluate the efficacy and toxicity of romiplostim in the treatment of ITP

**Materials & Methods** Retrospective observational study. Period: April 2009–June 2010. Inclusion criteria: 100% of patients with ITP treated with romiplostim. Data sources: medical records and computer application Document Management ®. Data collected: age, sex, diagnosis, previous treatments, splenectomy, dose, dose adjustments, number of doses received, and platelets before and after initiation of treatment and adverse events. Whereas effective when platelets were higher than 50000 platelets/L.

**Results** 8 patients (7 women and 1 man, mean age of 69.75 ± 16.96 years), diagnosed with ITP were treated with romiplostim. All received steroids as pre-treatment and 4 also received other treatments such as rituximab, azathioprine, cyclosporine, immunoglobulins, cyclophosphamide, genoxal, vincristine, without success. Only two patients were splenectomised before starting treatment with romiplostim. The initial dose was 1 mcg/kg once weekly in all patients. Dose adjustments were realized in all the patients less in 2. In three patients, 6 who required dose adjustments, only had to be increased to 2 mcg / kg and reaching optimum levels of platelets. Other two patients received doses of 3 mcg / kg and a patient is titrated up to 5 mcg / kg to over 50 000 platelets/L. The median dose was 37.5 romiplostim (4–60). The median platelet count before starting treatment was 20500 (7000–37000) platelets/L. The median platelet count following initiation of treatment was 78559 (39675–153500) platelets/L. 3 out of 8 patients achieved platelet counts > 50 000 platelets/L in the second dose of romiplostim, another 3 in the third dose, another in the fourth and last one of them caught up in becoming the fifth dose below the threshold of 50,000 platelets/L in dose 24. Increasing the dose of 1 mcg / kg again reached the threshold dose of 25. With regard adverse events were well tolerated in five of the eight patients. Of the three patients who had adverse effects one of them presented constipation, another high blood pressure and the last had a deep vein thrombosis and the treatment was suspended.

**Discussion & Conclusion** A significant percentage of patients with ITP, with failure in traditional treatments may benefit from using romiplostim which has a new mechanism of action and appears to be effective and safe.

Romiplostim is a newly marketed drug whose safety profile in phase IV is in development and due to the high percentage of patients switching the dosage and high cost, we believe it should be monitored of adverse events that occur during treatment

**Keywords** efficacy, idiopathic thrombocytopenic purpura, romiplostim, toxicity

## MS-88

### Abnormal neuroendocrine tumors imaging with indium 111-pentetreotide: implication of gastrointestinal duct and food regimen

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**Introduction** <sup>111</sup>In-Pentetreotide (InP) is the main radiopharmaceutical used in Somatostatin Receptors (SSR) imaging. Administered by i.v. route, it binds to these receptors and allows neuroendocrine tumours (NET) imaging and diagnosis. However, SSR scans require beforehand a Strict Low residues diet (SLR). If this diet is not respected, SSR scans often show abnormal radioactivity distribution, especially in bone marrow. Such distribution is known to be related to the uptake In-111, a degradation product of InP. We were therefore interested in exploring mechanisms that may induce these abnormalities and the influence of gastro-intestinal residues on the radiochemical behaviour of this tracer, cleared in digestive duct by gallbladder.

**Materials & Methods** Two simulations media were prepared according to USP: 1- Gastric Simulation Fluid (GSF; pH 1.2, pepsin enriched), 2- Intestinal Simulation Fluid (ISF, pH 6.8, pancreatin enriched). Fibrous residues (crushed wheat and meat) were added to these fluids to obtain 10% enriched GSF and ISF (respectively GSFF and ISFF). The previous 4 solutions were incubated were added 1: InP and incubated 3 h at 37°C. After centrifugation, supernatant fluids were analyzed by Thin Layer Chromatography (TLC-SG strips; Citrate Buffer 0.1M pH = 5) allowing to separate and to quantify InP and eventually its degradation product, soluble <sup>111</sup>In. The solid and liquid phases obtained by centrifugation were separately counted on a Perkin Elmer 1470 counter. GSFF and ISFF centrifugation pellets were finally re-suspended then re-analyzed as previously indicated.

Results were expressed as mean ± SD (n = 6–8, p < 0, 05). Statistical analysis were performed with SPSS 13.0 Software using mainly the one-way ANOVA test (p < 0,05).

**Results** In residues-free fluids, InP has degraded in gastric solution by releasing In-111 (98.7±0.8% of released In-111) while it remained stable in intestinal media (3.5±1.3% of In-111). Presence of residues did not modify these results (released In-111 was 92.1±1.3% and 1.5±1.2% respectively in GSF and ISF). The analysis of centrifugation fibers pellets showed that, in gastric media, fiber-fixed radioactivity is insignificant. However, we found that fibers incubated in intestinal media retain significant amounts of radioactivity, mainly constituted of intact InP.

**Discussion & Conclusion** Our study showed that when InP is cleared by gallbladder in intestinal lumen, it is not evacuated in faeces but still binds to intestinal residues and alters consequently imaging quality and interpretation, especially in case of NET intestinal tumours. In intestinal media, InP remains not metabolised. However, in gastric media, InP degrades, releasing unbound In-111, that may undergo enterohepatic recycling, bone marrow uptake and imaging abnormalities. These results enforce necessity for complying SLR diet.

**Keywords** Drug interactions, Endocrine tumors, Imaging, Octreotide, Pentetreotide, Somatostatin analogues, Somatostatin receptors



## MS-89

### Pharmacist's follow-up of maternal exposure. Retrospective study of maternal/neonatal outcomes

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**Introduction** Lack of vital clinical/medication data to guide decision making limits case reports value. To support clinical decision, procedures must use methodological evidence-based approach clinical questions. Aim: maternal/neonatal outcomes assessment of drug exposure followed-up by pharmacists and obstetricians.

**Materials & Methods** Pharmacist's follow-up of maternal drug exposure used evidence-based approach to support clinical decision, concerning maternal therapy, mother's disease monitoring and foetal risk assessment. Maternal/neonatal outcomes were assessed by retrospective study, by medical record review of 79 cases reported to Reproductive Medicine, since 2004, and for which collaboration of Medicines Information Centre was asked for counseling and follow-up.

**Results** Information provided to all clinical queries was considered reliable, accessible, complete, applicable and used to support decision. Information available on medical records on illness and treatment during pregnancy was often scarce or missing. Of the 79 cases, 70 were pregnant when they first came: 25 1st trimester (4–12 weeks) and 45 2nd trimester (13–24 weeks). Ages ranged from 15–42 years, with 13 being over 35. There were pregnant with several associated conditions: 25 with 2 diseases, 3 with 3 and 2 with 4. CNS diseases occurred more frequently: depression (21/70), anxiety (9/70) and epilepsy (4/70). Women with CNS disease were exposed to 33 CNS drugs, with higher exposure to diazepam (8), paroxetine (7), alprazolam (7), valproic acid (4) and trazodone (4), and to 22 other drug groups to treat associated diseases. Fifteen women were exposed to 1 drug and 24 to 5 or more, with a maximum of 19. Depression and anxiety was treated with monotherapy or with 2, 3, 4 or 6 CNS drugs combinations. To treat associated diseases 1 or 2 more drugs were added. There is the possibility of establishing a causal relationship in 5 cases where babies had abstinence syndrome and floppy child syndrome. The malformations that occurred in one baby (clubfoot and tetralogy of Fallot) and the deletion of the *SMN1* gene in another (originating a medical pregnancy termination) cannot be related to CNS drugs.

**Discussion & Conclusion** Only 35% of women came to us in first trimester. There were 5 cases in 21 of abstinence syndrome and floppy child syndrome, characteristic of exposure to benzodiazepines and antidepressants. Results support need for systematic collection of clinical/medication data throughout pregnancy. We created a structured formulary for collecting information oriented to medication, disease and clinical situation of the pregnant, the foetus and the newborn.

**Keywords** Clinical outcomes, foetal risk assessment, Hospital Pharmacy, Intervention, Implementation, Pharmaceutical Care, Pregnancy

## MS-91

### Evaluation of mydriatic agents use for diagnosis of retinopathy of prematurity

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**Introduction** Retinopathy of prematurity is an eye disease which affects 21% of prematurely born babies. Neonatal eye examination is indicated for high risk group for retinopathy of prematurity: Infants born with birth weight 1500 grams or less and/or gestational age of 32 weeks or less and/or high levels of oxygen.

Drugs used to dilate the pupil include parasympatholytic and sympathomimetic agents. The mydriatic agents commonly used for prematurely babies are phenylephrine, atropine and tropicamide. Combination of both drugs or single drug is commonly use.

Clinical pharmacists collaborate with physicians and ophthalmologists for drug evaluation.

Until 2010, atropine 0.3% was standard protocol for pupil dilatation in the neonatal intensive care unit.

Adverse drug reactions have been reported with atropine's use.

We aimed to evaluate the efficacy and tolerance of other mydriatic agents and we compared four groups.

**Materials & Methods** Retrospective review of 80 medical records between 2009 and August 2010 in Neonatal Intensive Care Unit (NICU) and Neonatal Medical Unit.

The primary outcome measure is the quality of fundus examination reported by the ophthalmologist for each patient.

In Group 1, patient received one drop of atropine 0.3% in each eye, 30 min before examination.

In Group 2, patient received one drop of tropicamide 0.5% in each eye, every 15 min four times, one hour before examination.

In Group 3, patient received one drop of tropicamide 0.5% in each eye, every 10 min six times, one hour before examination.

In Group 4, patient received one drop of tropicamide 0.5% in each eye, every 10 min six times, one hour before examination and one drop of phenylephrine 2.5% along with the last drop of tropicamide.

**Results** The quality of an intraocular examination depends on adequate pupil dilatation. Comparison of pupil dilatation will be done between the four groups. Results will be shown at congress.

**Discussion & Conclusion** The best association of mydriatic agents should provide rapid and wide pupil dilatation, without adverse drug reaction.

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**Keywords** Drug use, Mydriatics agents, Retinopathy of prematurity

## MS-92

### Evaluation of the professional practices for oral drugs administration: drafting of administration instructions

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**Introduction** An evaluation of the professional practices for oral drugs administration allowed targeting the more problematical points concerning this step in the drug circuit.

The work group explored possibilities of improvement which led to the drafting of instructions for oral drugs administration.

**Materials & Methods** Along the results of this study, dysfunctions have been noted: bad checking of the last prescription's date, no

systematic information of the patient and validation of the administration. The existing organization has been reviewed by the work group that proposed, for each dysfunction, one or more ways of improvement. These solutions can be implemented in a more or less short term.

**Results** From these possible improvements, general instructions for oral drugs administration were written, in order to structure and organize a methodology of administration in our establishment.

These rules state the essential steps before and upon administration, as well as at the time of validation. Five key words summarize them: identity, conformity, information, actuality and traceability.

The identity of the patient must be checked; soon photography will appear on the treatment sheet.

The conformity between treatments prescribed and prepared in the medication container is checked at the time of the administration; a table of description allows the registration of errors.

The patient is informed about his treatment, which allows a better adhesion to the project of care.

The exact treatment is actually given to the exact patient: the identification of the dose to administer is essential, the drug is pulled out of its blister in front of the patient, right before the administration.

The treatment is swallowed in the presence of nurse; in the contrary case, the reason is notified on the prescription writing software.

The validation of the administration on the software must be done very soon after the administration.

A request for additional computers was made to facilitate this traceability.

**Discussion & Conclusion** The improvements suggested are either a reminder of the existence of documents facilitating the administration, or fast and easily set up methods, or additional means. The drafting of these instructions is a first improvement of practices; these rules will evolve according to the material and human means of our establishment. A planning of distribution of the administrations was established according to the hours, the units of care and manpower.

The Commission for Medications and Sterile Medical Equipments validated the instructions of administration which were distributed to nurses and their assistants at a transmission meeting in each unit of care. This document is available on the Intranet and in the treatment binders in the units of care.

To highlight the benefit of these instructions, a second evaluation will be planned in one year, using the questions used for the first evaluation of the professional practices.

**Keywords** conformity, drug administration, identity, Information, traceability

## MS-93

### Medicine use review on long stay prescriptions: impact of pharmaceutical interventions

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**Introduction** Institute: Pharmacy unit of geriatric care centre, University Hospital of Nimes. Background and objectives: To measure, by means of performance indicators, the impact pharmaceutical interventions (PI) proposed to prescribers during medicine use review. Design: Pharmaceutical analysis of long stay prescriptions, exhaustive list of interventions and their acceptance over a period of 2 months. Setting: Three care units of a geriatric care center.

**Materials & Methods** The chosen performance indicators are the number of accepted or refused PI (with or without clinical

justification). Within the accepted PI, treatment withdrawals, treatment additions, modification of treatment to “as needed”; treatment substitutions, dosage adaptations and biological monitoring were accounted. In every case, the concerned therapeutic class was notified.

**Results** The study concerns 103 patients, whose average age is 81 years (62% of women), and average resident time is 2 years and 2 months. On 1038 lines of prescription analyzed, 311 PI were suggested to prescribers: 140 were accepted (45%) leading to prescription modifications; 96 refused with clinical justification (31%) and 75 refused without clinical justification (24%). On 311 PI, therapeutic classes concerned were: 24% vitamin D, 21% laxatives, 13% analgesics, 13% psychotropics, 5% anti-Alzheimer medication, 3% iron, 1% potassium, 21% other classes. Amongst 140 accepted PI, 35% were modifications of treatment to “as needed”; 26% treatment withdrawals; 12% biological monitoring; 10% dosage adaptations; 10% treatment additions; 3% treatment substitutions; 3% other fields.

**Discussion & Conclusion** Pharmaceutical interventions on long stay prescriptions has a significant impact: indeed, by including refused PI with a clinical justification, the rate of acceptance reaches 76%. The main modifications aim at decreasing the number of lines of prescription: in fact, in the elderly more particularly, polymedication is linked to iatrogenic effects. Moreover, this work joins with the Afssaps Recommendations [1] and encourages a real collaboration between pharmacists and prescribers.

### Bibliographic references

[1] Fiche de bon usage “Prévenir la iatrogénèse médicamenteuse chez le sujet âgé ». Afssaps, juin 2005.

**Keywords** long stay prescriptions, medicine use review, pharmaceutical interventions

## MS-94

### Quality assessment of pharmacy technicians' knowledge in order to intercept pharmacist errors in a centralized cytostatics preparation unit

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**Introduction** This study was carried out in an university hospital specialized in cancerology and in clinical research with 36000 anti-neoplastic preparations realized per year by trained pharmacy technicians. They received both initial and ongoing formation which should permit to intercept potential pharmaceutical errors, and/or prescribing errors not previously stopped by pharmacists. The aim of this study was to assess the quality of pharmacy technicians' theoretical knowledge in real situation and if experience brings other information not dispensed by formation.

**Materials & Methods** 11 pharmacy technicians were evaluated in normal activity, on a 2 weeks period, without any information.

Manufacturing sheets usually used to prepare chemotherapy drugs, were modified to present at least one pharmaceutical error.

20 errors were voluntarily created and transmitted to pharmacy technicians: 6 errors could have been potentially fatal for the patient, 8 serious, and 6 with limited clinical consequences. In these errors, 11 could have been intercepted because of the theoretical formation and 9 because of their experience. Information not bring by formation is considered given by experience.

**Results** 75% of errors (15/20) were intercepted by pharmacy technicians with an average of 10 min delay. 91% of errors (10/11) which

could have been intercepted because of the theoretical formation were stopped. The remaining error would not present any clinical consequences for the patient. 5 errors were intercepted because of experience, with one potentially fatal error (1930 mg of etoposide) and one serious (error on commercial docetaxel concentration: 20 mg/ml instead of 10 mg/ml). However 27% of intercepted errors (4/15) were stopped once the chemotherapy drug was prepared. 44% of errors (4/9) which could be intercepted because of experience were not stopped. One of these errors would have had limited consequences for patients, but another error could have been fatal (injection in intramuscular way of 20 mg of vinblastin in 50ml of NaCl 0.9%), and 2 could have been serious (1200 mg of 5-fluorouracile in 1000ml of dextrose 5% during 15 min, double preparation of 1048 mg of 5-fluorouracile for the same patient in 30 min of interval).

**Discussion & Conclusion** This study highlights how the knowledge transmitted by theoretical formation is well used and integrated by pharmacy technicians in real conditions. However it's not sufficient to allow interception of all pharmaceutical and prescription errors. Experience brings other information necessary to practice in the best conditions. This first study was well accepted by the pharmacy technicians as a quality indicator of the formation. Pharmacists' attention is required to prohibit the dispensation of an erroneous preparation.

**Keywords** Chemotherapy, Experience, pharmacy technicians, theoretical formation

## MS-95

### Analysis of intravenous drug incompatibilities in an intensive care unit in university hospital

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**Introduction** Drug incompatibilities are relatively common in inpatients and may result in morbidity or mortality and increase costs of the therapy. The aim was to identify the most frequent and relevant drug incompatibilities in critically ill patients and to develop the standard operating procedures (SOP) for intravenous drug administration.

**Materials & Methods** Retrospective analysis of 221 patients with multi-organ failure, intoxications and serious infections admitted to the intensive care unit (ICU) between January and June 2009 with at least 2 different intravenous drugs were performed. The most frequent brands of intravenous medications used in the intensive care unit of gerontology and metabolism department in a university hospital were identified. Based on the data, SOP were made and the training of physicians was initiated.

**Results** From 14074 drug pairs potentially given to the patients on ICU through one intravenous line, 2,62% of drug pairs were incompatible. Into the most frequent incompatible drugs pertain ciprofloxacin, midazolam, amino-acid infusion, insulin and furosemide. The newly developed SOP class these and other incompatible drugs with the group of drugs that should be separated from all other administered drugs. The use of an idle intravenous line was recommended for this group.

**Discussion & Conclusion** This project was intended to identify the most frequent drug incompatibilities and to develop the new SOP. In comparison to other studies made in this field, a lesser number of potential incompatibilities were observed in this study. The next prospective studies will be necessary to determine the real number of incompatibilities and the improvement after the developing new SOP

and training of physicians. The study was supported by grant No 53410/C/2010 Charles University Grant Agency.

**Keywords** drug administration, drug incompatibilities, ICU, medication errors

## MS-97

### Assessment of clinical practices: antibiotic strategy in the Landerneau Hospital

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**Introduction** The aims of this work are:

- to ensure that prescription of antibiotics and curative antibiotic treatment are in accordance with good practices,
- to assess the contribution of the pharmacist through the prescription's validation.

**Materials & Methods** In March 2009, a multidisciplinary group was created in our hospital.

A clinical audit was conducted in May 2009.

The audit grids used were based on H.A.S\* grids of April 2008, and also on S.P.I.L.F.\*\* grids: "adjustment of antibiotic treatment to 48-72h in public or private hospitals, 2008".

Some criteria were added in relation to the contribution of pharmaceutical act.

It was a retrospective study on 30 medical records of patients who received antibiotic treatment (15 in medicine department and 15 in surgery department).

Further to these audits, actions were implemented from June 2009 to April 2010, mainly the reassessment after 72 h by the clinician; this was achieved thanks to the addition of an insert on the sheet prescription and also thanks to the controlled dispensation of antibiotics in relation with the adjustment of the treatment.

The clinical audit was conducted again in May 2010.

Results were presented in June 2010.

**Results** Between the first and the second audit, the rate of reassessment's traceability after 72 h increased from 3 to 66% (93% in medicine department, and 36% in surgery department).

Otherwise, the second evaluation showed an improvement in 8 criteria on 9 in relation to good practices of antibiotic treatment (the average rates of right answers to criteria moved up from 60 to 80%).

Finally, in the first evaluation, in medicine department, the pharmaceutical validation of prescription allowed:

- To improve compliance with guidelines: the rate increased from 93% to 100%.
- To improve the rate of adjustment after 72 h: the rate rose from 62 to 80%.

The results of the second evaluation were right away in accordance with guidelines.

**Discussion & Conclusion** The adjustment after 72 h and its traceability have significantly increased.

The conformity of the curative antibiotherapy rose significantly. This shows that the traceability of the assessment after 72 h helped to improve the treatment's adjustment and, thus, the quality of antibiotic treatment.

Computerization, currently setting up, should resolve certain issues such as the signing of the prescription as well as the precision of the treatment duration.

## Bibliographic references

\*H.A.S: Haute Autorité de Santé

\*\*S.P.I.L.F: Société de Pathologie Infectieuse de Langue Française

**Keywords** antibiotic strategy, Assessment of clinical practices, clinical audit, controlled dispensation, reassessment after 72 h

## MS-98

### Optimisation of Palivizumab Prescription, use and patient follow- up in paediatric units

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**Introduction** Palivizumab is a humanized, mouse monoclonal antibody directed against the F protein of the RSV (respiratory syncytial virus). The French health authorities have approved its use in the prophylaxis of RSV induced bronchiolitis. At the initiative of the hospital pharmacy and in co-operation with the clinical units, several pharmacist interventions were implemented into the palivizumab drug circuit to optimise prescription, use and patient follow-up.

**Materials & Methods** From the 30<sup>th</sup> of November 2009 to the 31<sup>st</sup> of March 2010, a prefilled computerised prescription form was set up by the hospital pharmacy to optimise palivizumab prescription by reducing incorrect prescriptions, prescription errors and patient follow-up. Accepted uses of palivizumab were those defined by the French health authorities. To improve palivizumab usage, a global usage protocol was drawn up for the neonate and paediatric reanimation units. In collaboration with the clinical units, palivizumab administrations to patients were grouped for better use of the different vial dosages. Leftovers from one patient could then also be used for administration to another patient. The prescriptions were analysed, and checked for conformity, and patient administrations were pooled in collaboration with the paediatric units. The pharmacy decided on the appropriate vial dosage(s) to be used. The savings that resulted by vial optimisation usage and waste reduction were then assessed by comparing palivizumab cost with and without the pharmacists interventions. Improved patient follow-up was assessed by the number of patients concerned by demands made by the clinical units regarding the patients palivizumab status (existence or not and date of a previous palivizumab injection).

**Results** In 122 days, 65 prescriptions for 44 patients were analysed. 100% of the prescriptions were for approved indications. 81.5% (53) of administrations were regrouped into 23 sessions. 40 patients were concerned. The average number of administrations per session was 2.3. The total palivizumab cost saved was €7,426.56. Only 18.5% of administrations did not give rise to a grouped administration session, 4 patients were concerned. Patient follow-up was directly beneficial for 4 patients (the clinical units had no knowledge of previous administrations), and indirectly for 11 patients (incomplete knowledge of previous administrations: unknown date of injection)

**Discussion & Conclusion** Before the pharmacists' intervention, there was no global usage protocol. The actions undertaken with the paediatric units' approval and co-operation have shown that it was possible to optimise vial usage and to reduce wastage of an expensive drug whilst improving patient follow-up. These interventions are of importance to the clinical pharmacy community as they are a novel example of the pharmacist's important role in the drug circuit.

**Keywords** Paediatric medicine, palivizumab, pharmacist intervention

## MS-99

### Boric acid 3% (w/V) sterile solution for external use: therapeutic uses in France

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**Introduction** Many hospital pharmacists manufacture different topical drugs containing boric acid. Since the beginning of 2008, the Central pharmacy from Paris University Hospitals provides sterile solution of boric acid 3% (w/V) for external use for any hospital in France. The aim of this study was to evaluate the therapeutic uses, and the need for external boric acid solution in human medicine.

**Materials & Methods** A standardized questionnaire concerning the use and the opinion about this drug was sent (fax and mail; September-December 2008) to 11 hospital pharmacists (main users in 2008). Data of the filled questionnaires were analysed: therapeutic use(s), dosage, opinion about the therapeutic interest of this drug (is it essential to keep it on manufacturing)?

**Results** 6/11 hospitals (55%) sent their answers. Two uses were reported. The surgeons of 4/6 hospitals need boric acid for external use as treatment of deep wounds with loss of substance to promote cell multiplication. After washing the wounds with boric acid solution, bandages containing this solution were keeping in contact with the wounds during. 3/6 hospitals used boric acid solution as a topic treatment of skin injuries caused by *Pseudomonas aeruginosa*. Concerning these 2 uses, boric acid was administered 1 to 3 times a day, during a few days till several weeks. All practitioners wanted to keep on using this drug.

**Discussion & Conclusion** Considering the first use (promoting cell multiplication), the risk of systemic toxicity of boric acid must be considered because of a large contact between boric acid and damaged skin. This practice should be validated and cannot be recommended at this time. On the other hand, boric acid for external use is essential as a treatment for skin injuries caused by *P. aeruginosa* in order to limit the use of antibiotics (externally colimycin as well as intravenously) considering the risk of antibiotic resistance. Nevertheless, the use of boric acid must be controlled because of its severe toxicity in case of systemic penetration: vomiting, neurological disorders (delirium, myoclonic epilepsy, sleepiness), acute renal failure, metabolic acidosis were reported. The toxicity increases when chronic application on deep injuries and in elderly people lasts a long time on a large skin area: the risk is also higher and must be underlined.

As a result, we decided to keep on manufacturing this hospital compounding with a new label including special cautions. According to the dermatologists, this drug should be reserved for *P. aeruginosa* contaminated wounds. Our better knowledge of this antiseptic solution leads us to warn hospital pharmacists about the toxicity of this widely used external drug. Some recommendations about its use have been diffused in order to promote a safety prescription.

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**Keywords** antiseptic, Boric acid, hospital compounding, skin injuries



## MS-100

### 25% lidocaine ointment for diabetic foot pain: from formulation to systemic safety assessment.

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**Introduction** Vascular complications commonly develop in patients with diabetes mellitus. Foot problems can become serious because of impairment of the immune and vascular systems. Wound and ulcer treatment are usually difficult to treat and include debridement of the wound and special dressing. Moreover, this kind of wound can be so painful that topical analgesic treatment such as 5% lidocaine appears inefficient. Thus, the need for a powerful local analgesic is relevant. The aim of this work was to evaluate a 25% lidocaine ointment for diabetic foot pain relieve. Chemical, stability and systemic absorption of lidocaine were evaluated.

**Materials & Methods** Starch glycerite was used to prepare the 25% lidocaine chlorhydrate ointment. Stability studies were realized by an HPLC-UV method on a RP C8 column (Mobile phase was composed of potassium dihydrogenophosphate buffer and acetonitrile (75/25 v/v) and detection was performed at 205nm). For stability studies, three batches were prepared and samples were assayed each day between D0 and D14. The safety of treatment was assessed on 7 patients one hour after ointment application: blood samples were collected and analysed using an HPLC method with a liquid-liquid extraction procedure. Blood concentrations were compared to that described in literature.

**Results** The analytical method was validated according to ICH validation of analytical procedures. CV intraday and interday were less than 10%. In the ointment, lidocaine concentrations remained stable over 14 days at room temperature when stored in tubes. Lidocaine plasma concentrations in patients were low or undetectable when compared to plasma concentrations reported in literature (1).

**Discussion & Conclusion** This work shows that a 25% lidocaine ointment is chemically stable and can be safely used in wound treatment without any risk of cardiac toxicity. The efficiency of this formulation in pain release is currently been investigated. However, on the first 7 patients treated, it appears to be much more efficient in pain control than 5% lidocaine commercially available creams.

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**Keywords** diabetes mellitus, drug safety, Lidocaine, systemic absorption, toxicity

## MS-101

### Medication discrepancies at the emergency care department

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**Introduction** Earlier research at our institution revealed a high incidence of drug discrepancies (DD) at the intensive care unit. DD at the emergency care department (ED) were not yet investigated

although it is suggested that the highest frequency of preventable adverse drug events in hospitals occurs in the ED [Carter MK et al., 2006, *Am J Health-Syst Pharm*, Vol 63, 1353-61]. The objective of the study was to determine the number and type of DD for patients admitted to the “Urgent Care”- area of the ED.

**Materials & Methods** Observational, prospective cohort study conducted at the university hospital UZ Brussel/Vrije Universiteit Brussel. At ED admission, the medication history was documented by a pharmacist (structured interview) and was compared with the physician’s acquired medication history with focus on both acute and chronic drugs. When patients were transferred to another care unit, the prescribed drugs were evaluated with special focus on the chronic drugs.

**Results** The study group consisted of 86 patients of which 56 took chronic medication and 68 took acute medication; 38 patients took both acute and chronic medication. For the chronic medication group, the pharmacist found more chronic home medications per patient (median 4 range 0-15) than documented by the physician (median 3 range 0-13;  $p = 0.001$ ) and 98% of patients had DD with a median of 3 DD per patient (range 0–15). One or more DD were present with 72% of chronic drugs ( $n = 244$ ). The most common DD for chronic medication was not documenting the frequency of administration (43% of DD).

For the acute medication group the pharmacist (median 2 range 0–5) also found more home medications per patient than documented by the physician (median 1 range 0–5;  $p < 0.001$ ) and 81% of patients had DD with a median of 1 DD per patient (range 0–7). DD were present with 87% of acute drugs ( $n = 121$ ). For acute medication the most common DD was omission of an acute drug (49% of DD).

Of the 86 initial patients 29 were transferred to another care unit; 24 of them took chronic medication. Of the 24 patients 14 (58%) had one or more DD in their prescribed chronic medication. In total 35 DD were detected with a median of 1.5 DD per patient (range 0–4). DD were present with 27% of the chronic drugs ( $n = 129$ ). The most common DD was omission of chronic medication (74%).

**Discussion & Conclusion** The high number of DD emphasizes the importance of accurate and complete medication histories acquired by structural interviews at the time of ED admission. These medication histories should also include acute drugs because they, as well as chronic drugs might have triggered the ED visit. At the time of transfer to another care unit the prescribed medication should be reconciled with respect to the original home medication.

**Keywords** drug discrepancy, emergency department, hospital admission

## MS-103

### Drug prescribing potential errors and interactions: data from 7 Lebanese Hospitals

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**Introduction** Drug prescription is a difficult and risky task, and drug errors are made all over the world. Drug errors are quite possible in Lebanon, and health care professionals are aware of the potential advantages of clinical pharmacy. However, exact data about drug errors and interactions are lacking. Our objective was to describe drug errors and drug-drug interactions in medication orders given to patients admitted to Lebanese private and public hospitals.

**Materials & Methods** A prospective study was carried out: 313 patients taken from 7 teaching hospitals were evaluated; 1826 drug

orders were assessed and 456 drug-drug interactions were found. Drug errors and drug-drug interactions were evaluated. Data was entered and analyzed on SPSS, version 13.0.

**Results** Around 40% of drug orders were judged to comprise at least one drug error; the most common errors were no monitoring of parameters (20%), unnecessary therapy (9%), and non indicated drug (7%). Errors occurred mainly in the pediatrics department (50%), followed by the internal medicine ward (40%). Having an infectious or gastrointestinal problem almost doubled the risk of drug error, while having a cardiovascular, endocrinology or renal problem halved it. Antiulcer agents, NSAIDs, antibiotics and steroidal agents were the drugs mainly involved. 12 adverse events were reported, with an odds ratio of association to a drug error of 7.4 ( $p = 0.004$ ). As for drug-drug interaction (DDI), prescription could comprise zero to 29 interactions. Drugs with low margin of safety such as acenocoumarol, amiodarone and valproate could be involved. Pharmacodynamic interactions were mainly found (60%). The majority of DDI were of high clinical significance, with moderate (59%) to major (17%) severity. The majority (80%) of DDI were well documented.

**Discussion & Conclusion** International studies have shown that the clinical pharmacist collaboration with the physician could improve patients' outcomes and avoid deleterious impact of inadequate medication use. These results highlight the urgency of a clinical pharmacist intervention in Lebanon, to be able to decrease drug errors as well as to enhance the physician attention to DDI.

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**Keywords** drug error, clinical pharmacy, drug-drug interaction, adverse drug event

#### MS-104

##### Assessment of practices of surgery antibioprophyllaxis in Beirut Governmental Hospital

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**Introduction** The objective of this study was to evaluate changes in practices and recommendations applied to preoperative antibioprophyllaxis (ATBP) in all surgery performed at Beirut Governmental University Hospital and the incidence of surgical site infections (SSI) development.

**Materials & Methods** A 2 month prospective study was conducted from April until May 2010 on 410 patients with different types of surgical interventions. The conformity of practices has been considered against the five major criteria of the Agency for Accreditation and Evaluation in Health (ANAES), which are: prescribed ATBP or not, choice of antibiotic (ATB), dose and timing of first administration and duration of prophylaxis < 48 h). A data collection form concerning demographic patient data, health status, type of surgery and all ATBP parameters were completed.

**Results** Among 410 surgical interventions, 51.5% and 44.1% were clean and clean-contaminated respectively, and surgical ATBP was prescribed in 71% of patients. The overall compliance rate consistent with the five combined major criteria was 64%. The ATBP was

administered on time in 91% of patients and the dose of the first injection was appropriate in 96%. The choice of ATB and the duration of prophylaxis were appropriate in 62% and 97% respectively. The bivariate analysis showed a significant relationship of the prescription of ATBP with the type of prescriber ( $p = 0.006$ ) and the overall compliance rate ( $p = 0.0001$ ). The global SSI rate (3%) was statistically affected to the overall compliance rate ( $p = 0.01$ ) and the choice of ATB ( $p = 0.04$ ). The type of surgery was significantly related to the causes of non compliance such as prescription ATBP or not ( $p = 0.0001$ ), timing of administration ( $p = 0.039$ ), and the duration of prophylaxis ( $p = 0.0001$ ).

**Discussion & Conclusion** SSI remain a challenging problem and monitoring in surgical ATBP treatment must be improved by a long term prospective follow up studies to highlight specific risk factors. Clinical pharmacists should collaborate with physicians to improve practices in surgical ATBP.

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**Keywords** Antibiotics, Surgical antibioprophyllaxis, Surgical site infection

#### MS-105

##### Cysteamine eyedrops: optimisation of the manufacturing process and meeting safety and efficacy criteria for continuous supply

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**Introduction** Cystinosis is a lysosomal storage disease characterized by accumulation of cystine in various tissues especially in the cornea, causing photophobia and loss of visual acuity in cystinosis patients. The oral administration of cysteamine (Cystagon®) is not effective on the cornea due to its very poor vascularisation.

The Pharmaceutical Establishment of the Paris Hospital group developed 15 years ago an eyedrop formulation containing 0.1% of cysteamine to be active locally in dissolving the cystine crystals or preventing their formation. This hospital compounding is considered as an essential drug in cystinosis treatment. It was developed as a sterile freeze dried presentation, to be used for 7 days after reconstitution.

To maintain sterility of the reconstituted solution over the week benzalkonium chloride (BZC), available either as powder or concentrated solution, has been added as preservative. During production, BZC is difficult to handle, due to a limited solubility in the dextran based formulation.

The aim of this work was to elucidate the limiting factors for the correct solubilisation of BZC so as to develop a reliable and consistent production process essential for patients.

**Materials & Methods** The manufacturing process has been scaled down and various options for solubilisation and introduction of the BZC in the final eye drop formulation have been investigated at lab scale.

Clearness of the final solution, and BZC amount (assayed by the HPLC method, described in the EP monograph) have been used as

criteria to monitor BZC dissolution at the various stages of the manufacturing process.

Finally, the BZC antimicrobial preservation activity has been tested according to the challenge test of the EP method (*E. coli* and *P. aeruginosa* as challenge strains) to assess the robustness of the process as well as the preservative activity after reconstitution.

**Results** It has been shown that the best results were obtained when BZC is prior dissolved or diluted (depending on the form of BZC used) in a small volume of water for injection, before being mixed in the dextran solution.

This prior step of dissolution/dilution of BZC allowed to get a final eye drop solution with the correct content of BZC (98% recovery and a positive antimicrobial activity (4 log reduction within 6 h for the two strains).

**Discussion & Conclusion** In the context of a rare disease, it is important to provide patients with safe and efficacious drugs, very frequently developed at the level of the hospital pharmacy.

For cysteamine eye drops, specifically developed to cover this unmet medical need, technical production issues have led to some risk of shortage. It was thus important to make all efforts to optimise the production process and reduce the risk of shortage for the patients who are in great need of this medicinal product.

**Keywords** cysteamine, cystinosis, eyedrop, orphan drug, rare disease

## MS-106

### Selective decontamination of the digestive tract: manufacturing of colimycin-gentamicin capsules

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**Introduction** The pharmaceutical establishment of Paris Hospital group (EP HP) has been manufacturing for many years capsules of colimycin-tobramycin (adult: 52.6 mg/100 mg, and child: 26.3 mg/50 mg) for the selective decontamination of the digestive tract, making them available as an “hospital preparation” to the hospitals and clinics on the French territory. Feed back from the pediatric hospitals revealed that capsules are opened and the content dissolved in beverages or mixed with food, in order to ease oral administration in children.

In 2007 the French medicine agency (Afssaps) issued recommendations for using gentamicin in the combination instead of tobramycin.

The aim of this study was to develop a new formulation of capsule containing colimycin (C) and gentamicin (G) the most adapted to children and to determine the optimal strengths to cover both adult and pediatric needs.

**Materials & Methods** For setting the right combination and dosage strengths, opinion from Afssaps and AHP anti-infectious experts were sought.

Various excipients have been tested to formulate the final powder taking into account both the filling machine (alternating compressor/doser system) and the need for the capsule content to be dispersible for the pediatric presentation.

**Results** Based on the recommendations from the experts, the following combinations have been adopted: pediatric formulation with 40 mg/50 mg and adult with 200 mg/100 mg (C-G respectively). Microcrystalline cellulose and pregelatinised starch have been selected as they gave rise to a reasonably dispersible formulation and a powder satisfactorily processed by the filling machine. Batch release

results were satisfactory in terms of mass uniformity and uniformity of content.

**Discussion & Conclusion** In order to be in accordance with the Afssaps recommendations, the EP HP has determined 2 dosage strengths of C-G combination the most adapted to the selective decontamination of the digestive tract in children and adults. It has realised the pharmaceutical development of a new form with a higher quality in term of dispersion. The analytical controls are satisfactory. The capsules could be opened and the content easily mixed with beverages or food. This new preparation is able to promote an efficient treatment and to improve the quality of life and child compliance. It will be available for French hospitals and clinics in September 2010.

Another pharmaceutical form (a rapidly disintegrating tablet) is currently studying.

**Keywords** Drug-related problems, Drug use

## MS-107

### Study on Pandemrix pharmacovigilance at CHU St. Pierre

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**Introduction** The WHO declared a new influenza pandemic situation on 11.06.2009. Three vaccines (Celvapan<sup>®</sup>, Focetria<sup>®</sup> and Pandemrix<sup>®</sup>) were authorised by the EMEA. This pharmacovigilance (PV) study aimed to establish the safety of Pandemrix (P), an inactivated whole-virion vaccine against the A/California/07/2009 H1N1-like strain.

**Materials & Methods** This is a prospective and descriptive PV study about P approved as AK/09–10–66/3825 by St-Pierre’s local Ethical Committee. The vaccine contains haemagglutinin (3.75 µg), thiomersal (5 µg) and AS03 as adjuvant and it was prepared at the hospital’s pharmacy.

The study period was set from October 2009 to January 2010, involving St Pierre hospital’s employees (3202), all healthy adults. 926 subjects got vaccinated: 421 were under 40, 437 between 40–60 and 68 older than 60. Women accounted for 66.8% of the group.

62.3% had been vaccinated with a seasonal vaccine before (Influvac<sup>®</sup>).

Everyone received a questionnaire (Q) containing some of the most common expected adverse drug reactions (ADRs) when they got vaccinated. We focused on 3 local reactions (LR): injection-site pain, redness and swelling; and on 3 general ones (GR): temperature, respiratory disorders and myalgia.

Subjects were asked to fill in the Q after 3 days for the LR and 15 days for the GR. As it is known that 10 days is time enough to let these ADRs appear, replies were considered to be valid if answered after 3 days for the local ones and 10 days for the general ones.

We received 574 Q, 540 of them were well answered for the LR and 467 for the GR.

The two groups of reactions were treated separately in order to analyse the greatest number of them.

**Results** Based on the Q, we found that P caused much more LR than GR.

The most frequently reported ADR was injection-site pain (91.1%), followed by swelling (43.7%), redness (31.1%) and myalgia (29.4%). Respiratory disorders and high temperature were less reported (4.3% and 10.1% respectively).

Women experienced more and more severe ADRs than men. Swelling and redness were twice as much in women (38.8%, 53.6%) than in men (20.5%, 29.8%). ( $p < 0.05$ )

People over 60 showed a downwards tendency to suffer secondary effects, although there was no significant difference.

**Discussion & Conclusion** The EMEA Summary of Pandemrix characteristics (SPC) includes LR, myalgia and temperature as very common effects ( $\geq 1/10$ ). However, by our results, temperature is a common effect ( $\geq 1/100$ ). Respiratory disorders are not considered in the SPC.

The higher number of LR probably caused by P might be due to the adjuvant.

Neither sex nor age are mentioned on the SPC. Our results show that men tolerated P better than women and that people over 60 had less ADRs than the rest.

Although we assume that Pandemrix can be safely administrated, even for those who had already got vaccinated with Influvac, it is important to emphasise that there is a high probability of suffering LR after vaccination.

**Keywords** Pandemrix, Pharmacovigilance, Vaccine A/H1N1

## MS-112

### Pharmaco-therapeutic analysis: initial inventory

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**Introduction** Starting May 2008, a multidisciplinary team is responsible to set up computerized medical prescriptions and medical records using the *Crossway*® (Mac Kesson) software in our hospital. The complete medication orders become available to the pharmacist who carries out a centralized pharmaco-therapeutic analysis. The aim of this study is to evaluate qualitatively and quantitatively our pharmaco-therapeutic analysis activity.

**Materials & Methods** Pharmaceutical prescriptions were analysed by 3 pharmacists every day by looking at biology tests results and clinical data. This study covers four months in early 2010. All clinical pharmacy interventions made in four care units (cardiology, neurology, nephrology and geriatric; totalising 108 beds) are counted, and compared to the total number of medical prescriptions. Drugs and situations most frequently associated with drug-related problems are identified. Clinical pharmacy interventions are then ranked according to the criteria established by the French Society of Clinical Pharmacy (SFPC): addition, discontinuation, switch, choice of administration route, drug monitoring, optimization of administration modality, and dose adjustments [1]. Acceptance rate is evaluated based on changes in prescriptions following the interventions.

**Results** The proportion of prescriptions analyzed generating a clinical pharmacy intervention is 2,1% (191/ 9180). Of the 191 clinical pharmacy interventions, 26,7% related to antithrombotic drugs, 16,7% related to digestive and metabolic drugs, 14,1% related to antibiotics, and 12,6% related to cardiovascular drugs. The most commonly identified drug-related problems were supratherapeutic dose (27,7%), followed by nonconformity to guidelines or contraindication (21,5%) and infratherapeutic dose (15,2%). Clinical pharmacy interventions concerned primarily dose adjustments (38,2%). Thirty-five interventions (18,3%) were drug switch. Thirty interventions (15,7%) corresponded to proposals for drug discontinuation. Twenty-three interventions (12,0%) suggested the addition of a new drug, nineteen (9,9%) improved drug monitoring, and eleven (5,8%) an optimization of the administration modality. Acceptance rate is 85,3%.

**Discussion & Conclusion** This study is an initial inventory of the pharmaco-therapeutic analysis activity in our hospital. The intervention rate is low, which is probably due to a lack of completeness of the interventions reports. However, the acceptance rate of 85,3% is high. A multicenter French study found 4,66 clinical pharmacy interventions per 100 medications orders in 2008, with an acceptance rate of

73,4% [2]. Our acceptance rate is higher because the pharmacist personally meets the physician to discuss each particular case. This study suggests that a few types of drugs and errors constitute a substantial proportion of clinical pharmacy interventions. Knowledge of the most frequent drug-related problems could increase the efficiency of clinical pharmacy intervention.

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**Keywords** clinical pharmacy intervention, Drug-related problems, initial inventory

## MS-113

### Good use of anti-infectious medication in a general hospital. Example of anti-pseudomonas sp

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**Introduction** Since it has been created in 2002, the anti infectious commission of Annonay Hospital took different initiatives to promote the good use of antibiotics: elaboration of an Antibiotic Guide, daily follow-up of each prescription by the pharmacists, nominative drug dispensation. Since 2004, this commission has made a yearly prospective study to evaluate prescriptions conformity according to the recommendations. In 2009 the study was focused on all targeted anti-*Pseudomonas sp* antibiotic prescriptions.

**Materials & Methods** The study started on Jan. 1, 2009: a multi professional group analyzed all «anti *Pseudomonas sp* » complete prescriptions (ticarcillin, piperacillin + tazobactam, ceftazidime, imipenem, ciprofloxacin, amikacin, fosfomycin) for which treatment was over. The aim was to collect retrospectively an amount of 30 prescriptions and to check with the patient file if the prescription characteristic fit with a list of criteria previously established by the commission. Intentionally, no major pharmacological intervention during the patient treatment was realized. Then according to previous defined criteria, the prescriptions were classified in 2 groups, as “Conform” (=C) or “Non Conform” (=NC). For the NC, gravity criteria for nonconformity were mentioned (severe NC or non severe NC) and consequences for the patients, bacterial ecology and health economy were also analyzed.

**Results** In order to obtain the desired number of prescriptions, the study prolonged till Apr. 2, 2009. In that way, from 262 prescriptions analyzed during this period, 30 prescriptions (27 patients) were included in the study and 8 of them were classified NC (26,6%). Regarding these 8 NC prescriptions, 2 were severe NC (6,6%): a non adapted dose prescription (Imipenem 3g/day for a 88 years old kidney deficient patient) and a prolonged prescription (Amikacin, aleatory chosen, and administrated during 3 weeks for a cutaneous infection). The other 6 non severe NC prescriptions (20%) included an absence of de-escalation (5 cases) and a non justified antibiotic prescription (1 case).

**Discussion & Conclusion** In Annonay Hospital, the utilization of targeted anti-*Pseudomonas sp* antibiotics looks well controlled from a quantitative point of view; this can be due to the many years of sustained politics of the anti infectious commission. In opposition, from a qualitative point of view, this study points out the difficulties to obtain a complete control of professional practice. The study results were presented in the Hospital Drug's committee. More targeted recommendations were elaborated for the prescribers. Even



more, individual formations were given to the newly hospital prescribers. Good use of anti-infectious medication remains an important issue in Annonay Hospital.

**Keywords** Antibiotic management, anti-pseudomonas sp

## MS-114

### Pharmaceutical analysis of prescriptions: is there a reproductibility between pharmacists?

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**Introduction** The local hospital of Is sur Tille can admit 115 patients, of which 20 are sanitary beds. All medical prescriptions are stored on a database. The acting hospital pharmacist analyses and validates prescriptions in order to ensure safe delivery of the medicine. This activity is the basis of clinical pharmacy. In order to guarantee the non-interruption of this service, the absence of a pharmacist is offset by a replacement pharmacist who is equally capable of validating prescriptions according to the procedure of analysis inspired by Professor Calop<sup>1</sup>. The objective of this work is to study how the analysis of prescriptions is reproduced by different pharmacists.

**Materials & Methods** Over the period of the last three months and using prescriptions validated by the pharmacist P1, one third of the prescriptions drawn by lot were analysed again by the replacement pharmacist (P2). In order to evaluate the similarity of the prescription analysis of P2 versus P1, the criteria used are the pharmaceutical interventions (PI), the type of PI according to the classification of the SFPC and the medication classes concerned. Each criterion is analysed individually according to the  $\chi^2$  test.

**Results** During 3 months, P1 analysed 1416 medical prescriptions. The study was carried out on a sample of 472 prescriptions. The results of the analysis comparing the prescriptions of P2 versus P1 are: PI (P1 5.93% P2 4.87%). The PI concerning the posological adaptations (P1 53.57% P2 47.82%), the optimization of administration methods (P1 14.30% P2 17.39%), the substitutions (P1 7.14% P2 13.05%) and stops (P1 25% P2 21.74%) following contraindicated medical interactions. The medicines used include those for the central nervous system (P1 35.71% P2 30.43%), cardio-vascular (P1 39.30% P2 34.78%) and anti-infection (P1 14.30% P2 17.39%). For the type of PI, the value of  $\chi^2$  is 0.67 (ddl = 3, risk of 5%) and theoretical  $\chi^2$  7.81.  $\chi^2$  related to the therapeutic classes is 0.19 (ddl = 2, risk of 5%) and theoretical  $\chi^2$  5.99.

**Discussion & Conclusion** The outlined differences reveal a tendency towards homogeneity of the PIs translating the absence of ability to reproduce the analysis of prescriptions between P1 and P2, despite the application of a procedure. This analysis of prescriptions relies on knowledge of the prescribability habits and of the individual exercise of the pharmaceutical profession. The  $\chi^2$  test (calculated  $\chi^2$  < theoretical  $\chi^2$ ) lets us forebode that the division of PI is independent of pharmacist. P1 and P2 are not different in their pharmaceutical analysis despite the ambiguity of the final pharmaceutical judgement. This conflict in analysis of prescriptions having not been significant statistically, it seems necessary to measure its clinical impact on the service provided to the patients. Then, we will compare this data to hospitals activity similar in order to share the experience and to find a common methodological tool for the analysis of prescriptions.

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**Keywords** Pharmaceutical analysis, Pharmaceutical interventions, Reproducibility, Service provided to the patients

## MS-115

### Medication reconciliation: the need in the therapeutic management of patients

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**Introduction** The proliferation of actors in public health and the availability of an increasing number of new medicines is a challenge for the medicinal treatment of a patient throughout their care pathway. The main anomalies in the therapeutic management of patients are at the interface between the city hospital of his career, at the entrance and exit. The technique of “medication reconciliation” identifies and corrects these abnormalities. Thus, the hospital pharmacist (HP) of the Local Hospital Is sur Tille has studied the feasibility reconciliation treatments at the entrance and exit to the patient.

**Materials & Methods** The experiment took place during three months, all patients hospitalized in health sector. To compare the treatment before admission with the requirement for admission, HP was conducting a medication history input by interviewing the patient, using a questionnaire derived from the Hospital Fribourg. More, HP collected the information from therapeutic institutions of origin city or city doctors. At the exit, HP compared the admission treatment with the exit order. Discrepancies and drug therapy information's were provided to liberal doctors and pharmacists.

**Results** During the test period, 28 patients received medication reconciliation at the entrance and 20 at the exit. The population was hospitalized 21.1 days on average. The average duration of reconciliation is 43 min at the entrance and 28 min at the exit. The time between drug intake to the input and reconciliation is greater than 24h. The most contributive information proceed from medical records of the home institution (74.5%), the pharmacist (1.9%) and the patient (23.6%). Unintentional discrepancies were detected at admission (35%) and output (6%), they relate to omissions (75%) or dose modifications (25%).

**Discussion & Conclusion** The test of the questionnaire on patients highlights their lack of knowledge about their treatment and the great work of patient education to hospital. The literature<sup>1</sup> confirms the influence of hospitalization on drug therapy with unintended differences detected at admission and at the exit in 50% of patients. This shows the impact of medication reconciliation on securing the therapeutic management of the patient. 71.4% of patients were seen at the exit and received a pharmaceutical consulting with a management plan. All have found that the interview with a HP was a “good idea” and can improve the medication observance. Medication reconciliation is an essential practice of clinical pharmacy for hospital pharmacists and improves information sharing city-hospital. Thus, the pharmacist has plan to develop this activity to all patients.

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**Keywords** Pharmaceutical advice, Information sharing city-hospital, Medication history, Reconciliation medication

## MS-116

### Using pharmaceutical technicians to support the clinical pharmacist in Belgian hospitals

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**Introduction** The recent widespread of clinical pharmacy (CP) practice in Belgium is motivated by national health budget compression and the resulting urge for optimizing drug therapy, especially in the hospital setting. But the dramatic shortage of hospital pharmacists is slowing this development. Douchamps (2002) proposed a model where the clinical pharmacist would be the leader of a clinical support team (CST) composed of specially trained pharmaceutical technicians (PTs). Their mission would have been to detect on a broad scale any obvious inconsistency in inpatients' drug treatments and then to immediately refer it to their leader for effective cure.

**Materials & Methods** Between 2005 and 2007, 5 PTs (mean age  $\pm$  SD: 25  $\pm$  3) were recruited for specializing in CP. Each was thoroughly trained during a 2-year cursus encompassing: 1) knowledge of brand names and international non-proprietary names, 2) drug pharmacokinetics and pharmacodynamics, and 3) knowledge of the multiple steps of drug processing within our medication use system. Each was present in 2 wards for 30 min., in both the morning and the afternoon. Their main tasks were: 1) to collect and review drug prescriptions in order to propose drugs substitution to the medical doctors for conforming them to the drug formulary, and 2) to give logistical advices and pharmaco-therapeutic information to the nurses. Their interventions were analyzed at specific intervals during a 2-year period (from January 2008 to April 2010).

**Results** Among the 584 interventions recorded for analysis, 54% were related to drug prescribing, including dosage regimen correction (10%), drug substitution (24%) and medication error tracking. The remaining 46% were linked to logistical problems, related to drug ward-stock management including drug conservation checking and drug inventories (26%), as well as information and support to traditional medication distribution (20%). Monthly meetings between pharmacy and nursing personnel confirmed the high degrees of satisfaction and confidence of the latter in the CST as well as a tremendous improvement in communication.

**Discussion & Conclusion** In line with the initial request of nursing personnel for a more interactive interface with pharmacy, the CST is now actively involved in the computerized prescription order entry implementation, especially in physicians' and nurses' training. Although unique in the French-speaking part of Belgium, the CST approach also echoes the positive results previously achieved in Canada (Mabasa et al, 2008), UK (Telford and Soma, 2005) and US (Phillips, 2001). In conclusion, although it remains to be quantified through in-depth cost/effectiveness studies, within the next few years the CST model might prove to be one of the most valuable and promising answers to a cost-effective and sustainable clinical pharmacy practice in Belgium.

**Keywords** clinical pharmacy, clinical support, pharmaceutical technicians, team

## MS-117

### Medication safety and culture safety in pediatrics: an original approach involving Pharmacists and Nurses

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**Introduction** In the field of medication safety, the likelihood of medication errors is even greater in pediatrics units than in adult care unit because of specific characteristics: drug packaging unsuited leading to additional manipulation, vulnerable population related on age and not communicating, not standardized dosages. The patient safety has to be settled on a multidisciplinary approach involving pharmacists.

**Materials & Methods** Since January 2009, a cross-cutting approach has been implemented involving pharmacists and pediatrics nurses and including: Staff Quality, Risks, Professional practices, Feedbacks (CREX), Audits, Systemic analysis of medication errors (REMEDI).

**Results** An inventory was initially made and recommendations of good practices have been developed especially on dilutions, reconstitution of injectable drugs and "magistral preparations". Serious incidents were systemically analyzed with the REMEDI method and corrective actions have been implemented. The prescription supports have been improved in the aim to minimize transcripts. The booklet dedicated to pediatrics medicine has been updated. A crossover audit (71 criteria) has focused on all stages of medication, in terms of organization and professional practices. Positives points are identified: single and specific prescription (87%), patient identity (100%), weight (96%), prescriber's name and date (>80%). Points remaining to improve are: information on flow rate of infusion, dilution methods (30%), height or body surface areas (26%), a copy of the prescription in the output file (48%).

Items to be improved have been identified and our approach should lead to improve these points. The whole process has been validated by the Institution as Professional Practice Review under the criteria of the High Authority of Health

**Discussion & Conclusion** This cross-cutting approach involving pharmacists and nurses has led to high motivation of the 2 teams and fast practical results. All contribute to a secure system for pediatrics and at the development of a common patient safety culture Prescribers must be sensitive at this new approach.

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**Keywords** Medication error, Medication safety, Pediatrics, Risk

## MS-118

### Stability and compatibility of paracetamol and ketoprofen in a fail-safe iv administration set

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**Introduction** Intravenous infusion takes an important place in the current therapy in hospitals and pharmaceutical firms keep improving their infusion medical devices. B.Braun Medical has recently developed an iv administration set with an automatic infusion stop. It avoids nurses regularly check the end of the infusion and changing the medical device at each new drug infusion. But it's important to study the stability of the infused drugs, which stay in stasis for several hours in the dropper chamber and in the tube. We focus our study on two frequently used drugs in hospital practices: paracetamol and ketoprofen

**Materials & Methods** Paracetamol 10 mg/mL (Perfalgan) and ketoprofen 1 mg/mL (Profenid) are infused prepared and perfused individually and successively with the iv administration set Intrafix Safeset under ambient light and temperature. During individual infusions, samples were collected at the beginning of the infusion, at the end and after 24 h stasis of the drug in the medical device. During successive infusions, samples of the second infused solution were collected at the beginning of the infusion, every 5 min during the

infusion and after 24 h of stasis. Controls solutions of each drugs were prepared. Each sample was monitored by a visual inspection, pH and osmolality assessment and chromatographic analysis of each drug with a validated stability-indicating method.

**Results** The solutions remained clear and colourless after visual inspection, without formation of any particles in both type of infusion. No variation of pH and osmolality was reported throughout the study for each drug. Variations of paracetamol concentrations remained under a 10% threshold when infused individually or after ketoprofen. Ketoprofen concentrations remained stable during the time of each infusion but not after 24 h of stasis in the iv administration set. At 24 h we showed a loss of 11.5% of ketoprofen without apparition of degradation products. However, there was no variation of ketoprofen concentration in control solutions and the pH, osmolality and visual inspection were stable. So we assume that there is an interaction between ketoprofen and the PVC of the infusion tube. But in this case, this interaction has no consequence in clinical practice: the patients received the total prescribed dose and there is no apparition of degradation products so no toxic risk for patients during the stasis of the drug in the infusion tube

**Discussion & Conclusion** Repeated individual perfusions of paracetamol (Perfalgan) 10 mg/mL or ketoprofen (Profenid) 1 mg/mL are possible with the iv administration set Intrafix Safeset, leaving them in position until 24 h, because of the stability of these drugs. There is also no problem to infuse successively paracetamol and ketoprofen through this medical device: no drug instability or incompatibility appears during the 24 h of stasis and patients can be safely cared

**Keywords** Nursing care; Drug use; Drug stability; Drugs compatibilities

## MS-119

### Stability of a parenteral admixture for epidural analgesia in labour

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**Introduction** The addition of clonidine to epidural levobupivacaine and sufentanil for patient-controlled epidural analgesia in labour seems to improve analgesia, reduce the supplementation rate and reduce pruritus without improvement in maternal satisfaction<sup>(1)</sup>. Clonidine, levobupivacaine and sufentanil are mixed in the same infusion bag. But there is no publication to prove the stability of the admixture during the infusion. The aim of our study was to validate the compatibility and stability of the three drugs in this admixture.

**Materials & Methods** The epidural analgesia admixture was prepared by adding 10 ml of sufentanil 250 µg/5ml, 2 ml of clonidine 0.15 mg/ml in 100 ml bag containing 0.625 mg/ml of levobupivacaine. Admixture compatibility and stability were monitored over 24 h at 25°C with 60% residual humidity and at 33°C, in light conditions. Three batches of the admixture were prepared in each condition and two samples were made at each time: t0, immediately after the admixture preparation, and after 1, 2 and 24 h of storage. Each sample was monitored by a visual inspection, pH and osmolality assessment and chromatographic analysis of each drug with a validated stability-indicating method.

**Results** There was no visual alteration of analgesic admixtures over the 24 h of the study. The solutions were clear and colourless without formation of particles. The pH and the osmolality of each solution

remained unchanged throughout the study and were compatible with parenteral administration (Mean value of pH: 4.3; Mean value of osmolality: 305 mOsm/kg). No variation in concentrations of the three drugs over 10% (with a 95% confidence interval) was observed during 24 h. No degradation products were detected by chromatographic analysis during the experiment.

**Discussion & Conclusion** Based on the presented results, ad mixture of levobupivacaine, clonidine and sufentanil remains stable. Under clinical conditions and can be used to give efficient and safer pre-treatment in epidural patient-control analgesia.

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**Keywords** drug administration, drug stability

## MS-120

### Analysis of Belgian projects related to seamless care

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**Introduction** Seamless care is the desirable continuity of care delivered to a patient in the health care system across the spectrum of caregivers and environments. Despite the desirability of such continuity, patients often experience drug-related problems as a result of discontinuity of care.

The objectives of this study were to summarize Belgian data on drug related problems related to discontinuity of care, as well as initiatives to improve continuity of care focusing on medications.

**Materials & Methods** A combination of three approaches was used: (1) indexed literature search; (2) hand search of specific Belgian medical and pharmaceutical journals and abstract books of national conferences; (3) grey literature search through a questionnaire survey sent to “experts” in the field.

**Results** A high number of recently started heterogeneous projects, mostly initiated in the hospital setting, were inventoried. Many interventions focus on admission, and involve medication history taking by a clinical pharmacist. Patient counselling at discharge, either by a nurse or a clinical pharmacist, is part of many other projects.

For most studies, a positive impact was reported on one or more process measures. The impact on clinical outcomes was evaluated in a few cases only, and could not be demonstrated. Overall, the quality of the evidence is rather low.

Although many studies investigated the frequency and nature of drug related problems on admission as well as discharge, data on the causes of these problems were not identified as such and can only be extrapolated from the studies. Determining factors seem to be the lack of standardization and the involvement of many health care professionals, without clear definition of responsibilities.

**Discussion & Conclusion** Since recently, a variety of types of interventions related to seamless care has been developed. Most interventions were set up in the hospital setting, with an important proportion of initiatives taken by clinical pharmacists.

**Keywords** medication management, seamless care

## MS-121

### Assessment of level and quality of information given by sponsors during pharmaceutical clinical trials initiation visits

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**Introduction** The study was carried out in a university hospital specialized in cancerology and clinical research (more than 300 clinical trials).

In our hospital, a specific pharmaceutical visit is undertaken before the beginning of the clinical trial. The aim of this organization is to get back as many as possible information and to manage correctly the clinical trial. Most of the sponsors don't know very well pharmaceutical tasks and the hospital pharmacist have to check several points with sponsors.

However sponsors knowledge may be deficiency about pharmaceutical tasks, leading the hospital pharmacist to check several points.

The objective of this study was to assess the level and the quality of information given by sponsors to the hospital pharmacists during the pharmaceutical visit and to suggest solutions in order to improve communication.

**Materials & Methods** Elaboration of a checklist to collect answers of sponsors to pharmacists questions.

Assessment of the quality of these answers.

Results are classified in 9 groups: clinical trial description, experimental and associated drugs, treatment description, supplying, storage, prescription, dispensation, treatment preparation and treatment administration. Each group is divided in several items (93 items for the 9 groups).

**Results** During 17 months (from November 2008 to April 2010), 83 pharmaceutical initiation visits were assessed. Information known by sponsors were treatment description (95%), experimental and associated drugs (95%), clinical trial description (94%), storage (93%), prescription (89%), dispensation (89%), treatment administration (78%), supplying (75%) and treatment preparation (75%). 5 items were known by sponsors unless 50%: in the group supplying: drug order point (46%) and drug reorder quantity (45%), in the group treatment administration: actions being taken by patient in case of vomiting (42%), in the group treatment preparation: drug stability concentration after dilution (42%) and drug stability duration after reconstitution (37%). In only 19% of cases, sponsors showed pharmacists drug demonstration kits.

**Discussion & Conclusion** This assessment highlights the discordance between data known by sponsors and information necessary for pharmaceutical team to set up and manage a clinical trial. Most often, unknown data are more often practical information like drug preparation information or drug administration. Even general information like treatment or clinical trial description is not known in 100% of cases. We could explain these discrepancies by the lack of pharmacist's involvement in clinical trials protocols elaboration. Another way to improve the level of sponsors' information should be to send them the pharmaceutical questions before the visits.

**Keywords** clinical trials, pharmaceutical initiation visit

## NUV-1

### Parenteral nutrition on an abdominal surgical ward: supersize me?

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**Introduction** Postoperative nutritional support can be provided by parenteral nutrition (PN). The main consideration is not to overfeed the patient (1,2) as hyperalimentation is known to increase energy expenditure, oxygen consumption and carbon dioxide production; to induce fatty liver disease and can lead to hypertriglyceridaemia (1,3). In severe malnourished patients, refeeding syndrome can occur (3).

We investigated in this study whether administered calories correspond to the calculated energy requirements.

**Materials & Methods** Monocentric prospective observational study A 56-bed abdominal surgical ward

Patients exclusively fed with PN were included. Total daily caloric administration was compared with calculated total energy requirements based on 3 formulas: 1) 30 kcal/ kg ideal bodyweight per day, for BMI<18.5 use actual bodyweight, for BMI>30 use adjusted bodyweight (1, 4); 2) Harris-Benedict (HB) equation multiplied by 1.2 (5) and 3) Ireton-Jones (IJ) equation (6). Standardized total parenteral nutrition (TPN) preparations were used. Under- and overfeeding were defined as administered calories less than 90% and more than 110% of the calculated energy requirements respectively (7).

**Results** During 56 days, 38 (9.43%) out of 403 admitted patients were solely fed with TPN, accounting for a total of 352 TPN days. Patient demographics will be presented on the poster. Results are expressed as absolute number of TPN administered. The energy supply, according to the first formula (30 kcal/kg/d), the HB equation and the IJ equation, was only concordant in 15.91% (56/352), 9.38% and 0.30% respectively, too low in 7.95% (28/352), 6.25% (22/352) and 6.36% (21/352) respectively and too high in 76.14% (268/352), 84.38% (297/352) and 93.75% (330/352) respectively.

**Discussion & Conclusion** Compared to the commonly used formulas, most patients receiving PN are overfed. Since overfeeding can be related to complications, defining the amount of PN must happen on a more case-by-case basis. To guide the prescriber, we are working on a device in the electronic prescribing system which calculates the total energy requirement and proposes a PN plan.

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**Keywords** parenteral nutrition, postoperative, overfeeding



## NUV-3

### Folic acid use in a multi-ethnic population of pregnant women

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**Introduction** In the late twentieth century spina bifida and anencephaly—two of the most common and severe birth defects—were confirmed to be caused primarily by folic acid deficiency. Therefore, it has been recommended that each woman capable of becoming pregnant should use folic acid supplements at a daily dose of 400 µg starting one month before conception and continuing until the end of the first trimester. The aims of the study were to investigate the possible differences in folic acid use among a multi-ethnic population of pregnant women, and to identify the determinants of antenatal folic acid use in this population.

**Materials & Methods** 350 pregnant women of different ethnicities participated in the study at the Universitair Ziekenhuis Brussel, by filling a questionnaire about socio-demographic characteristics and folic acid use. Chi-square tests and binary logistic regression analyses were performed using SPSS programme.

**Results** In this cohort, 58.6% used folic acid supplements during pregnancy. The use of folic acid was markedly lower in women of Arab/Turkish and other non-Western ethnicities ( $p = 0.003$ ). Factors like early booking for antenatal visits ( $p = 0.001$ ), understanding of physicians' spoken language ( $p = 0.004$ ), and following education in Western countries ( $p = 0.006$ ) were positively associated with folic acid intake. The most important risk factors of low folic acid use included low educational attainment [OR: 0.46 (95% CI: 0.27–0.79)] and low socio-economic status [OR: 0.40 (95% CI: 0.23–0.69)].

**Discussion & Conclusion** The antenatal use of folic acid was significantly lower in Arab/Turkish and other non-Western immigrant women. This can likely be attributed to lower education and lower socio-economic status (the most important risk factors), as well as poor understanding of the physicians' spoken language.

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**Keywords** Pregnancy, Folic acid, Immigrant women, Neural Tube Defects

## NUV-4

### Visual compatibility of naloxone with commonly used parenteral drugs administered via a Y-Site: development of a simple method

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**Introduction** Administration of parenteral drugs to inpatient represents an important side of pharmacotherapy. Clinical pharmacists are frequently faced with compatibility problems related to the administration of concomitant drugs via Y-site. Some data regarding this topic have been published in the literature. However, when data published are poor or missing, it might be useful to be able to conduct

tests in your hospital to assess visual compatibility of different parenteral drugs administered via Y-site. The aim of this study is to present a simple method developed by our group for assessing visual compatibility of a target drug administered via a Y-site and present a clinical example by using naloxone.

**Materials & Methods** A list of 97 different drugs to be tested was established by three clinical pharmacists. Selected drugs represented common parenteral drugs used all over the hospital. Our method is based on mixing one milliliter of the target drug (naloxone) with one milliliter of each of the 97 tested drugs. The original drug concentrations were used during the study (no dilution). The assessment was realized under normal lightning conditions, at room temperature and each visual compatibility test was performed in duplicate. Visual compatibility was assessed by two different observers (naked-eye and by using a 3 times magnifying glass), after mechanical agitation of all mixed drugs at four different moments (after 0, 15, 60 and 240 min).

**Results** For all tested drugs, no evident visual incompatibility was observed except with cyclosporin, diazepam, indomethacin, lorazepam, nitroglycerin, pantoprazole, phenytoin, and thiopental. In addition, unconfirmed compatibility results were noticed between naloxone and acyclovir, aminophylline, amphotericin B and cefazolin. Consequently, we cannot recommend concomitant administration of naloxone with any of those twelve tested drugs via Y-site.

**Discussion & Conclusion** There is no standardized method for the assessment of visual compatibility of parenteral drugs administered via a Y-site that can be performed simply in a hospital pharmacy. Indeed, there is no consensus regarding the better contact times to apply, the kind and the concentration of drugs to use (brand or generic, diluted drug or not). Moreover, the conditions in which this study was conducted (ex. non-diluted drugs) should be taken into account if its results were to be used for the administration of drugs to an actual patient. The method that was developed allows us to perform the assessment of visual compatibility only whereas supplemental chemical compatibility tests would be optimal. However this type of tests involved a specialized and equipped laboratory. Despite the limits of our method, we consider it to be useful for clinical pharmacists when compatibility information is necessary to ensure safe drugs administration and that no such data is available in the literature.

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**Keywords** drug administration, visual compatibility

## NUV-5

### Parenteral nutrition on an abdominal surgical ward: is it always justified?

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**Introduction** After abdominal surgery, a patients' oral nutritional intake may be postponed for several days. Sometimes, nutritional support is provided by parenteral nutrition (PN). However, this expensive and hazardous (1) way of feeding may not always be justified. Literature states that PN is indicated in patients whose nutritional status is at risk, in whom enteral feeding is contra-indicated and who cannot meet their caloric requirements by mouth or via nasogastric tube within 7 days (1,2).

This study investigates whether the administered PNs were justified.

**Materials & Methods** Monocentric prospective observational study A 56-bed abdominal surgical ward

All patients fed by PN were included during the study period. On the first day of PN administration, the patients' nutritional status was screened by the Nutritional Risk Screening (NRS) tool (3). Depending on NRS (NRS < 3: not at risk, NRS ≥ 3: at risk) and duration of PN, patients were classified in 4 cohorts as shown in the table on the poster. Contra-indications for enteral feeding were defined as intestinal obstruction, malabsorption, fistulas, intestinal ischemia, severe shock with impaired splanchnic perfusion and fulminant sepsis (2). PN in cohort 1 was defined as unjustified as in this cohort NRS is < 3 or the duration of PN is < 7. In the other cohorts, the combination of the contra-indications and the surgeons' opinion was used to justify the PN.

**Results** During 67 days, 39 (25,1%) out of 267 admitted patients were fed by PN for at least one day, accounting for a total of 346 PNs. Patients demographics will be shown on the poster. Retrospectively, 7 patients, accounting for 26 PNs, were assigned to the first cohort (NRS<3, PN<7days) and were therefore unjustified. After applying the contra-indications for enteral feeding and the surgeon's opinion to the patients from the other cohorts, another 12 patients and 99 PNs could be considered as incorrect. In total 125 PNs (36,12%) in 19 patients were unjustified.

**Discussion & Conclusion** Although it is difficult to determine prospectively how long a patients' oral nutritional intake will be impossible, nutritional support should be based on NRS, duration of nutritional support and contra-indications for enteral feeding. As parenteral feeding is expensive and hazardous, alternatives should be explored first, e.g. enteral feeding. We see herein an important role for a nutrition team.

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**Keywords** parenteral nutrition, postoperative, NRS

#### NUV-6

##### 8 months of biological monitoring in parenteral nutrition: impact on liver function?

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**Introduction** Biological disturbances may occur in children fed by parenteral route. In our paediatric hospital, a laboratory test is routinely done for all children at 7 days and 21 days after introduction of parenteral nutrition (PN).

**Materials & Methods** The purpose of the study is to investigate possible links between the administration of PN in premature and disturbances in liver function tests found on D7 and 21 days after the start of the PN. The prematures for which one of the 2 tests is made are excluded from the study. Prematures included are hospitalized in Neonatology and in intensive care unit.

The criteria are:

- Group 1: PN more than 17 days with tests at D7±3 days and D21±3;
- Group 2: PN less than 17 days and more than 10 days, with tests at D7±3 and D21±3, test made at D21 after stop of the PN;
- Group 3: PN more than 17 days with a test at D7±3 and with a test made at D21 after D24.

The AST, ALT, GGT and conjugated bilirubin (CB) rate are collected over a 8 month period.

**Results** On D7, the AST and ALT were measured for 33 prematures, the GGT for 32 and the CB for 37 of them (groups 1,2,3). On D21, the AST, ALT and GGT were measured for 28 prematures and the CB for 30 (group 1).

On D7, 100% of prematures have normal AST and ALT rates (N<75IU/L).

On D21, AST was normal for 93% of premature, high for 7% and the ALT is normal for 100%.

On D7, GGT rate is normal (N<45–140IU/L) for 43%, high for 41% and low for 16%.

On D21, GGT rate is normal for 47%, high for 14% and low for 39%.

On D7, CB rate is normal for 70% (N<14μmol/L) and high for 30%.

On D21, CB rate is normal for 67% (N<14μmol/L) and high for 33%.

**Discussion & Conclusion** The infusion of PN does not seem to have any impact on AST and ALT rates.

This data suggests that the longer the PN is, more the GGT rate tends to normalize or even fall, but a test made at D21 does not necessarily mean a long period of PN.

An increase of GGT rate means cholestasis when the AST and ALT rates are tripled and CB rate increases: 2 prematures were suffering from cholestasis.

On D21, 16 prematures have 2 criteria to distinguish a pathologic jaundice: the fraction of CB greater than 15% of total bilirubin and jaundice persists after more than 2 weeks of life.

The presence of CB is synonymous with cholestasis.

The biological disturbances associated with cholestasis are visible the 3rd week of PN. So the test on D21 determines if children are suffering from cholestasis.

10 patients had 2 disturbed parameters during the first 21 days of PN. This number is proportionally large compared to the number of patients in the study.

The liver function tests should be monitored closely from the beginning of the PN and probably also on a medium or long term, but only a monitoring of prematures during a long period could afford to assert this.

The pharmacist, by daily analysis of PN prescriptions, contributes to an optimal support of premature, including a nutritional point of view.

**Keywords** Liver function, Parenteral nutrition, premature

#### NUV-7

##### Parenteral nutrition in patients with renal failure: pharmaceutical care

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**Introduction** Renal failure patients have a wide variety of metabolic disorders which may cause malnutrition. Poor nutritional status is a major risk factor for morbidity and mortality, so, an adequate nutritional support during hospitalization may improve the better progression of their disease. The aim of the Nutrition Area of the Pharmacy Service was keeping track of these patients when they enter to the hospital, checking if the nutritional management conducted by the doctor team was right.

**Materials & Methods** This is a retrospective observational study during 11 months in which we selected those patients who were prescribed parenteral nutrition of renal protection. For each patient were analyzed several biochemical parameters for nutritional assessment recommended by the European Society for Clinical Nutrition and Metabolism (ESPEN). Nitrogen balance was calculated after three days of the onset of parenteral nutrition (PN), using the values of urea in urine (g/L), 24-hour diuresis and grams of nitrogen supplied with parenteral nutrition.

**Results** During the study period there were 24 patients with renal protection parenteral nutrition. At the beginning of the PN, patients had the following blood-values average of creatinine, urea and total protein: 3.18 mg/dL, 160 mg/dL and 5.2 g/dL (respectively). In relation to the nutritional assessment of these patients, only in 46% of them albumin data were requested. However, in all of them data of total cholesterol and lymphocytes were measured. Analyzing and comparing the values with the standards published by the Spanish Society for Hospitalary Pharmacy, it was found that 75% of patients had moderate malnutrition at the time of prescription of PN. With regard to nitrogen balance, 37% of patients needed more nitrogen input to meet their daily needs as the balance took values less than -2 g/day. From the Pharmacy Service these results were notified, but only one patient received additional enteral nutrition.

**Discussion & Conclusion** Nutritional support of patients with renal disease was not consistent with the recommendations, malnutrition and inadequate inputs. More communication between the Pharmacy Service and the medical team would improve the nutritional assessment of these patients.

**Keywords** Parenteral nutrition, Renal failure

## NUV-9

### Stability study of parenteral nutrition mixture containing a new generation lipid emulsion

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**Introduction** The sterile preparation unit of the Hospital Pellegrin produces in an automated way 8000 total parenteral nutrition a year for 1 pediatric intensive care unit and 2 services of neonatology. These preparations are ternary mixtures with electrolytes. To optimize the parenteral contributions, the medical and pharmaceutical multidisciplinary team chose to replace the lipid emulsion of these mixtures by a new generation emulsion. This emulsion contains triglycerides medium chains, triglycerides long chains and its content in omega 3 is favorable to the production of eicosapentaénoique acid and docosahexaénoique acid in whose synaptic and retinal development role is demonstrated. Because of the instability known for lipid emulsions in mixtures and considering the potential toxicity to the administration of too voluminous lipid globules, the sterile preparation unit wished to study the stability of ternary mixtures with electrolytes containing this new emulsion.

**Materials & Methods** The physical stability of 84 pediatric ternary mixtures was studied i) after manufacturing, ii) after 24 h of storage at room temperature, iii) after 48 h of storage in 4°C and iv) after 120 h of storage in 4°C. The techniques of used analyses were: the macroscopic analysis, the microscopy with contrast of phase and the size grading with diffraction laser.

**Results** The macroscopic analysis shows that there are no macroscopic abnormalities. The microscopy with contrast of phase shows

homogeneous mixtures for 84 samples in every time of the study. The size grading laser shows a very homogeneous distribution of particles in time i), ii) and iii) of the study. The average size of the particles is 0.495µm, 90% of particles have a lower size in 0.5µm, the specific average surface is of 25m<sup>2</sup>/g. In the term of a preservation of 120 h, the grading distribution is modified for 2.3% of tested mixtures. It is translated by the existence of a double particular population: 97,3% of the volume of mixtures contains a particular population the average size of which is 0.5µm, 2.7% of the volume contains medium-sized particles of 0.9µm. The specific average surface decreases in 3.2% on all the samples.

**Discussion & Conclusion** The behavior of the new emulsion in mixture is satisfactory. The analysis of particles does not show significant grading destabilization after a preservation of 120 h. The manufacturing of nutritive mixture is accompanied by many physico-chemical analyses and bacteriological controls. In the frame of the validation of the manufacturing process and the reassurance of the clinical use of these mixtures, the control of the stability of the emulsion is also indispensable. This study shows the expertise of the pharmacist in control and in galenic formulation and encourage the pooling of the pharmaceutical and medical skills for the patient benefit.

### Bibliographic references

**Keywords** Nutritional support, lipid, stability

## NUV-10

### Analysis of the prescriptions of Pediaven®

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**Introduction** Last year, the staff of unit who makes the parenteral nutrition (PN) admixtures was insufficient to request the demand of paediatric's units. It was decided to make only the solutions for the paediatric intensive care unit for which the composition of the solutions must be specific for each child. For other services, the parenteral nutrition will be assured by an ready to use shape, Pediaven®. Pediaven is an industrial parenteral nutrition perfusion. The aim of the study was to assess whether the prescriptions of Pediaven® were in accordance with the recommendations of the suppliers and to estimate the cost of this treatment.

**Materials & Methods** *Design:* Retrospective Study. All children who received Pediaven® from August 2009 till April 2010 were included. *Setting:* Departement of Paediatric in Reims University Hospital *Main Outcome Measures:* An standardized data collection form was elaborated. Data collected were pathology at the origin of the PN, posology, age and weight of the children, nature of addition in PN, duration of the treatment, type of nutrition (exclusive or additional)

**Results** 20 patients (13 male, 7 female) were included. The average age of the patients is 7, years. 4 groups of diseases were observed: oncology (n = 10; Average of age: m = 9,4 years [1,9–19]), digestive diseases (n = 6; m = 2,71 years [0,021– 11]), infectious diseases (n = 1; m = 16 years) and other (n = 3; m = 8,3 years [0,83–14]). 566 units of PEDIIVEN were used during this period. The daily cost by child and a day is 72.1€. The types of nutrition were exclusive for 20% patients (n = 4), additional for 50% (n = 10), exclusive then additional for 20% (n = 4), additional then exclusive for 5% (n = 1) and for 5% not informed (n = 1). The duration averages of treatment was 26 days (23,2 days for oncology; 33,8 days for digestive diseases; 5 days for infectious diseases and 14,7 days for other).

**Discussion & Conclusion** Some nonconformity were observed. One of her concerns the additions in the perfusion, which are not in accordance with the recommendations of the manufacturer. Of more

the prescribed volumes are not still in adequation with the volume of pockets, what increases considerably the cost of the treatment.

On the other hand some prescriptions overlapped, that is why a typical prescription was organized in order to facilitate the follow up of dispensation. This nonconformity will be discussed with the services.

**Keywords** paediatric, parenteral nutrition

## NUV-11

### Advanced pharmaceutical practices for anticipating preparation of parenteral nutrition mixtures in neonates

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**Introduction** The steps of compounding process necessary for the production of parenteral nutrition mixture (PNM) require well-trained pharmaceutical staff, validated protocols of preparation in aseptic facilities. Consequently, although adequate provision of nutrients involved daily prescriptions by individual physicians, the anticipated preparations of PNM for at least three consecutive worked-days might be decided by nutritional pharmacists.

**Materials & Methods** Thirty infants that were admitted in the neonates' intensive care unit and were required total parenteral nutrition (TPN) support immediately after birth. Ninety prescriptions for TPN were received at hospital pharmacy as followed: thirty prescriptions received at day 0 for consecutive compounding and infusion at day 0; sixty prescriptions received at day 1 for consecutive compounding and infusion at day 1 and anticipated infusion at day 2.

One hundred and six infants were admitted in the neonates' intensive care unit. One hundred and six prescriptions for TPN received at hospital pharmacy were grouped as function of compounding and infusion day as followed:

- (i) Forty-one prescriptions received at day 0 for consecutive compounding and immediate infusion at day 0 completed by forty-one prescriptions received at day 1 for consecutive compounding and immediate infusion at day 1 and one-day anticipated infusion (day 2);
- (ii) Sixty-five prescriptions received at day 0 for consecutive compounding and immediate infusion at day 0 and two-day anticipated infusion (day 1 and day 2).

**Results** Ten parameters of compounding were compared. The one-way analysis of variance showed a significant difference for volume of PNM prescribed for day 1, day 2 and day 3. The post-hoc tests (Bonferroni's test) showed that perfused volumes at day 0 and day 2 were significantly different ( $p < 0.05$ ) whereas any other parameters did not vary significantly.

Concerning 106 studied prescriptions, 41 prescriptions were not anticipated for three days (38.6%) whereas 65 prescriptions received at day 0 for consecutive compounding and immediate infusion at day 0 and two-day anticipated infusion (day 1 and day 2). Detailed analysis of these 106 prescriptions showed a significant difference ( $p < 0.05$ ) between the two groups for infant age, body weight and fever.

**Discussion & Conclusion** The study showed that the prescribed volume was the only parameter that significantly varied between day 0 and day 2. Consequently, at day 2, final volume might be adjusted into pre-made PNM at day 0, by adding sterile water in aseptic conditions. Therefore, anticipated preparation might be suggested to

make preparation conditions less difficult. However, in low-weight infants under twenty two days old, anticipated PNM preparations are compromised since daily nutrient intakes adjustment must be taken into account.

**Keywords** nutritional contribution; Parenteral nutrition; Pharmaceutical preparation

## NUV-12

### Acute Maple Syrup Urinary Disease therapeutic strategy in French hospitals

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**Introduction** Maple Syrup Urinary Disease (MSUD) is an hereditary disease of branched chains amino acids (BAA) metabolism. Its prevalence is 1-5/10000. Leucine accumulation is responsible for mostly neurological symptoms that may lead to death. Acute failures must be treated by eliminating BAA in toxic blood rate and restarting protein anabolism with carbohydrates, lipids and essential amino acids (AA) intakes. Estimated 30 to 50 French patients a year suffer from acute MSUD.

On request from a reference center for hereditary metabolic diseases, an AA solution for acute MSUD is available since January 2010. It is the first AA mixture specific to MSUD treatment to be administered through peripheral vein. An observational study was then launched. The primary endpoint is to identify acute MSUD patients characteristics and therapeutic options. Secondary endpoints are to assess the new parenteral AA solution and to show new therapeutics needs.

**Materials & Methods** Study involves all French hospitals that treat MSUD (19 hospitals) and will be run for 2 years. After each order of the new solution, a survey was sent to the hospital physician referent for MSUD. Information about the patient and his disease was requested: gender, age, MSUD diagnostic circumstances and acute failure etiology. Clinical assessment was done on admission (weight, temperature, neurological, cardiovascular, respiratory and intestinal symptoms), BAA blood rates and metabolic acidosis were monitored for the entire course of the treatment. The treatment was detailed: dialysis, AA solution infusion (time, path and dose), others intravenous (IV), oral or enteral intakes (carbohydrates, lipids, essential AA), insulin and hydration solution. Data were registered and analyzed by the AGEPS Regulatory Affairs Unit and reviewed by the above reference center.

**Results** In 6 months, 4 hospitals were included and 5 answers have been received. Patients were 8 to 27 years old and are all men. All of them had neonatal MSUD and the failure was due to a non compliance with the diet. Every patient received the new parenteral AA solution, 4 received IV dextrose and lipids and 1 patient was supplemented enterally. Valine and isoleucine were systematically given orally, since those AA are not available IV. The treatment was maintained until BAA blood rate normalized (media 4.2 days).

**Discussion & Conclusion** There have been fewer acute MSUD cases than expected since the study has begun, although it is a rare disease. It is necessary to improve communication about it. The first cases show that acute MSUD failures are mostly due to a non compliance with the diet, not to infectious issues. If this is confirmed, information to the patients could help them to improve their health. Use the new IV AA solution could allow to avoid dialysis, which was the only treatment for severe cases until now.

**Keywords** amino acids, Leucinos, patient characteristics, survey, treatment



## NUV-13

### Standard parenteral nutrition for preterm infants: impact on amino acid intake and growth

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**Introduction** Early and aggressive amino acid supplementation is recommended in preterm infants in the neonatal period to prevent catabolism and long term adverse consequences<sup>(1,2)</sup>. Inadequate early nutritional intake was suspected in our institution with individualised parenteral nutrition (IPN) due to prescribing and compounding time. Ready-to-use standard parenteral nutritions (SPN) for the first 5 days of life were developed and implemented to improve amino acid intake in the early neonatal period and growth.

**Materials & Methods** Retrospective case (=preterm with SPN) - control (=preterm with IPN) study in a neonatal and paediatric intensive care unit between April 2008 and August 2009. SPN: glucose 10.8%, amino acids 3%, +/- electrolytes. Inclusion criteria: preterm infants with birth weight  $\geq 2000$  g and gestational age  $\geq 32$  weeks. Primary outcome (Kaplan Meier analysis): growth parameters during the first 15 days of life (number of days for recovering birth weight, maximal weight loss and AUC of growth curves). Secondary outcome (Mann-Whitney): cumulative amino acid intake during the first 5 days of life.

**Results** 58 preterm infants were included (10 for SPN group - 48 for IPN group). Mean birth weight was  $1196.0 \pm 286.7$  g vs  $1108.3 \pm 352.5$  g ( $p = 0.383$ ).

A trend to recover birth weight earlier was observed in the SPN group ( $6.6 \pm 1.2$  days vs  $8.8 \pm 0.7$  days,  $p = 0.07$ ). No difference was observed for maximal weight loss ( $84.0 \pm 60.6$  g vs  $100.0 \pm 62.5$  g,  $p = 0.28$ ) or AUC of growth curves ( $0.3 \pm 0.2$  kg per day vs  $0.5 \pm 0.5$  kg per day,  $p = 0.36$ ) between the two groups.

Amino acid intake was significantly higher during the first 3 days of life in the SPN group (day 1:  $1.4 \pm 1.0$  g  $\text{kg}^{-1}$  per day vs  $0.0 \pm 0.1$  g  $\text{kg}^{-1}$  per day,  $p = 0.000$ ; day 2:  $1.9 \pm 0.4$  g  $\text{kg}^{-1}$  per day vs  $0.7 \pm 0.8$  g  $\text{kg}^{-1}$  per day,  $p = 0.001$ ; day 3:  $2.4 \pm 0.4$  g  $\text{kg}^{-1}$  per day vs  $1.8 \pm 1.0$  g  $\text{kg}^{-1}$  per day,  $p = 0.067$ ). No difference was observed for days 4 ( $2.8 \pm 0.6$  g  $\text{kg}^{-1}$  per day vs  $2.7 \pm 0.9$  g  $\text{kg}^{-1}$  per day,  $p = 0.869$ ) and 5 ( $3.1 \pm 0.7$  g  $\text{kg}^{-1}$  per day vs  $3.2 \pm 0.9$  g  $\text{kg}^{-1}$  per day,  $p = 0.551$ ).

**Discussion & Conclusion** Amino acid intake was significantly improved by SPN during the first 3 days of life of preterm infants and a trend to recover birth weight earlier was observed. Results of this pilot study have to be confirmed in a larger scale study.

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**Keywords** Growth, Preterm infants, Standard Parenteral Nutrition

## NUV-14

### Management of total parenteral nutrition in a pediatric oncology unit

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**Introduction** About 2000 Total Parenteral Nutrition (TPN) bags are compounded annually in a cleanroom for the pediatric oncology unit at Rennes's hospital. The aim of this study was to characterize prescription and administration modalities of individualized TPN in our pediatric oncology unit, in order to optimize nutritional support and to prevent potential drug-nutrients interactions.

**Materials & Methods** The study was conducted for one month. All TPN prescriptions were analyzed, prescribers were asked about their TPN prescribing practices and nurses were asked about TPN administration methods. During the study, the pH of each TPN bag was measured, all intravenous co-administered drugs were listed and a potential interaction with TPN was checked in literature.

**Results** *Prescription methods:* TPN is indicated when oral intake is less than 50% of the nutritional needs during 5 days. TPN is started at 20–30 kcal/kg/day and increased to 70–80 kcal/kg/day by increments of 20kcal/kg every 2–3 days. Fat represents 33% of energy intake while 66% is provided by carbohydrate. Protein energy amounts are determined by a calorie-to-nitrogen ratio ranging from 200 to 250 kcal per gram of nitrogen for a correct muscle development. Electrolytes amounts are monitored daily according to their blood levels and TPN tolerance is assessed by measuring glycaemia and glycosuria. Before each chemotherapy treatment, TPN is stopped progressively in a few days.

*Administration methods:* TPN is performed in a cyclic mode 16 h a day preferably by central venous catheter. Co-prescribed drugs are always administered via a Y-site connection without any filter. During the study, 42 drugs were co-prescribed and among them 12 were prescribed to more than 50% of the children (esomeprazole, alizapride, paracetamol, nalbuphine, amphotericin B, ceftazidime, acyclovir, imipenem, ondansetron, calcium, amikacin, potassium). The pH of TPN mixtures were measured between 4.98 and 6.5, sometimes very far from the stability range of the drug solution. Drug-TPN interactions are documented in literature such as precipitates (shown with acyclovir and amphotericin B), phase separation (shown with nalbuphine and ondansetron) or change in zeta potential (shown with amikacin). No interaction was reported with ceftazidime and imipenem while no information was found for the six other molecules. All nurses stop the administration of TPN during acyclovir perfusion.

**Discussion & Conclusion** This study showed that prescribing practices are close to the recommendations of the Société Francophone Nutrition Clinique et Métabolisme (SFNEP) excepted the lack of search of malnutrition markers before TPN prescription. However, practices are not homogenized and many questions remain unanswered about interactions between drugs and TPN. The use of 1.2  $\mu\text{m}$  filters could prevent the risk of precipitation. The complexity of interactions makes the compatibility difficult to predict. A pharmaceutical intervention to educate nurses seems to be necessary.

**Keywords** administration method, drug-nutrient interactions, pediatric oncology, total parenteral nutrition

## NUV-15

### Determination of potassium, sodium, calcium and magnesium in total parenteral nutrition formulation by atomic absorption (AA240FS VARIAN<sup>TM</sup>)

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**Introduction** To ensure the delivery of a pharmaceutical goodness-product, and according to Good Manufacturing Practice (GMP), total parenteral nutrition (TPN) must undergo various quality controls, including physicochemical controls, such as electrolytes. The flame

photometry is the reference method for the determination of sodium and potassium, but its lack of sensitivity limits the dosage in these two ions. Biological selective electrodes are designed to analyze the mix of ingredients which are very different of those of TPN. It is in this context that we opted for the atomic absorption spectrophotometry (AAS).

**Materials & Methods** A validation of AAS was performed to estimate the quantitative and qualitative parameters for the determination of sodium, potassium, calcium and magnesium. The validation was based on French Society of Pharmaceutical Science and Technology (SFSTP) recommendations: - limit of detection and limit of linearity (domain analysis),

- repeatability and reproducibility (precision),
- comparing values obtained on a sample pool compared with theoretical values (regression line).

**Results** The AAS is known as a sensitive and selective technique, with which the components of the preparation do not interfere. The optimal working conditions have been developed for the analysis of nutrients mixtures. The results have validated the method for this preparation. It has good linearity (correlation coefficients > 0.98), it's accurate (repeatability and reproducibility with CV < 5% for 4 ions at different concentration levels) and sensitive (detection limits < 0.5 mmol / L working within the mixture).

**Discussion & Conclusion** One advantage of SAA240FS VARIAN™ is its fast sequential mode. It allows sequential multi-element analysis on the same solution by rapid scanning of successive wavelengths, and the rapid change of appropriate lamps. Resulting in significant time savings, even with small series. Its dual pump system allows firstly the addition of a radiation buffer ionization and secondly, the implementation of automatic dilutions (validated up to 1/50<sup>th</sup>). The autosampler can easily handle a large number of samples. This tool ensures quality control before the distribution of the TNP bags.

**Keywords** Atomic Absorption Spectrophotometry, Chemicals quality controls, Technical validation, Total Parenteral Nutrition, TPN dispensation

## NUV-16

### Nutritional parameters of Iranian HIV positive individuals

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**Introduction** Human Immunodeficiency virus (HIV) infection is a major health problem in the world and HIV infected individuals are prone to malnutrition due to several factors including; inadequate nutrients intake (anorexia, gastrointestinal complications such as nausea, vomiting, oral and esophageal sores), nutrients loss (malabsorption and/or diarrhea), metabolic alteration (increased protein turn over and changes in fatty acid metabolism), hypermetabolism and increased calorie requirements (10–30%) and drug nutrients interaction. The goal of this study was to evaluate nutritional parameters of Iranian HIV-infected patients.

**Materials & Methods** This was a one-year cross-sectional, descriptive analytic survey conducted at Iranian HIV Center in Imam Referral Hospital affiliated to Tehran University of Medical Sciences, Tehran, Iran. Demographic data including social, behavioral and medical history of patients was collected in the proper designed forms. Nutritional assessment for each patient was done based on anthropometric parameters. BMI less than 16, 16–17 and 17–18.5 were considered as severe, moderate and mild malnutrition respectively.

All patients asked about body weight changes during previous 6 months.

The Mid Arm Circumference (MAC); circumference of non-dominant arm midway between shoulder and elbow, was measured using metal tape measure. The Triceps skinfold Thickness (TST) was measured by caliper at midpoint between the acromial and olecranon processes of the scapula and the ulna in position that patient's arm hang relaxed at the side. All measurements were performed three times and the average results to closest mm were registered in a questionnaire.

**Results** Significant and severe recent weight loss detected in 10.8% and 7.7% of patients respectively. Based on CDC definition, 18.5% of patients had wasting syndrome. Serum albumin was significantly lower in HIV-infected patients than control group. ( $P = 0.03$ ). Seventeen patients (92.6%) had albumin level of less than 2.5 g/dl. There was positive correlation between patients' serum albumin level and CD4 count ( $r = 0.9$ ,  $P = 0.03$ ). Patients with wasting had significantly lower serum albumin than other patients (2.1 g/dl vs 2.7 g/dl,  $p = 0.01$ ). Also a significant reverse relationship founded between patients' CD4 lymphocyte cell counts and weight loss ( $r = -0.79$ ,  $P = 0.004$ ). Moderate malnutrition was the most common type of malnutrition in the HIV-infected patients, presented in 38.5% of patients. Mild malnutrition was the second most common in this group, present in 25% of the patients.

**Discussion & Conclusion** In conclusion malnutrition was prevalent in Iranian HIV positive patients and this would emphasize that an early evaluation of nutritional status and assessment of an appropriate tailored nutritional support implemented along with the specific antiretroviral treatment.

**Keywords** Nutrition and HIV

## NUV-17

### Quantifying volatile fatty acids in pharmaceutical preparations by FTIR Technique

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**Introduction** Our hospital is a regional reference centre in digestive diseases with nutritional dysfunctions treatment. The centralized pharmacy realizes several registered preparations for nutrition support, specially Volatile Fatty Acids (VFA). VFA, made of short chain acids (acetic, propionic and butyric acids) are naturally produced by the colon and play a key role in the maintenance of a digestive symbiosis and in the colonic pathologies prevention. The aim of the current study was to develop a quantitative VFA quality control (QC) using FTIR (Fourier Transform Infrared) analysis.

**Materials & Methods** *VFA composition*: Sodium acetate trihydrate 8.2 g/L (Cooper, France), Sodium propionate 2.9 g/L (VWR, France), Butyric acid 3.7 g/L (VWR, France), Sodium hydroxide 1.25 g/L, final pH = 6.2–6.8 (Cooper, France), Sodium chloride 1.46 g/L (Cooper, France) in osmotic water.

**FTIR analysis conditions**: The FTIR device used was the MultiSpec® module (Microdom, France). A minimum 1.2 mL undiluted samples was directly analyzed. In spite of the proximity of the 3 VFA IR spectra, preliminary studies showed the existence of correlation for each VFA at, at least, one IR frequency region. The method was then validated for each VFA within these regions regarding ICH criteria. Validation study included linearity (using a Partial Least Squares or PLS model), accuracy (15 determinations). Intraday (repeatability; 3 replicates, 2 times/day) and inter-days (intermediate precision; 3 days) precision studies. For linearity studies, calibration solutions were designed following a matrix concept: the individual

concentration of each VFA was increased from 50% to 150% of the target concentration (see above) while the 2 other VFA were kept at their 100% concentration.

**Statistics:** Statistical analysis were performed with SPSS 13.0 Software using one-way ANOVA test ( $p < 0.05$ ). Results were expressed as mean  $\pm$  SD (RSD  $\pm 15\%$  considered as acceptable).

**Results** The selected IR regions corresponds to C=O and C-H bonds stretching frequencies: 1423–1408 and 1554–547  $\text{cm}^{-1}$  for acetates, 1419–1404  $\text{cm}^{-1}$  and 1551–1535  $\text{cm}^{-1}$  for propionates and 1211–1203, 1223–1215  $\text{cm}^{-1}$  for the butyrates. Method linearity was assessed from 4.0 to 12 g/L for the acetates, 1.5 to 4.5 g/L for the propionates and 2.0 to 5.5 g/L for the butyrates. The matrix calibration design permitted to reach high  $R^2$  varied from 99.7% for propionate to 99.9% for acetates. For the 3 VFA, the method was accurate (CV = 4.7% for acetates to 9.8% for propionates) and precise (intraday: CV = 5.2% for acetates to 9.1% for propionates; interday: CV = 7.1% for acetates to 9.3% for propionates).

**Discussion & Conclusion** We succeeded, using PLS modelling, to quantify 3 VFA mixed in a pharmaceutical preparation using a spectral method. Rather a complicated mathematical and difficult development, once validated, the technique appears reliable, cost effective and permits VFA QC in routine, within less than 3 min analysis time.

**Keywords** FTIR, Nutritional support, Patient safety, Quality control, Volatile Fatty Acids, Short Chain Acids

## NUV-18

### Development of a new ethanol locks quantitation method by FTIR: comparison to gas chromatography

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**Introduction** Our hospital is a regional referent center in Parenteral Nutrition (PN). PN infusions may be associated to antimicrobial locks to prevent bacterial contamination of infusions sets. For this purpose, antibiotic locks are mainly used. When, due to local ecological criteria, these locks are not indicated, they may be replaced by Ethanol 70% (EtL), prepared in the centralized pharmacy. EtL are undergo prior to their use regulatory quantitative quality controls, usually performed by Gas Chromatography (GC). However, GC is time consuming and heavy to set up in routine. Therefore, we decided to develop a new simple, rapid, reliable method for ethanol quantitation using FTIR (Fourier Transform Infrared) technique. In a second time, the newly developed method was cross-validated with GC.

**Materials & Methods** *FTIR analysis conditions:* The FTIR device used was the Multispec® module (Microdom, France). 1.2 mL undiluted locks were analyzed within less than 3 min. Preliminary studies showed correlation between concentrations (conc.) and transmittance in two IR regions: 1041–1045  $\text{cm}^{-1}$  and 2904–2897  $\text{cm}^{-1}$ . The method was validated within these regions using ICH criteria. 2 conc. ranges (high and low) were studied in saline (20–800 g/L and 0.5–20 g/L). Validation study included linearity, accuracy (15 determinations), intraday (repeatability; 5 replicates, 3 times/day) and interdays (intermediate precision; 3 days) precision studies.

*GC analysis conditions:* Shimadzu GC-80, Internal Standard (IS): propanol-2; Column: Porapak Q (80–100 mesh x2 m; Oven: 145°C); Detection: FID; Rt: 2.4 min (Ethanol) and 4.6 min (IS); injection volume: 4  $\mu\text{L}$ . EtL samples were 1/200 diluted in osmosed water and mixed 50:50 to IS. The method was previously validated within a 0.5 g–5 g/L range.

*FTIR/GC correlation study:* 45 samples (3 conc. levels: 1, 3 and 5 g/L; 15 replicates/level) were simultaneously analysed by both methods.

**Statistics:** Statistical analysis used mainly the one-way ANOVA test ( $p < 0.05$ ) and results were expressed as mean  $\pm$  SD (RSD  $\pm 15\%$  considered as acceptable). Correlation study used Pearson factor and Wilcoxon signed-rank test.

**Results** The 2 selected IR regions meet respectively ethanol C-O and C-H stretching frequencies. Using these regions, the FTIR method was found linear. Linearity ( $R^2 > 99.3\%$ ) was assessed with an MLR model (multiple linear regression) within the high conc. range and a partial least squares (PLS) model for the low conc. range. The method showed good accuracy (CV = 4.3%), and correct repeatability (mean CV = 5.4%) and intermediate precision (mean CV = 5.8%). Furthermore, we found tight correlation with GC method ( $R^2 = 98.9\%$ ), even if FTIR give systematically lower but significantly different results from GC.

**Discussion & Conclusion** The newly developed FTIR method appears convenient for routine practice: it is rapid, reliable, cost-effective and correlates tightly with the GC reference method.

**Keywords** Antimicrobial locks, Ethanol locks, FTIR, Parenteral nutrition, Quality control

## NUV-19

### Aluminium content in parenteral nutrition compounds and in parenteral nutrition admixtures: between practice and recommendations

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**Introduction** Aluminium is a ubiquitous metal, well known as a contaminant of parenteral nutrition admixtures with a toxic potential. The assessment of aluminium in dialysis solutions is a regulatory requirement because the accumulation of this element may leads to bone disease, and central nervous system toxicity.

The aim of this study was to evaluate aluminium concentration in parenteral nutrition compounds and in parenteral nutrition admixtures, manufactured in our hospital, in order to assess the daily rate of aluminium which each patient received. The specific objectives were (i) to compare aluminium concentration in parenteral compound solutions to the allowed maximal concentration (i.e. 25  $\mu\text{g.L}^{-1}$ ), (ii) to assess the daily rate received per kilogramme of weight for 15 patients with home parenteral nutrition and (iii) to evaluate the impact of our manufacturing process in aluminium contamination.

**Materials & Methods** Fifty-eight samples from fifteen patients were selected for sampling and aluminium determination. Each patient was in a steady state and received long term parenteral nutrition seven days a week, twenty four hours a day. All the parenteral nutrition admixtures and twenty six parenteral nutrition compound solutions were sampled for aluminium determination. The samples were stored into EDTA Di-potassic BD Vacutainer® and aluminium content was assessed by atomic absorption spectrophotometry at 2500°C.

**Results** Twelve parenteral nutrition compound solutions in twenty six (all packaged in glass container) and all the parenteral nutrition admixtures contained more than the Food and Drug Administration recommended concentration (i.e. 25  $\mu\text{g.L}^{-1}$ ). In addition, the manufacturing process used in this study was responsible for 30 percent at most. Ten patients on fifteen received daily rates of aluminium per kilogramme of weight significantly upper than the proposed safe maximum rate recommended by the American Society of Parenteral and Enteral Nutrition and American Society of Clinical Nutrition (i.e. 2  $\mu\text{g.kg}^{-1}.\text{day}^{-1}$ ).

**Discussion & Conclusion** This study shows that in parenteral nutrition admixtures and in several parenteral nutrition compound solutions, aluminium concentrations are clearly upper than the Food and Drug Administration recommended concentration. The lack of consensus on aluminium concentration, in parenteral nutrition admixtures and in parenteral nutrition compound solutions, suggests introducing European norms and specific monographs for parenteral nutrition.

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**Keywords** Aluminium, Contamination, European norms, Parenteral nutrition

## NUV-20

### Stability of Alpha Ketoglutaric acid and 5-Hydroxymethylfurfural in a micronutrient supplementation

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**Introduction** Perioperative optimization is of great importance for physical ability of faster recovery after surgical interventions. An excellent opportunity to reduce possible complications before, during or after an operation is the consumption of micronutrient supplementation containing ketoglutaric acid (KG) and 5-hydroxymethylfurfural (HMF). Combination of KG and HMF optimizes physical effort and reduces oxidative stress.

The shelf-life of such solutions is limited. In order to prevent the development of possible degradation products, detailed knowledge about them is needed.

After the drinking solution containing KG and HMF (pH 4.0) was exposed to different stress conditions like pH, temperature, light and oxygen, a main degradation product was found and identified.

**Materials & Methods** To analyze the structure of the unknown degradation product samples were pre-cleaned by SPE using anion-exchange cartridges and preparative LC (mobile phase: water containing 0.05% TFAA and methanol, 80:20). Analytical separation of the components of the drinking solution was performed via HPLC (column RP-18e, 250x4.6) using a gradient program changing from mobile phase A (NH<sub>4</sub>Ac buffer 20mM, pH 2.70/ methanol 99:1) to mobile phase B (NH<sub>4</sub>Ac buffer 20mM, pH 2.70/ methanol, 70:30) after 3.5 min. Structure elucidation was carried out by LC-MS-MS (TriQuad, positive mode) and <sup>3</sup>H-NMR (600 MHz).

**Results** Through stability studies we clarified that the decomposition product formation depends on the presence of both KG and HMF under equimolar loss. According to results obtained with LC-MS-MS, we hypothesized an ester or an aldol condensation product as the only two possible products. Since esterification does not occur in acidic aqueous solutions, we concluded that the only possible structure should be the result of an aldol condensation between the aldehyde

carbon of HMF and the alpha carbon of KG carbonyl group. The mass of the product is 255 m/z (positive mode). <sup>3</sup>H-NMR analysis confirmed this structure.

**Discussion & Conclusion** Patient safety is one of the main goals in drug development process and therefore structure elucidation of possible degradation products in new pharmaceutical formulations is of great importance. The current work presents the clarified structure of the main degradation product occurring in the drinking solution under investigation by this providing the option to block or reduce the formation of it. In addition in vitro studies will be performed to evaluate potential toxic effects.

At the moment the combination of KG and HMF in a micronutrient supplementation for special medicinal purposes is already in use and shows to be a highly promising complementation approving the perioperative optimization.

**Keywords** LC-MS-MS, micronutrient supplementation, perioperative, stability

## NUV-21

### A pilot study about the concordance between calculated osmolarity and measured osmolality of total parenteral nutrition solutions

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**Introduction** Total parenteral nutrition solutions are used in adult and pediatric patients. The composition of total parenteral nutrition is responsible of its osmolarity that can contribute to clinical complications especially in newborns. The aim of this study is to compare the calculated osmolarity and the measured osmolality of a one-day production of total parenteral nutrition solutions in our hospital.

**Materials & Methods** This is a pilot study carried out at the Pharmacy department of CHU Sainte-Justine in collaboration with the Faculty of Pharmacy at University of Montreal. The calculated osmolarity is obtained from our computerized prescription tool for the management of total parenteral nutrition orders. The measured osmolality is obtained by averaging two measurements obtained by freezing depression (Microphone-Osmette) for each sample of total parenteral nutrition solution compounded during a one-day production.

**Results** Twenty-seven total parenteral nutrition bags compounded on May 6<sup>th</sup>, 2009 were included. Thirty-three percent of the evaluated total parenteral nutrition bags have a final osmolality lower than 1000mOsm/kg (n = 9). The relative difference between the calculated osmolarity values and the measured osmolality values varies between 0% and 48% (median of 9%). The relative difference observed appears to be lower for solutions of less than 1000mOsm/kg compared to solutions with higher osmolality (>1000mOsm/kg).

**Discussion & Conclusion** This pilot study shows that the calculated values of osmolarity estimated by the computerized tool for management of total parenteral nutrition order are mainly lower than the measured values of osmolality. The variation observed between the values of osmolarity and osmolality obtained varies according to the composition of each solution. Clinical pharmacists must be able to the estimate or calculate appropriate osmolarity of total parenteral nutrition solutions to maximize their use and minimize complications for patients.

**Keywords** Osmolality, Osmolarity, Total parenteral nutrition



## NUV-22

### Correlation between exposure to phthalates and concentrations of malondialdehyde in infants and children undergoing a cyclic total parenteral nutrition

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**Introduction** Plasticizers such as di(2-ethylhexyl) phthalate (DEHP) are added to polyvinyl chloride (PVC) to confer flexibility. However, DEHP is associated with reproductive disorders in human population. Due to its non covalent bond to the PVC matrix, this plasticizer tends to leach easily. Infants and children undergoing a cyclic long-term total parenteral nutrition (TPN) could be particularly at risk of potential toxicity from DEHP due to regular exposure. Malondialdehyde (MDA) is one of the most commonly used markers of free radical activity. The purpose of this study was to investigate how chronic exposure to phthalate affects the plasmatic rate of MDA.

**Materials & Methods** Studies were performed on seven randomized infants and children on regular cyclic long-term TPN and were compared with five non-treated infants after approval by the Ethics Committee of Jeanne de Flandre Hospital for children.

The circulating concentrations of DEHP in children and infants during the TPN were measured by HPLC. The concentrations were assessed before and after the TPN session. In the same way, plasma-MDA concentrations were also measured by HPLC using UV detection after derivatisation with 2,4-DNPH.

**Results** The circulating concentrations of DEHP before and after a 10-11h cyclic TPN treatment in seven infants and children under regular perfusion ranged widely with a significant rise after the treatment among all the patients when compared to the initial levels. The same phenomenon observed with the rate of MDA showed that the two events are closely dependent. Therefore, a chronic exposure to DEHP during a cyclic TPN raises the plasmatic MDA level, indicating increased oxidative stress.

**Discussion & Conclusion** MDA is a product of lipid peroxidation considered as a presumptive marker for the development of oxidative stress in tissues and plasma. Chronic exposure to phthalates during TPN increased the potential risk of free radical activity *in vivo*. So, it has been recommended that DEHP-free containers should be used for administration of parenteral nutrition preparations in pediatrics.

**Keywords** DEHP, MDA, long term TPN, children, HPLC

## PEC-1

### Patients with a future diagnosis of diabetes have higher drug use and costs: an analysis of community pharmacy data

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**Introduction** Research has indicated that patients with a future diagnosis of diabetes have a higher probability of endocrine, metabolic, nutritional or cardiovascular disorders as compared to control patients. This study assesses drug use and costs in patients with Type 2 diabetes mellitus as compared to patients without diabetes over a time period prior to and after diagnosis of diabetes.

**Materials & Methods** A case-control study compared drug use and costs of patients with a future diagnosis of diabetes (experimental patients) with patients without a diagnosis (control patients) based on community pharmacy records. An experimental patient had used oral hypoglycaemic drugs during 2006. Experimental and control patients were matched in terms of age, gender and quarter of index date. A repeated measures analysis calculated the mean number of packages and costs of drugs in experimental patients during the two years prior to diagnosis and the first year following diagnosis and in control patients during three years.

**Results** Our dataset covered 2,697 patients (899 experimental and 1,798 control patients). The mean annual number of packages and costs of drugs increased over time for experimental and control patients ( $p < 0.001$ ). In patients with a future diagnosis of diabetes, the growth in drug use and costs over time was more pronounced than in control patients ( $p < 0.001$ ). Higher drug use and costs were mainly observed for cardiovascular drugs, antidepressant and antipsychotic drugs, and drugs related to gastric acid disorders.

**Discussion & Conclusion** Patients with a future diagnosis of diabetes have higher drug use and costs prior to diagnosis than control patients. This study shows that drug use could be an incentive to promote preventive measures to avoid additional costs related to medicines eventually prescribed.

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**Keywords** Economic outcomes

## PEC-2

### Induction-related cost from 500 patients with acute myeloid leukaemia: explanatory factors of cost

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**Introduction** The economic profile of acute myeloid leukaemia (AML) is badly known. The few studies published on this disease are now relatively old and include small numbers of patients. The purpose of our study was to determine the explanatory factors of cost, and to evaluate the induction-related cost of patients with diagnosed AML and included in the AML 2001 trial.

**Materials & Methods** This study was performed from the French Public Health Insurance perspective. Only direct medical costs were included: hospitalisation data, chemotherapy regimens, colony stimulating factor consumption. Hospital resources were calculated using different methods based on the: 1/ local *per diem* hospitalisation (analytical accounting system); 2/ French public Diagnosis-Related Group database. Multiple linear regression was used to search for explanatory factors and to evaluate the induction-related cost. The robustness of results was assessed through one-way sensitivity analyses and bootstrap simulations.

**Results** Among 825 patients included in the AML 2001 trial, economic data was obtained and analysed for 500 patients, whom characteristics are similar to those of the 825 initial patients. After adjustment, only 2 explanatory factors were found: an additional induction course and salvage course increased induction-related cost by 38% ( $\pm 4$ ) and 15% ( $\pm 1$ ) respectively, in comparison to 1 induction, explaining up to 24% of induction-related cost variability. These 2 explanatory factors were associated with a significant increase in the mean length of stay ( $p < 10^{-4}$ ). Interestingly, intensive care stay, treatment and response to treatment were not related to the induction-related cost ( $p > 0.10$ ). In comparison, factors associated with financing a hospital stay for “induction” were the number of inductions or the salvage course, treatment and intensive care stay.

With multiple linear regression, the average management of a hospital stay for “induction” and the financing of a hospital stay for “induction” were evaluated respectively at  $\text{€}10,633 \pm 2,119$  [8,670–20,427] and  $\text{€}41,852 \pm 6,037$  [36,631–53,108]. Sensitivity analyses showed robustness of results.

**Discussion & Conclusion** Only the control of length of stay may lead to a decrease in induction-related cost for patients with AML. Only a better valorisation of DRG rate may lead to a decrease in the difference between hospital resources according to two different methods. Evaluating the management of hospital stays for “induction” is the first step to evaluating the economic profile of AML. It is important, in particular, to assess intensive treatment so as to confirm this underestimation or rebalance financing for AML patient management.

**Keywords** acute myeloid leukaemia, cost, economic burden, explanatory factors, induction

### PEC-3

#### Interest of cost transaction theory to evaluate hospital efficiency on medical device organization: observational study of 37 french hospitals

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**Introduction** Prescriptions of SMD (sterile medical device) for inpatients are rare or uncommon. The lack of prescriptions requires other methods to coordinate the healthcare delivery and to insure the quality of care and the correct use of SMD. In absence of explicit legislation hospitals organized themselves under specific constraints which are both local and institutional. In an environment where economical constraints put an increased pressure on resource allocation, our hypothesis is that hospitals organize themselves in order to reduce organization induced costs (transaction costs) and reach economic efficiency in the healthcare delivery. In order to assess hospital organization we analyzed pharmaceutical organization in a representative sample of hospitals. We aimed to identify the specificities of transactions taking place inside hospitals.

**Materials & Methods** We conducted an observational study and included 37 hospitals in the Ile-de-France area. Interviews were realised with the MD dedicated pharmacist. The questions were oriented on the workforce, individual tasks, resources invested and perimeter of activities covered. Quantitative and qualitative data were analysed with a dedicated statistic software.

**Results** Mean SMD expenses was 7.600.200€ per hospital for 3334 references. Whereas SMD command and preparation process are commonly computerized (70% 100%, respectively), 60% of practices differs in the SMD delivery process which ranged out of

pharmaceutical perimeter. Correlation tests showed that several variables are correlated with MD expenses as: hospital size ( $R^2 = 0.52$ ,  $p < 0.01\%$ ), surgery activity ( $R^2 = 0.48$ ,  $p < 0.01\%$ ) and pharmacist implication in buying process ( $R^2 = -0.38$ ,  $p = 0.021$ ). Organizational mechanisms were identified: from vertical integration like MD production (ex: vascular endoprosthesis) or *traceability* of implantable MD (IMD), to externalisation of MD delivery or IMD consignment.

**Discussion & Conclusion** We showed that organizational parameters are correlated with the hospital MD expenses. Each parameter translates into a specific cost to insure the appropriate flow of product or information necessary to the transaction taking place. From supply chain to good use recommendations, pharmacists involvement in the MD sector put them at the core of a nexus of health goods and information transactions. In spite of a uniform institutional constraint, heterogeneity in pharmaceutical practices exists. Pharmacist choices on the internal organization result in transaction costs. We argue that the minimization of these costs is a principle that can lead to assess the efficiency of the whole hospital organization.

**Keywords** cost transaction theory, hospital efficiency, hospital practice, medical devices, organization

### PEC-4

#### Computerized Physician Order Entry (CPOE) of injectable antineoplastic drugs: economic impact of pharmaceutical management to prevent prescribing medication errors

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**Introduction** In the context of CPOE of standardized injectable antineoplastic drugs, a cost-benefit analysis was carried out to determine the potential economic profile of clinical pharmacy validation and intervention in the prevention of prescribing medication errors (PME) in a university teaching hospital.

**Materials & Methods** The viewpoint is that of the payer or French national Public Health Insurance system, and is limited to hospital cost. A decision analysis model was performed to compare two strategies: with clinical pharmacy validation ( $\pm$  pharmacy intervention) and without clinical pharmacy validation. The model is based on only direct medical costs (in Euros) related to net cost (monetary value of the time-investment by the pharmacy staff to prevent PME) and net benefit (medical cost, derived from the monetary value of the potential clinical consequence of avoided PME: expensive antineoplastic drugs, hospitalisation). Results are expressed according to the benefit-to-cost *ratio* (net benefit divided by net cost), and total benefit (net benefit of consequences *minus* net cost of time-investment). The robustness of the results was assessed through a series of one-way sensitivity analyses.

**Results** Over one year, PME incidence was estimated at 1.5% [1.3–1.7], i.e. 218 avoided PME. Potential avoided length of hospital stay was estimated at 419 days or  $1.9 \pm 0.3$  days [0–40] per PME. Cost-benefit analysis could estimate a net benefit-to-cost ratio of 33.3 ( $\text{€}17.34/\text{€}0.52$ ) and a total benefit at  $\text{€}16.82$  per clinical pharmacy validation or  $\text{€}249,844$  per year. The sensitivity analysis showed robustness of results. The net benefit-to-ratio varied from 12.0 to 48.2. The total benefit ranged from  $\text{€}236,179$  to  $\text{€}252,221$ .

**Discussion & Conclusion** In our hospital, CPOE of antineoplastic drugs improves the relevance of clinical pharmacist interventions, expanding pharmaceutical analysis and also the role of the

pharmacist, for example, to ensure the good use of drugs. The specific role of the clinical pharmacist in improving medication safety is highlighted, both on an organisational level and in terms of individual patient care. The cost-benefit analysis shows a substantial economic benefit of clinical pharmacy validation and intervention in the prevention of PME in a centralized pharmaceutical unit.

**Keywords** clinical pharmacy, cost-benefit analysis, intervention, neoplasm, prescribing medication error

## PEC-5

### Assessment of adequacy of prescription about long-term pathology

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**Introduction** In 2008, 8.3 million of people affiliated to the General Insurance Programme of Health Insurance benefit from exemption of patient's contribution towards the cost of medical treatment to long-term pathology (1 contributor in 7). The same year, expenses of drugs have been come to 15.9 billion € with an estimated cost related to the inadequate use of prescription about long-term pathology amounting to 6.7% of this amount. (1)

The objective of this study is to point out no-conformities of medicinal prescriptions at the end of hospitalization among patients in long-term pathology and to analyse issues of cost.

A retrospective analysis has been realized between January 2010 and March 2010 in the Services of immunology-rheumatology and infectious and tropical diseases, Lapeyronie and Gui de Chauliac University Hospitals, Montpellier, France.

**Materials & Methods** Data have been collected with a standardized form realized according to recommendations of High Authority of Health relative to long-term pathology by pharmacist residents. Main criteria gathered were: kind of long-term pathology, number of lines of each prescription in relation or not with exempted disease and possible extra cost reimbursed unduly by Health Insurance.

**Results** Long-term pathologies met are mainly represented by human immunodeficiency virus (26.7%), rheumatoid arthritis (26%), cardiovascular diseases (19%) and diabetes (14%).

On 60 prescriptions, 15.8% of medicines don't seem to have a direct relation with the long-term pathology and wouldn't justify the 100% (extra cost unduly reimbursed).

Total amount actually reimbursed in relation with long-term pathologies come to 78249,83€ with an extra cost unduly reimbursed by Health Insurance estimated to 2297,53€ (ie a medium extra cost by prescription of 38,3€): So, it estimates to 2.94% the extra cost unduly reimbursed by Health Insurance for our study.

**Discussion & Conclusion** The percentage of medicines not prescribed according to recommendations underline bad practice of use of prescription about long-term pathology.

So, main reasons of driftings of possible prescriptions can be: lack of information about long-term pathology, absence of sensitizing for prescriber, and easiness of prescription to the latter.

Improvement of coverage of long-term pathology by prescribers is important because Health Insurance anticipates an increase of number of patients affected by long-term pathology on the horizon 2015 to 12 million, whose expenses to Health for the Pharmacy would reach 33 milliards €.

Diffusion of figures of expenses reimbursed wrongly by Health Insurance and education concerning long-term pathology are essential in order to provoke a realization on behalf of all health actors.

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**Keywords** Long-term pathology, extra cost, Health Insurance

## PEC-6

### Economic impact of inclusion of women with metastatic breast cancer in clinical trials

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**Introduction** Breast cancer is the most common disease among women worldwide with more than 1.2 million cases diagnosed every year, of which 500,000 are lethal. The inclusion in clinical trials allows patients to benefit in most cases from new treatments such as targeted therapy. These treatments are often expensive. A major challenge in pharmacoeconomics is to provide data which is useful for designing clinical trials, hence allowing better control of expenses in health care research and business. A case-control study was conducted in order to determine the economic impact of inclusion of women with metastatic breast cancer in clinical trials which involved injectable chemotherapy in first-line therapy at a university teaching hospital.

**Materials & Methods** "Case patients", treated in a trial, were paired up with "control patients", not included in a trial, on the basis of matching first-line metastatic criteria: Her2 status, age, number of disease sites and location of disease, disease-free interval from the diagnosis time to the metastatic phases. Exclusion criteria are: locally advanced cancer, previous hormonal therapy for metastatic breast cancer, still in first-line therapy at the end of the study, unwilling or missing patients. The costs evaluated were only the direct medical costs incurred by the French Public Health Insurance (FPHI). The main resources used were identified and collected for each patient: hospitalization data, chemotherapy consumption and transport cost. The average hospitalization costs were evaluated according to the Diagnosis Related Group (DRG). The economic analysis extends from the start of first-line metastatic chemotherapy to the progression in second-line. The robustness of the results was assessed through one-way sensitivity analysis.

**Results** Characteristics for 66 patients included in this study (33 cases, 33 controls) were similar. All 44 patients treated with adjuvant medical therapy were exposed to anthracyclins and less than half were exposed to taxanes.

The average costs associated with case patients were three times less than with control patients, respectively  $11,800 \pm 10,200$  € and  $32,100 \pm 22,600$  € ( $p = 2.10^{-3}$ ). The chemotherapy cost represents 20% of the global cost for case patients and 76% for control patients. Estimated savings were 1,400,000 € when including 33 patients in a trial, i.e.  $42,500 \pm 22,600$  € per patient.

**Discussion & Conclusion** Consideration of economic constraints on health care is a reality. Despite its inherent limitations, our study suggests that inclusion of women with metastatic breast cancer in clinical trials may be considered an effective economic strategy for the FPHI. This study needs further investigation beyond the scope of costs and expenses: there is hope that clinical trials can affect the overall survival of patients and lead to new treatment strategies after first-line chemotherapy, suggesting new possibilities for future research.

**Keywords** breast cancer, clinical trial, metastatic, pharmacoeconomics

## PEC-7

### Pharmacy staff's cost attribute to the clinical departments

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**Introduction** Pharmacy staff's cost in some European countries (including France) are not specifically reimbursed from the payors' point of view and are considered as fixed cost to clinical activity. With the arrival of a new DRG (Diagnosis Related Group) payment based system, hospital accounting departments have decided to attribute pharmacy staff's cost to the clinical departments proportionally to their drug budgets. They hypothesized that new innovative drugs prescribed need to be accurately (ie time consuming) analysed and prepared in pharmacy, inducing staff's charges. For the Onco-hematology dept (53% of the hospital drug budget) this estimation seems to be lacking robustness and remains unclear.

**Materials & Methods** Conducting a retrospective analysis of 2009 pharmacy managing cost in 5 domains of pharmacy activities: chemotherapy, clinical trials, plasma products, drugs included in DRG and drugs out DRG. Staff's cost linked to these activities have been calculated from a top down economic procedure. The 5 payroll domains are defined by the employees' work assessment. Domains activities are quantified from preparations and dispensations lines extracted from softwares (Chimio®, Copilote®) and the drug formulary. The percentage of lines for each clinical department has been collected. This allowed us to estimate for each domain, how to share the predetermined staff's cost among the clinical departments. Clinical departments have to pay the charges sum of their 5 percentages of pharmacy's activities consumption.

**Results** Percentages of pharmacy staff's cost obtained: Onco-hematology: 44% of the pharmacy staff's cost in the new method vs 53% when sharing pharmacy staff's cost along the drug budget, Digestive dept: 15% vs 23%, Orthopedy: 4% vs 8%, whereas the 5 other department ratios rise (Specialised Medicine: 22% vs 8%, Emergency: 11% vs 5%, Gynecology: 3% vs 1%, Biology: 1% vs 0.5%, Burns dept: 1% vs 0.2%).

Ratios decrease when departments consume mostly expensive drugs domains.

**Discussion & Conclusion** This new analytical accounting system allow to attribute more precisely the pharmacy staff's cost. Moreover management of costly drugs and for which the therapeutic index justifies accurate checking of the prescription is more costly (pharmacy staff's cost) than dispensing commonly prescribed drugs such as analgics. However, the time dedicated to manage these costly drugs is not proportional to their unit and global costs. The Onco-hematology dept approves these results because they take into account their rising expensive drug's consumption. The new method's limits are: payroll's repartition in only 5 domains, time-consuming to extract data (>40h), yearly reformulation. Its advantage is: more precise estimation of pharmacy cost management, allowing employees' work forecast depending on clinical department's evolution.

**Keywords** Hospital pharmacy, Pharmacy staff's cost attribution

## PEC-8

### Cost-effectiveness analysis of active TDM in elderly patients treated with aminoglycosides

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**Introduction** Aminoglycoside antibiotics are used to treat serious gram-negative infections. However, their use has been limited by the risk of ototoxicity and nephrotoxicity and their pharmacokinetic variability. Efficacy and toxicity are related to blood concentrations, thus requiring therapeutic drug monitoring (TDM). As elderly patients are particularly at risk of accumulation, active therapeutic drug monitoring (ATM) can be performed using a Bayesian method. The objective of this study was to analyse the clinical and economic impact of ATM in elderly patients.

**Materials & Methods** A two-year retrospective study was performed to compare (Student t-test) two geriatric hospitals, one using a Bayesian-based ATM with the USC-Pack software (ET1) and the other using non-guided TDM (ET2). A sensitivity analysis was conducted on nephrotoxicity definition and cost, on target efficacy concentration, on cost of pharmaceutical staff working on this software.

**Main Outcome Measures** Renal function estimated by the MDRD formula. Doses and length of treatments. Efficacy evaluated by internal reference to target concentration. Nephrotoxicity defined as described in the literature. Direct medical costs. Cost-effectiveness results expressed as ratios.

**Results** 56 patients received aminoglycosides in ET1 and 47 patients in ET2. The initial renal function of patients was 82 ml/min in ET1 and 100 ml/min in ET2 ( $p = 0.04$ ). The length of treatment was significantly higher in ET2 than in ET1 (6.7 versus 4.6 days,  $p = 0.22$ ). A significant deterioration of renal function was observed in 8.5% of patients from ET2 and no patient from ET1. The number of patients achieving the target concentration was higher in ET1 than in ET2. The cost per patient was 114€ for ATM and 165€ for non-guided TDM. The sensitivity analysis confirmed these results.

**Discussion & Conclusion** Clinical practices appear to be different between the two hospitals. ATM for aminoglycoside is better on three criteria: efficacy, toxicity and cost. It would be interesting to continue this study to evaluate the impact of ATM on other drugs (anticancer drugs ...).

**Keywords** aminoglycoside, elderly patients, pharmacoeconomics, therapeutic drug monitoring

## PEC-9

### Benefits of negotiations by the pharmacist for medicine purchase in hospital

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**Introduction** French public hospital use for drug purchases the rules of public contracts. Sainte-Anne hospital has launched a consultation in 2010 for the supply of all medications (697 lots) with a tender procedure (TP) (no negotiation possible) followed by negotiated contracts (NC) after unsuccessful tender (negotiation possible). Some lots of the TP are declared unsuccessful, either because there was no offer, either because the price offered is deemed too expensive. The pharmacist with its drug expertise has a role in the choice of drugs because he is at the crossroads of discussions in medical, technical and economic. The aim of this study is to analyze the impact of the hospital pharmacist (HP) in the negotiation of drug prices which is to



get an offer where there was none at the TP, or to try to lower drug prices at the NC compared to those proposed in the TP.

**Materials & Methods** An analysis of the economic balance is done on all of the consultations. The number and the total amount of unsuccessful lots are determined. The evolution between 2009 and 2010 of the turnover is evaluated. The number of lots for which the negotiation was successful or not is determined. The success criteria for negotiation are: an offer for a drug to which no laboratory had made offers at the TP and a downward price after negotiation by the HP for drugs whose prices offered at the AO is considered too expensive (>5% / 2009). Furthermore a prospective survey of the working time concerning the HP and the resident has been achieved. **Results** Following the TP, 503 lots are awarded. 9 lots are declared without continuation (that no longer needed). 185 lots (no offer for 64 lots and 121 lots with a cost deemed too high) are declared unsuccessful and treated in the NC. Following NC, 23 lots are declared without continuation, there is no offer for 37 lots which will be supplied from the wholesaler, and 125 lots are awarded. Among the 125 lots, 70 lots prices have not advanced. The negotiation was successful for 51 lots (27 lots with an offer in NC, so there were none in TD, 24 lots with an evolution of lower prices compared to the TD). 4 lots can not be analyzed. The consultation represents an amount of approximately € 2 million per year. Compared to 2009, the projected savings are estimated at € 33,123. The lower prices obtained through negotiation represents a saving of € 15,114. The HP (€ 61.33/h) and the resident (€17.34/h) worked, respectively 30h and 8h, with an investment of € 1,980 and a return on investment of 13 134 €.

**Discussion & Conclusion** The negotiated contracts allow to saving and achieve optimum satisfaction of needs of the hospital. More than half of the savings in this procedure are directly related to trading by the pharmacist who has achieved a return on investment. A “direct” procedure NC might be a better economic solution than the TP to generate savings reinvested in other pharmaceutical activities related to care services.

**Keywords** economic outcomes, medicine purchase, negotiation, pharmaceutical interventions, Pharmacist behaviour

## PEC-10

### Evaluation of the cost and effectiveness of a morphine implantable pump in chronic low back pain

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**Introduction** Implantable drug-delivery systems (IDDSs) to administer morphine intrathecally are innovating in management of no cancerous chronic pain. Few publications evaluate the interest of the IDDSs. The Pharmacy of Sainte-Anne hospital has evaluated the cost and the effectiveness of the morphine pumps (PM) used in the pain unit of the hospital.

**Materials & Methods** This is a retrospective study conducted in patients with chronic low back pain implanted by a PM. The effectiveness of the MP is evaluated by comparing the results obtained before implantation and 3, 6 and 12 months after implantation by two ways: VAS score of 0-10 (assessment of overall pain, sciatica, low back pain) and Oswestry index (assessment of functional disability related to pain). The pump efficiency is assessed by comparing the average number and type of painkillers (strong opioid, weak opioid, nonopioid analgesic according to the WHO analgesic ladder, and other drug as antidepressants, anticonvulsants or muscle relaxants) used before and after implantation. The economic analysis of the PM takes into account costs of pharmaceuticals (drugs “pain” and IDDSs)

and the number of visits and days of hospitalization of patients in the pain unit are also collected.

**Results** Data are collected in 5 patients implanted in 2006/2007 from their medical records over the period 2002 to February 2010, with a period of 3 years after implantation.

Before implantation, the average VAS scores for global pain, sciatica and low back pain are 8, 7.9 and 7.2. At 3 months, pain intensity decreased by an average of 63% (respectively 2.8, 2.8, and 2.6). From 6 months, the levels of relief are less with scores of 6.1, 4.6 and 3.6. At 12 months, the average success rate of the PM is 31% (respectively 5.5, 4.3, 5.5). The Oswestry score is improved from 63% to 50%, 48% and 60% respectively 3, 6 and 12 months after implantation. Patients have averaged 3.6 painkillers a day before implantation and 2.6 after implantation. On average they have per day 1.2 strong opioids, 0.4 weak opioids, 0.4 non-opioid analgesic and 1.6 other painkillers before implantation. After implantation they have no more opioid an average of one non-opioid analgesic and 1.6 other painkillers a day. The average treatment cost per patient per year has decreased by 26% from € 3,163 (drugs) to € 2,326 (€ 806 drugs + € 7600 PM cost amortized over 5 years)

The average number of visits and hospital days per patient per year decreased by 30% (from 10 to 7 consultations) and 37% (6.2 days 3.9 days).

**Discussion & Conclusion** The use of IDDSs appears to provide better management of pain and decreased treatment costs. However, this study covers only 5 patients over a short period and does not include the cost of installation and monitoring costs of city. A prospective study on a larger number of patients is needed to confirm these preliminary results.

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**Keywords** cost-effectiveness, economic outcomes, intrathecal morphine delivery, low back pain

## PEC-11

### Cost effectiveness analysis of Quincke needles use during Lumbar puncture

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**Introduction** Lumbar Puncture (LP) is an act that is usually practiced in neurology. However, it is not free of side effects, such as Post-Lumbar Puncture Headache (PLPH) which is the most inconvenient for patients. It is a iatrogenic accident which could have been avoided by simple preventive measures, some of which are related to the puncture technique used. The shape of the needle is involved in the arisen of PLPH<sup>1,2</sup>. Several types of needles can be used during a LP: Quincke bevelled needles or pencil point needles.

The aim of this study is to assess medical and economical impact on the use of Quincke bevelled needles during diagnostic LP within an University Hospital neurology department.

**Materials & Methods** 39 patients who had a diagnostic LP with Quincke needles were included in the study. The patients were asked whether they noticed side effects on the day of LP and the following days, and about the impact of these symptoms in their daily life. It

was considered relevant to take into account the consequences of PLPH in terms of costs due to medical consultations, to medical treatment and to prescribed sick leaves. We chose a French Public Health insurance perspective. The time frame was 6 months.

**Results** Among these 39 patients, 17 (43,5%) presented a PLPH in the days following PL, and 1 patient (2,6%) presented lumbar ache. The intensity of PLPH was qualified as moderate by 2 patients (11,7%), as intense by 3 patients (17,6%) and as very intense (inability to stand up) by 12 patients (70,6%). The average duration of PLPH is 7,7 days. The total cost of PLPH treatment for the 17 patients was estimated at 1518 €, taking into account 168 € of medical consultations, 41,40 € of prescribed drugs, and 1309 € of sick leave. The average cost of PLPH treatment is 89 €.

**Discussion & Conclusion** This study emphasizes a high incidence of PLPH with Quincke bevelled needles. Yet several studies have proven that so called « atraumatic » pencil point needles could reduce the incidence of PLPH<sup>1,2</sup> by 50%. In practice, atraumatic needles are rarely used particularly due to their cost (a pencil point needle is 5 times as expensive as a Quincke type needle). This study shows that this additional cost seems acceptable compared to economic consequences of a possible PLPH in terms of hospitalization extension, medical consultations, or sick leaves. Indeed, at Grenoble University Hospital, around 3800 LP are performed every year. If atraumatic needles were used for all PL, there would be an additional cost estimated at 19 000 €; but 760 PLPH could be avoided, French Public Health insurance would then save 67 640 €.

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**Keywords** cost effectiveness analysis, lumbar puncture, pencil point needles

## PEC-12

### Medico-economic evaluation of stay for induction in acute myeloid leukemia (AML)

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**Introduction** Resource allocation is at the heart of debate in all healthcare systems, and cost control an inevitable subject. The treatment of AML necessitates several stages, what makes evaluation of its cost complex. The few pharmacoeconomic published studies mainly deal about costly strategies such as allografts. The main objective of our study is to compare the direct costs incurred during

the hospital stay for induction to official tariffs from the French Diagnosis Related Group (DRG) prospective payment system. Next, we measure the economic impact of the revaluation of Hematology's French DRG between 9th and 10th version of their classification.

**Materials & Methods** 821 patients (id est 29 centers) are included in this french prospective randomised trial, AML 2001, from 2001 to 2005. The economic study, based on patients for whom we obtain economic data, is performed from the perspective of the French Public Health Insurance, restricted to hospital institution costs. Direct hospital medical costs are valued according to 4 approaches: analytic accounting system of our hospital (AAS), French DRG cost databases of hospital discharged (readjusted, or not, to hospital stay duration) and financing obtained by the French DRG.

**Results** The medico-economic analysis includes 500 patients (16 centers) randomized into two arms of induction: idarubicin (n = 245) and daunorubicin (n = 255). Following the induction phase, the rate of complete remission is 84%. The average cost of induction valued by the AAS of our hospital reaches €43,037 +/- 12,665 [8,186–137,742] without significant difference between the two arms (*p* = 0.28). The AAS reference cost is 5.8 times higher than the national estimated cost provided by the DRG cost databases, 4.0 times higher if adjusted to stay duration. The financing of hospital stay for “induction” by the french 2004 DRG is €11,130 +/- 4,888 [3,027–64,030]. A significant difference between the three evaluations of cost of stay and the financing is shown (*p* < 10<sup>-4</sup>). Thanks to 10th version of DRG, financing increases to €12,055 +/- 4,905 [2,663–57,560] (*p* < 10<sup>-4</sup>).

**Discussion & Conclusion** The confrontation of the macro- and micro-economic approaches of hospital costs is a recurrent question. The distinction between lymphoma and leukaemia introduced into the 10th classification of DRG doesn't reduce the gap. The DRG's rates stay far from the actual expenses incurred. Among the explanatory factors, we found errors in coding of diagnoses and acts leading to classify the stay in an inappropriate DRG. A better description of stays and in particular of the average length of stay is required.

**Keywords** Acute Myeloid Leukemia–Induction–Cost–Economic burden

## PEC-13

### Pharmaceutical costs of new therapeutic procedures for desensitization in pre-lung transplantation in France

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**Introduction** With a wealth of experience in renal transplant, new treatments aiming at decreasing anti-HLA antibodies in patient eligible for a lung transplantation, have been developed very recently, what greatly enhance the chances of those patients to obtain a transplant. Those new protocols are based on the off-label use of high dose of intravenous polyvalent immunoglobulins (IV Ig) (without sucrose) and/or plasmapheresis, which change the economic weight of pharmaceutical cost before lung transplantation. The aim of the study was to estimate the impact of treatment cost on the hospital budget and to compare it to what is currently reimbursed by national health insurance for covering medical costs in patients hospitalized for desensitization before lung transplantation.

**Materials & Methods** We conducted an observational cohort study of people who presented for a desensitization protocol in a lung transplantation context in 2009 at Bichat-Claude Bernard hospital (Paris, France). Data collected included details of number/time/type of hospitalizations, drug regimens and treatment cost.

**Results** In 2009, 7 patients waiting for a lung transplant were hospitalized for a desensitization protocol corresponding to 20 hospitalizations. The mean hospitalization period was 10.6 +/- 2.1 days

(min: 4; max: 46). The median cost, as it is reimbursed by public health insurance, was 3 792 +/- 831 euros per hospitalization.

The real cost of drug for those patients was evaluated at 4 392 +/- 647 euros per hospitalization and 12 550 +/- 3 327 euros per patient, what represents 115% of the total cost of hospitalization. According to what is invoiced by the hospital, the drug part represents 242 euros, which is 18 times less than reality.

The major cost driver was IV Ig representing 89.7% of pharmaceutical costs, widely in front of anti-fungi, anti-CMV drugs or antibiotics.

14/20 hospitalizations matched with IV Ig courses: Patients received in average 2.9 +/- 0.5 courses during 3.9 +/- 0.2 days, at 0.5 g/kg/days, every 37.6 +/- 2.1 days for a mean cost of 5 353 +/- 383 euros per course.

**Discussion & Conclusion** Presence of anti-donor antibody, once an absolute contra-indication to transplantation, can, nowadays, be considered as an immunological hurdle that can be managed through appropriate immunological manipulation. Those new protocols in lung transplantation are very expensive and are not yet fully covered by national health insurance and are supported by hospital budget. Moreover, an evaluation of IV Ig use in this indication seems necessary.

**Keywords** Desensitization, Economic outcomes, Immunoglobulins, Lung transplantation

## PEC-15

### Generic medicines pricing policies in Europe: current status and impact

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**Introduction** Generic medicine pricing is an area of national responsibility of European Union countries. To date, little is known about how generic medicine pricing policies vary between countries, about the incentives that policies create for various stakeholders (e.g. industry, regulatory authorities, health care payers, physicians, pharmacists and patients), or about the impact that policies have on the objectives that countries wish to pursue. This study aims to present the current status and impact of generic medicine pricing policies in ambulatory care in Europe.

**Materials & Methods** The study conducts a literature review of policies relating to free-pricing systems, price-regulated systems, price differentiation, price competition and discounts, and tendering procedures. The literature review identified studies by searching the following databases: Pubmed, Embase, National Health Service Economic Evaluation Database, Cochrane Database of Systematic Reviews, Web of Science and EconLit. The publication date was restricted to January 2000 until October 2009.

**Results** The literature search resulted in 688 citations of which 23 articles were retained for the literature review. Competition from Indian generic medicine manufacturers, European variation in generic medicine prices and competition between generic medicine manufacturers by discount suggest that the potential savings to health care payers and patients from generic medicines are not fully realized in Europe. One way of attaining these savings may be to move away from competition by discount to competition by price. Free-pricing systems may drive medicine prices downwards under specific conditions. In price-regulated systems, regulation may lower prices of

originator and generic medicines, but may also remove incentives for additional price reductions beyond those imposed by regulation. To date, little is known about the current status and impact of tendering procedures for medicines in ambulatory care.

**Discussion & Conclusion** The European experience suggests that there is not a single approach towards developing generic medicine pricing policies in Europe.

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Dylst, P; Simoens, S. Generic Medicine Pricing Policies in Europe: Current Status and Impact. *Pharmaceuticals* **2010**, 3, 471-481

**Keywords** Europe, generic medicines, pharmaceutical policy, pricing

## PEC-16

### How much money and time are the family of dermatology patients willing to trade off for improved quality of life?

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**Introduction** It is well documented that skin diseases can have a detrimental effect on an individual's day to day life and can severely affect their Quality of life (QoL). More recently, new research has highlighted the effect that these skin conditions can also have on the family members QoL. The Family Dermatology Life Quality Index (FDLQI) was developed recently by Basra, M et al. in 2007. This is a 10 item questionnaire designed to measure the negative impact on QoL of family members and partners of patients with skin diseases. There has also been research done into how much patients would be willing to pay (WTP) and Time Trade Off (TTO) for a treatment to suppress all the symptoms of the disease, however there is no research into WTP and TTO for relatives of dermatology patients. The aim of this study is to further research the impact of inflammatory skin conditions on family members QoL and to investigate how much time and money relatives would be willing to spend on a hypothetical treatment to relieve the patient of all symptoms of their disease.

**Materials & Methods** This study was conducted in the Dermatology Outpatients Department at Llandough Hospital. Here, patients family members were approached and asked to take part in the study if they met the inclusion criteria. The questionnaires which were then completed by the participants were the FDLQI, Disease Severity Index, WTP question and TTO question.

**Results** A total of 52 family members participated in the study and the mean score of the FDLQI was 6.48. The mean percentage of relatives monthly wage which they were willing to spend on a hypothetical treatment was 13% and the mean amount of time they would give to this treatment was approximately 3 h per day. The FDLQI showed internal consistency (Cronbach's  $\alpha = 0.83$ ) similar to previous studies and the same factors scored highest on the FDLQI as in previous findings. Strong positive correlation ( $r = 0.604$ ,  $P = 0.01$ ) as found between the perceived disease severity and the impact on the relatives QoL. Positive correlation was also found between WTP and TTO with the FDLQI.

**Discussion & Conclusion** This study has further validated the FDLQI and has demonstrated that families of patients with inflammatory skin conditions QoL is impacted negatively by the disease and that this is important to take into consideration with regards to treatments. The study has also shown that relatives of patients with dermatological conditions are willing to give up their time and money for a treatment that would suppress the symptoms of the disease in the patient. The study has also provided evidence that more severe the disease, the

greater the impact on relatives QoL and the more time and money relatives are willing to spend on a treatment.

**Keywords** Dermatology, Family Dermatology Life Quality Index, Questionnaire, Time Trade Off

## PEC-17

### Categorisation of HTA agencies and their decision-making systems from regulatory approval to reimbursement

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**Introduction** All new medicines need to be granted marketing approval by a regulatory authority before they can be accessed by patients. Licensing approval is based on safety, efficacy and quality. National health providers can then decide if they should purchase the new medicine. This project aims to identify the different organisations and HTA agencies involved from the market authorisation to access of new medicines in 10 countries. This study will also produce a visual method of comparison by creating a process map for each country

**Materials & Methods** The HTA systems and reimbursement processes are to be characterised and evaluated in the following 11 countries: Australia, Canada, Denmark, England, France, Germany, Japan, The Netherlands, Sweden, Switzerland and the United States. Information for each of these countries will be sourced from published sources, IDRAC regulatory database, government and private agency websites, ISPOR Global Health Care Systems Road Map Project ([www.ISPOR.org](http://www.ISPOR.org)) and direct contact with agency officials. Information from these sources will be used to construct a process map for each market. These maps will be of added value as the currently available maps only connect the agencies involved in the process. Each map is to represent the process from marketing authorization to reimbursement by following the steps taken for a new medicines dossier. Therefore the first step taken within each process map will be from the sponsor submission of the dossier.

**Results** This study successfully produced a unique mapping methodology that has been applied to produce a process map to represent the market authorisation to market reimbursement for each of the eleven countries in this study. A table for the Allocation and distribution of key tasks for each country was also produced as an additional aid to the process maps. To help understand the differences in HTA outcomes a table was produced to compare the annual budget and number of full time employees for each of the key agencies that perform HTA.

**Discussion & Conclusion** It is likely that medicines may be approved but not reimbursed. Due to different HTA criteria, a drug may be reimbursed in one country but not in another. The systematic process maps produced in this project will help identify why these differences take place and how such barriers may occur.

The difference in the position of the HTA agency within the decision-making process can help explain the differences in reimbursement decisions and the time taken to reach such outcomes.

**Keywords** HTA, Regulatory Authority, reimbursement, systematic mapping process

## PEC-18

### Monoclonal antibodies: indications, budget impact and use

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**Introduction** The aim of this descriptive study is to explore three features of the market for monoclonal antibodies. First, which monoclonal antibodies are registered for which indications in the European Union and which antibodies are available on the Belgian market? Second, what is the budget impact of monoclonal antibodies in a Belgian university hospital? Third, what is the approved and off-label use of monoclonal antibodies in the same hospital? Our findings may serve to provide insight into the availability, use and costs of monoclonal antibodies in real-life practice and to inform the prescribing behaviour of physicians.

**Materials & Methods** Information about monoclonal antibodies was extracted from the European Public Assessment Reports published by the European Medicines Agency. The Belgian Centre for Pharmacotherapeutic Information was accessed to explore which monoclonal antibodies were marketed in Belgium. Annual data about the budget impact and the number of patients using monoclonal antibodies in University Hospitals Leuven were extracted from pharmacy databases from 2004 to 2008. A qualitative questionnaire was sent to hospital physicians to elicit approved and off-label use of monoclonal antibodies.

**Results** In March 2010, 39 monoclonal antibodies (17 of which are orphan drugs) were registered in the European Union. Around 40% of these were marketed in Belgium. Six monoclonal antibodies were revoked for commercial reasons. The proportion of the hospital drug budget spent on monoclonal antibodies has more than doubled from 8% in 2004 to 17% in 2008. The monoclonal antibody budget was made up of infliximab (41% of budget), trastuzumab (20%), rituximab (10%), cetuximab (9%), ranibizumab (9%) and others (11%) in 2008. Although monoclonal antibodies tend to be used in their registered indications in University Hospitals Leuven, a number of cases of off-label use were documented.

**Discussion & Conclusion** The monoclonal antibody market is expected to continue to evolve with the registration of new antibodies, expansion of indications, and increased utilisation.

**Keywords** Economic outcomes, Hospital pharmacy

## PPH-1

### Patterns of counselling performed in Swiss community pharmacies while dispensing medication

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**Introduction** In the prescribing-dispensing process, community pharmacists are the last point of contact in the healthcare chain and uniquely poised to deliver targeted counselling, to screen for compliance problems and to improve medication compliance. We defined compliance as the extent to which the patient's behaviour matches *agreed* recommendations from the prescriber [1], and counselling as an approach that focuses on enhancing individual problem-solving skills for the purpose of improving or maintaining quality of health and quality of life [2].

**Materials & Methods** We developed a tally sheet based on published recommendations [3] and analysed systematically patient's counselling in 20 randomly selected community pharmacies in the region of Basel, Switzerland. Tacit observation was performed over one day and services provided to every client were manually recorded.



**Results** Services spent by 39 pharmacists and 93 members of their staffs to 1866 clients were recorded during a total of 148 h in February and March 2010. Of the 3922 items dispensed, 44.6% were on prescription. Counselling was provided 1911 times to 834 clients, predominantly by staff members (69%), and statistically more often to patients with a prescription ( $\text{Chi}^2 = 98.3$ ;  $p < 0.0001$ ). Counsels were dispensed on the correct use of the drug (44%), its dosage (35%), its pharmacological effects (15%), and specific compliance issues (6%). Patients with prescription obtained statistically more advices on compliance issues than patients with self-medication ( $\text{Chi}^2 = 14.6$ ;  $p < 0.001$ ). Pharmacists engaged statistically more often in compliance counselling than the other members of their staffs ( $\text{Chi}^2 = 27.3$ ;  $p < 0.001$ ).

**Discussion & Conclusion** Approximately 45% of the clients received at least one explicit counselling during the dispensing process, predominantly those with a prescription. The content of 94% of the advices derived from the summaries of product characteristics, while only 6% treated specific compliance issues, which require specific communication skills. Pharmacy education and continuing education programs need to reinforce the importance of counselling on compliance issues to every patient, and to provide actual and future pharmacists as well as the pharmacy staffs with adequate communication skills and tools.

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**Keywords** adherence, Community pharmacy services, compliance, counselling

## PPH-2

### Appropriateness of prescribing pregabalin

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**Introduction** Pregabalin obtained its first marketing authorisation in Spain in 2004. Since then, its use has increased exponentially. According to the information in the Summary of Product Characteristics (SPC), pregabalin is licensed in adults for the therapeutic treatment of epilepsy, neuropathic pain and generalised anxiety disorder. The main objectives of this study were to determine the appropriateness of the prescribing of pregabalin as well as its pattern of use.

**Materials & Methods** Design: Descriptive, transversal, and multicenter study. Setting: All-area centres from Costa de Ponent Primary Care, of Catalan Institute of Health (coverage for 1.3 million inhabitants). Subjects: 6,247 patients with medical record and an active pregabalin prescription in March 2010. A simple random sample of 256 individuals was selected ( $\pm 6\%$  accuracy). Study period: January 2006 to March 2010. Variables: age, sex, pregabalin dose and schedule, diagnosis for which it is prescribed, duration of treatment, concomitant medication and premedication both for the same diagnosis for which pregabalin is prescribed.

**Results** 27% ( $n = 71$ ) of patients took pregabalin for a therapeutic indication as per the SPC. The diagnoses of all patients taking

pregabalin were: bone and joint pain (41%), neuropathic pain (20.3%), herniated disc or disc disease (13.7%), fibromyalgia (9.8%), anxiety (6.6%), epilepsy (0.8%) and 7.8% not stated. The average age of the sample was 60 years ( $\text{SD} = 14.4$ ) and 64% ( $n = 164$ ) were women. The average daily dose used was 154.7 mg (minimum 25 mg/day, maximum 600 mg/day). Patients over 65 years took lower daily doses than patients younger than 50 years ( $p = 0.029$ ) and those between 50 and 65 years ( $p < 0.003$ ). Of the 256 patients, 48% took pregabalin for less than a year, 27% between one and two years, 19.9% between two and four years and 5.1% for over 4 years. For pain treatment ( $n = 217$ ), 39.2% took a drug associated with pregabalin, 19.8% two drugs, 11.1% three drugs, 0.9% four drugs and 29% did not take any drug associated with pregabalin. In addition, 14.7% of patients had taken gabapentin or amitriptyline before starting treatment with pregabalin.

**Discussion & Conclusion** Pregabalin is used mostly in unlicensed indications even when the evidence of its efficacy is limited to peripheral neuropathy. Only a quarter of treatments with pregabalin are administered for an adequate indication according to the SPC of the EMA, although the FDA has approved the use of pregabalin in fibromyalgia. Other indications such as a herniated disc or disc disease may also be considered a type of neuropathic pain. The average daily dose did not vary by gender, but decreased with age. Three quarters of patients are taking other drugs for the same health problem, therefore increasing the problem of polypharmacy. It should consider first-line treatments based on current evidence/guidelines and product license restrictions.

**Keywords** Drug Utilization, Pregabalin, Primary care

## PPH-3

### Outcomes of diabetes risk-testing performed at community pharmacy setting

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**Introduction** Type 2 diabetes is a global epidemic. The development of the disease can be foreseen and prevented for some of the patients at risk. As easily-available health-care providers, community pharmacists can identify people at high risk of developing type 2 diabetes and counsel/refer them appropriately. International Diabetes Federation recommends the use of brief patient questionnaires to help healthcare professionals to quickly identify people who may be at a higher risk. This study aimed to evaluate the outcomes of a program testing diabetes risk of the clients, performed at the community pharmacy setting.

**Materials & Methods** The study was conducted at a community pharmacy located at Erenkoy District of Istanbul, Turkey. The Turkish version of the Finnish Type 2 Diabetes Risk Assessment Form, providing a measure of the probability of developing type 2 diabetes over the following 10 years was used as the questionnaire. The clients who were seemingly over-weight and older than 45 years of age were invited to the study and the study was carried on those accepting to participate.

**Results** A total of 109 clients participated in the study. Fifty-nine percent of the participants were female and the mean (SEM) age was 54.3 (1.3). The mean (SEM) body mass index was 29.3 (0.3) kg/m<sup>2</sup>. Of the participants, 43% were hypertensive and 16.5% were found to have higher than normal blood glucose levels. Majority (94%) of the participants had abdominal obesity. The risk of developing type 2 diabetes within 10 years was found to be moderate for 31%, high for

24% and very high for 5.5% of the participants. Those at the moderate risk group were advised to consider their physical activity and eating habits. Those in the high and very-high risk group were advised to have their blood glucose levels measured to determine if they have diabetes without symptoms. All these three risk groups were referred to a physician for further guidance.

**Discussion & Conclusion** Even a simple diabetes risk test performed at the community pharmacy can help to identify the patients at high risk and help the prevention/delay of developing diabetes.

**Keywords** Community pharmacy, Risk assesment, type 2 diabetes

## PPH-4

### Prevalence of patients' difficulties in swallowing solid oral dosage forms

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**Introduction** Swallowing difficulties, or dysphagia, can occur in any age group, although it is most common among elderly people. It can affect patients' ability to take solid oral dosage forms, thus compromising medication adherence. Although literature is poor, available data show that prevalence in the general population ranges from 25 to 60%. Prevalence in community pharmacies needs to be explored.

**Materials & Methods** Community pharmacies were recruited from a random selection in three Swiss states: Basel-Stadt (BS), Basel-Landschaft (BL) and Lausanne (LA). Patients' ability to swallow solid oral medications was enquired with a semi-structured interview; the interviewer spent 4 h in each included pharmacy. Each consecutive patient (18 years and older) entering the pharmacy with a prescription for at least 3 different solid oral forms was enrolled. Study was approved by the Lausanne ethics committee.

**Results** Sixty pharmacies took part in the study (20 in BS, 10 in BL, 30 in LA) between March and May 2010. Patient inclusion rate was 77.8% (410/527). Prevalence of swallowing disorders was 22.4% (92/410). Patients with swallowing disorders were older (mean age: 67.5 ± 16 years vs. 63.0 ± 14 years, range 19-96;  $p = 0.03$ ) and more often women (69.6% vs. 59.1%;  $\chi^2 = 3.3$ ,  $p = 0.04$ ) than patients without swallowing disorders. They had on average 4.6 ± 2.7 drugs with a mean number of 5.5 ± 3.3 tablets or capsules to take daily, which didn't differ from the number of drugs taken by patients without swallowing difficulties (4.9 ± 2.5 drugs and 5.9 ± 3.5 tablets; n.s.). The difficulty was mainly related to the big size (63%) or the quality of pill coating (rough, sticky, 14%). Twenty-one patients (37.5%) stated that their swallowing disorders resulted in non adherence, rated as rarely (12 patients), sometimes (6 patients), very often (1 patient) or always (2 patients). According to patients, no pharmacist and only 2 physicians enquired about patients' swallowing issue.

**Discussion & Conclusion** Swallowing difficulties are frequent among patients in community pharmacies in Switzerland with an estimated prevalence of 22%. The problem resulted in non adherence or partial adherence in at least 35% of these patients. However, pharmacists and physicians did not routinely inquire about the disorder. Guidelines should be developed for promoting systematic approaches of patients in community pharmacies.

**Keywords** Community pharmacy, Prevalence, Prospective study, Swallowing difficulties, Switzerland

## PPH-6

### Analysis of the use of Teriparatide and Parathyroid hormone to prevent osteoporotic fracture at primary health care centres in Southern Spain

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**Introduction** The irrational and inappropriate use of drugs is one of the main health challenges in both developed and developing countries. Effective pharmaceutical interventions are necessary to improve prescription quality, a current priority for health systems worldwide. The objective of this study was to examine prescriptions of parathyroid hormones for the prevention of osteoporotic fractures and evaluate their adherence to the established protocol in primary health care centres in a region of southern Spain.

**Materials & Methods** Retrospective analysis (January-September 2009) of the prescriptions of the parathyroid hormones, teriparatide and parathyroid hormone (Pth), to prevent osteoporotic fracture in primary health care centres. Patients were identified by using FARMA software from Microstrategy program. Review of computerized clinical records yielded demographic data (sex, age, etc.) and clinical variables (treatment, previous fragility fracture [FF], densitometry [T score] by dual energy X-ray absorptiometry [DXA] and previous treatment with bisphosphonates, etc.). In the protocol, the prescription was considered appropriate for: option 1) female without FF aged >60 yrs, with DXA <-2.5 and previous bisphosphonate treatment; and option 2) female with FF and previous bisphosphonate treatment.

**Results** Out of the 118 patients under treatment, 9 were male and 109 female. The treatment was appropriate in only 24.8% of patients. Patients inappropriately treated (75.2%) had the following characteristics: a) FF with no previous bisphosphonate treatment (37.6%), b) No FF and aged < 60 yrs (3.7%); c) No FF and aged > 60 yrs: i) T score > -2.5 (22.9%); ii) T score < -2.5 with no previous bisphosphonate treatment (11%).

**Discussion & Conclusion** According to this study, these drugs are frequently prescribed in an inappropriate manner. Analysis of the origin of prescriptions would be useful to develop strategies to promote the rational use of drugs and improve the quality of prescriptions.

**Keywords** osteoporotic fracture, parathyroid hormones, primary care, rational use

## PPH-9

### Representation of elderly persons in clinical trials in pharmacy department of Lapeyronie and Arnaud de Villeneuve University Hospitals

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**Introduction** In 2010, elderly persons older than 65 years represent 16.6% of the french population. They are more at risk for renal, heart, hepatic and neurologic disorders that is why they consume more than a third of the medicines marketed. However, during clinical trials, only a few drugs are tested in elderly patients. According to the guidelines of International Conference of Harmonization<sup>[1]</sup>, drugs must be studied in all age groups. The objective of this study is to evaluate the participation of patient aged 65 or older in clinical trials and to assess the impact of protocol exclusion criteria on the elderly enrollment.

**Materials & Methods** This study was conducted in 2009 at the clinical trials unit of Lapeyronie and A. de Villeneuve pharmacy. 50 clinical trials, among the 210 opened, were selected in a random way respecting the proportion by medical unit. Each trial was analyzed in 2 steps:

- research of an age of inclusion
- for studies without explicit age limits: the most frequent exclusion criteria having an influence on elderly participation were researched as anemia, cardiac disorders, stroke, hepatic disorders, arterial blood pressure, diabetes mellitus, psychiatric and neurologic disorders, and renal failure.

**Results** The 50 studied trials were distributed into 10 clinical departments. The main departments concerned were Pneumology (22%), Infectious diseases (18%) and Immuno-Rheumatology (18%). In 74%, no explicit age of exclusion was found. Among these 74%, only 30% had no factor limiting the elderly recruitment.

For the 70% left, at least one limiting factor was present. Hepatic disorders were involved in 50% of the cases: 20% of the trials exclude patients with transaminases higher than 1.5 times the normal range. In 44% of the cases, renal failure was a limiting factor. Cardiac disorders, including arrhythmia, heart failure and coronary artery disease were implicated in 36% of the cases. 20% of the cases were related to hypertension and 18% to psychiatric or neurological disorders.

**Discussion & Conclusion** Elderly people are underrepresented in published trial literature. In our study, most of the clinical trials analyzed have no explicit age limit of enrollment. However, when elderly people are enrolled, they mustn't present risk factors or associated diseases, which doesn't represent the disease prevalence in this age bracket of the population. The lack of information about the drugs effects on these subjects can explain the arisen of frequent iatrogenic effects.

Efforts have to be made to apply european guidelines for the conduct of trials in specific elderly diseases, in order to obtain the appropriate medication dose and safety in this population.

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**Keywords** clinical trial, elderly persons

## PPH-10

### Inventory of fixtures of the Iatrogenic effects of drugs to the reception of emergency room

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**Introduction** The iatrogenic effect of drugs is a priority of public health where the pharmacist has a determining role. The goal of this study was to determine the various characteristics of the iatrogenic events (IE) such as their proportion, their severity and their cause in order to target, at the local level, a prevention work of these events for the patients and the medical staff.

**Materials & Methods** A retrospective study carried out in April 2010, with 3636 admissions at the emergency department of Libourne hospital made it possible to analyze the admission causes. The admissions for iatrogenic effects were identified after reading the files. The iatrogenic events are then ordered to allow their analysis.

**Results** The results obtained are comparable with the national studies in particular those of the ENEIS<sup>1</sup> in 2004. In 30 days, 181 iatrogenic events (4.9%), of which 151 iatrogenic drugs events (IDE) was

diagnosed. Without sexual prevalence (ratio man/woman = 0, 93), 60% of the patients concerned are more than 60 years old. Two classes of drugs are mainly accused drugs of the cardiovascular system (44%), drugs of the central nervous system (17%). There was almost one admission a day for IDE due to the anti-vitamins K (AVK). 58% of the patients who have more than 60 years admitted for IDE are been transferred to hospitalization department. Only 57 cases are esteemed as avoidable whereas a great majority of the IDE is inevitable (62, 2%).

**Discussion & Conclusion** This observational study received a favorable opinion of the clinicians; therefore a more precise analysis of the iatrogenic events causes for the patients who are more than 60 years will be set up in order to lead to concrete actions of clinical pharmacy.

These actions will help educate medical teams and improve information and the therapeutic education of patients.

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**Keywords** iatrogenic events

## PPH-11

### Antipsychotic drugs and risk of pulmonary embolism

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**Introduction** Antipsychotic drugs (AP) expose to several adverse effects. Since the beginning of the years 2000, the association between risk of venous thromboembolism (VTE) and AP use was emphasized through clinical studies. However, the results are variable according to the study. As the consequences of VTE are often severe, this has led us to conduct an analysis on the relationship between each type of AP, their dose and pulmonary embolism (PE): one of the major complication of VTE

**Materials & Methods** Our study was a retrospective epidemiological analysis assessing the prevalence of PE in AP users versus non AP users. It was based on the data collected from the year 2006 in Premier database. Patients were over 18 year-old and had at least one prescription of AP.

A log regression was performed to analyse the association between PE events and AP use. A dose-effect relationship was assessed according to quantities administered and administration routes. Analyses were adjusted for potential confounders: age, sex, Charlson co-morbidity Index, diagnoses of infection-sepsis, inflammatory bowel, psychotic disorders and in or outpatients.

**Results** Among 28,723,771 included patients, 450,951 (1.6%) presented an AP prescription. Haloperidol was the most commonly prescribed drug (157,667 patients or 35.0%) but atypical APs represented more than 78% of the prescriptions.

The risk of PE was higher in AP users than in the total population (odds ratio = 1.2;  $p < 0.001$ ). Clozapine was associated with the highest risk of PE. Moreover the risk seemed to be correlated to the increase of dose. For each route of administration, the adjusted relative risk rose with the increase of the dose of AP.

**Discussion & Conclusion** This study suggests a moderate but statistically significant increase risk of PE among AP users. Some others

studies have suggested a global increase (1,2). We have looked specifically at each type of AP and found differences in terms of PE risk (except for quetiapine and aripiprazole). An innovative relationship between the risk of PE and the AP dose used is described. All analyses were adjusted for potential confounders.

Further studies are required to confirm the relationship and especially to explain the mechanism but this study suggests an increased risk of PE with AP treatment, changing with the type of AP and dependent on administered dose.

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**Keywords** antipsychotic drugs, doses, Pharmacoepidemiology, Pulmonary embolism

#### PPH-12

##### Potentially inappropriate drug prescribing for the elderly: experience of an internal medicine department in a French General Hospital

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**Introduction** Drug induced adverse effects are frequently encountered in the elderly. In order to improve the quality of prescription in this population various medication assessment tools were developed to evaluate the appropriateness of treatment. The most quoted and used tool is the Beers criteria (last update in 2002). French criteria have been adapted from the Beers Criteria. The purpose of this study is to evaluate, over a 2-month period, the extent of inappropriate drug prescribing for the elderly from hospitalisation to discharge according to the French criteria.

**Materials & Methods** A 2-month prospective study was undertaken from 06/04/2010 to 04/06/2010. This study is conducted in a 30-bed Internal Medicine Department in a French General Hospital. All new patients hospitalised in this Department, aged 65 or over were included in the study. Prescriptions were classified as inappropriate if they fulfilled the French criteria.

**Results** In this Internal Medicine Department at the point of admission 99 prescriptions for elderly patients (38 male, 61 female) with an average age of 82.4 (range 66–97) years were reviewed. The total number of medications reported was 926. Each patient received an average of 9.35 drugs (range 2–19). According to the French criteria 8.21% (76/926) of medications reported were classified as inappropriate in 50 patients. Among these 50 patients 62% (31/49) received only one inappropriate drug, 26% (13/50) received two inappropriate drugs and 12% (6/50) received 3 or more inappropriate drugs. The most common inappropriate drug groups prescribed were psychotropic drugs (73.68%) followed by cardiovascular drugs (19.73%).

There was no significant difference between the number of inappropriate drugs prescribed at the point of admission and the number of inappropriate drugs prescribed at the point of discharge (83 versus 76). The most common drug groups prescribed were psychotropic drugs (83.13%).

**Discussion & Conclusion** The results show that, if the French criteria are used, there is a high rate of inappropriate drug prescribing for the

elderly. A reduction in the rate of inappropriate drug prescribing for the elderly is difficult for doctors. Indeed, most psychotropic drugs or cardiovascular drugs cannot be stopped abruptly because of their adverse reactions. This is especially the case when these drugs have been prescribed for many years.

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**Keywords** Elderly Patient, general hospital, Inappropriate medications

#### PPH-13

##### Asthma care in primary health care clinics under surveillance

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**Introduction** As one of the world's most common lung illnesses, asthma, and even more so, uncontrolled asthma, places a sizeable onus on health care systems and expenditures. Management and control of asthma provide even more challenges, since no single view or measurement can be coupled to it. Recognition of substantial asthma control and implementation of practice guidelines can however lead to improved disease management. The objective for the study was to evaluate the fulfilment of therapeutic goals as set out by science-based guidelines for diagnosis and management of asthma, thereby contributing to improved managed health care through implementation of proper management skills.

**Materials & Methods** Retrospective evaluative study; reviewing medical records of asthmatic patients for specific outcome measures; two time frames of 3 months each, 6 months apart (May–Jul 2008 and Feb–Apr 2009).

Six statistically verified pre-selected local primary health care clinics in the Dr Kenneth Kaunda Municipal District, Potchefstroom, South Africa.

Essential quality measures, focusing on health care, provider care and patient health status, were selected as reflectors of quality of care. Clinical activities feasible for monitoring in this context were: diagnosis; patient follow-up; severity symptoms, as well as trigger- and co-morbid condition consideration.

**Results** A total of 212 eligible patient records were reviewed over the 2 time frames. Quality measures depicted the following outcomes for the different time intervals: 74% and 94% had a documented asthma diagnosis; 80% of patients were given follow-up dates in both intervals. Care deficiencies came to light in the areas of symptom enquiring, trigger factor and co-morbid condition considerations, with percentages varying from 4% to 22%.

**Discussion & Conclusion** The data obtained assist as a guide for health care providers to institute change for the purpose of ensuring optimal patient outcomes, thereby advancing health and quality of life by bridging the current knowledge and best practice gap.

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**Keywords** Asthma, Clinical outcomes, Implementation, Management skills, Quality of care

## PPH-14

### Migraine in patients with Rosacea

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**Introduction** Rosacea is a common chronic skin disease. Abnormalities of small blood vessels are assumed to be key causative factors, but various hypotheses have been postulated. Like rosacea, migraine has been associated with abnormal vascular physiology. Triptans (selective 5HT<sub>1</sub>-receptor agonists) stimulate cranial vasoconstriction and are effective against migraine headache. Only few studies with inconsistent findings explored the association between migraine and rosacea.

**Objective:** This study aimed to analyze the association between migraine and the risk of developing a first-time diagnosis of rosacea. We further explored a possible association between use of triptans and incident rosacea.

**Materials & Methods** We conducted a case-control analysis using the UK-based General Practice Research Database. We included 60,113 rosacea patients and the same number of controls in the analysis. We identified cases with an incident diagnosis of rosacea between 1995 and 2009, and matched each control to a case patient on age, sex, general practice and index date. We compared the prevalence of migraine and the exposure to triptans prior to the index date between patients with rosacea and rosacea-free controls.

**Results** A history of migraine was slightly more prevalent in cases with rosacea as compared to rosacea-free patients (odds ratio, OR 1.23, 95% CI 1.18–1.29), after adjusting for smoking, alcohol consumption, body mass index, diabetes mellitus, hypertension and use of calcium channel blockers. The highest OR associated with migraine was found in women above the age of 50 years (adj. OR 1.41, 95% CI 1.30–1.53). Additional adjusting for use of hormone replacement therapy did not substantially influence the OR (adj. OR 1.35, 95% CI 1.25–1.47). The ORs were similar for patients with migraine who used triptans (adj. OR 1.30, 95% CI 1.20–1.41) and for patients not using triptans (adj. OR 1.21, 95% CI 1.15–1.27), as compared to patients without migraine. Stratification by the total number of prescriptions, as an indicator for severity of migraine, did not reveal a difference in ORs.

**Discussion & Conclusion** Our findings suggest that patients with migraine, with or without triptan use, may be at a slightly increased risk for an incident rosacea diagnosis. The frequency of triptan use, a marker for migraine severity, did not influence the risk estimate. Women of 50 years or older were at a slightly higher risk of developing rosacea.

**Keywords** migraine, rosacea, triptan

## PPH-15

### Sugammadex in reversal of deep Neuromuscular Blockade: preliminary results from its use at the University Hospitals of Lyon

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**Introduction** Sugammadex is a new agent with a cyclodextrin based chemical structure that is active to only reverse the action of Rocuronium and Vecuronium, two nondepolarizing neuromuscular blocking agents (NMBA). At the time of its admission on our formulary, little was known concerning its positioning in routine practice and its use was expected to increase the costs of reversal. The aim of this study was: to describe the first uses of Sugammadex in our hospital and to evaluate the cost associated and its potential impact on the use of NMBA.

**Materials & Methods** Because of its substantial cost, the Drug Committee validated consensual guidelines regarding its use in agreement with anesthetists. Two indications were then selected: reversal of deep neuromuscular blockade induced by Rocuronium or Vecuronium at the end of the surgery; reversal of deep neuromuscular blockade induced by Rocuronium in case of impossible intubation. A dotation of the drug was established in four anesthesiology departments in order to follow up patients treated with Sugammadex. An observational prospective study has then started as from November 2009 on patients being treated. A form was validated to collect data regarding patients' characteristics (age, sex, ASA score), or the use of sugammadex and NMBA. Furthermore, an assessment of costs of reversal by Sugammadex was performed. Since rocuronium and vecuronium are not frequently prescribed, we also assessed the impact of the introduction of Sugammadex on the use of NMBA. A basic description analysis was carried out with mean (minimum-maximal data).

**Results** 14 patients were treated with over the period November 2009-June 2010. Mean age was 65 (30–89) and 78% were women. Patients were cared for visceral or gynaecological surgery. The NMBA used in all cases was Rocuronium and its first indication was the crash induction when Succinylcholine was contra indicated. One patient received Sugammadex in the case of an impossible intubation. In the other cases, it was administered to reversal deep neuromuscular blockade at the end of the surgery. The mean dose was 5 mg/kg (2–16). For 3 patients, dose was different than recommended by health authorities. No side effects related to NMBA or reversal drug have been reported during this study. Average costs of reversal by Sugammadex were estimated at 209€ per patient (74–740). No significant trend towards a change in the use of NMBA has been observed.

**Discussion & Conclusion** This study provides a first description of characteristics of the population treated with Sugammadex in the Hospices Civils de Lyon. Results underline the increased costs of deep neuromuscular reversal by Sugammadex in comparison with passive reversal. The preliminary report is being completed with an assessment of the economic impact of Sugammadex on the length of stay and on the costs of PACU.

**Keywords** deep neuromuscular blockade, selective relaxant binding agent, Sugammadex, therapeutic use

## PPH-16

### Impact of a vaccination Campaign against influenza a in a hospital

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**Introduction** Last winter, in a pandemic context, we got interested by the point of view of health-care providers concerning the vaccination.

This work was carried in a geriatric hospital thanks to medical care professionals and administrative staff.

The aim was to define the profile of people feeling concerned by the vaccination campaign against influenza A H1N1.

**Materials & Methods** During autumn 2009, a 25 questions quiz was designed with yes/no or multiple choices questions. Questions were related to anthropometric and social characteristics (sex, age, job), reasons for vaccination, use of alternative therapeutics and reasons for all these choices.

144 questionnaires were collected and analyzed by a Bayesian neurons network software (Bayesia Lab®). This non parametric tool enabled us to isolate the criteria (questions) which could explain the will for vaccination. This work was divided into two parts:

1. A learning part based on our database (questionnaires): the criteria were ranked according to the strength with the target variable (will for vaccination).
2. A simulation part where we could draw the profile of subjects who wanted to be vaccinated.

**Results** 78% interrogated people thought the questionnaire was useful. 24% intended to be vaccinated, 60% didn't wish and 16% gave no answer. The neurons network showed that variables influencing the decision for vaccination (relative importance above 12%) were the reasons for vaccinating, the use of alternative therapeutics, the age, the vaccination against winter flu and the sex. People wishing to be vaccinated had the following trends: 63% did it to protect the community, 68% to protect themselves, and 63% to protect their close relatives. 91% didn't think about an alternative way to protect, 90% intended to be vaccinated against seasonal flu, 60% were women, and most of these people were between thirty and fifty years old. Concerning people who didn't want to be vaccinated, the first reason for their choice were the doubts about the security of this recently developed vaccine (52%), 12% didn't feel concerned by the vaccination against H1N1, and 7% defined as reticent about vaccination in general.

**Discussion & Conclusion** Right at the beginning of the pandemy, 24% of healthcare providers intended to be vaccinated. The main reason was the idea of protection, which was also a major argument of the national vaccination campaign. Finally, only 15% of the healthcare professionals got vaccinated in our structure; questions about the relevancy of this vaccination campaign can thus be raised.

**Keywords** healthcare professionals, pandemy, profile, Vaccine A/H1N1

## PPH-17

### Relation between antibiotics, indwelling urinary catheters and nosocomial bloodstream infections

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**Introduction** Blood Stream Infections secondary to Urinary Tract Infection (BSI-UTI) are predominant nosocomial bacteremia. The worsening of UTI to BSI depends on the initial treatment with antibiotics and the presence of risk factors such as indwelling urinary catheter (IUC). The purpose of this study was to determine the impact of the consumption of urinary antibiotics and IUC on the incidence of nosocomial BSI-UTI at the Centre Hospitalier Lyon Sud (CHLS).

**Materials & Methods** The BSI-UTI incidence was determined using data from epidemiological bacteremia survey conducted by the Hygiene and Epidemiology Unit (HEU). Data from 2003 to 2007 were analyzed using Epi-Info and SPSS softwares. Antibiotic use data (Defined Daily Doses -DDD) and IUC consumption (units consumed

per 100 patients) were extracted from the pharmacy inventory management software. Only norfloxacin data were analyzed because UTI is its only validated indication. Regression lines were plotted and coefficients of correlation ( $R^2$ ) were calculated to observe the strength of the relationship between BSI-UTI and antibiotics and IUC consumption. The analysis was performed at CHLS overall and by major sector of care (Medicine, Surgery, Intensive Care).

**Results** The BSI-UTI incidence data and norfloxacin DDD crossed analysis has showed a close relationship of proportionality in Surgery area. Indeed,  $R^2$  was calculated at 78.0%. The regression line showed a marked inverse relationship. Regarding the crossing of norfloxacin DDD and IUC, a close relationship of proportionality was observed in overall CHLS ( $R^2 = 77.9\%$ ) and in Medicine ( $R^2 = 92.3\%$ ) and Surgery area ( $R^2 = 76.2\%$ ). The regression lines drawn showed a proportional relationship.

No proportionality was found for the Intensive Care area.

**Discussion & Conclusion** The inverse relationship between BSI-UTI incidence and norfloxacin DDD observed in the Surgery area can be explained in that a urine test is done routinely at the hospital admission and that each positive test results in a prescription for antibiotics even without clinical UTI signs. These practices are specific to the Surgery area, which may explain the lack of proportionality in other sectors. This suggests that the norfloxacin DDD increase leads to a lower incidence of BSI-UTI. On the other hand, regression analysis allowed us to see that there was a proportional relationship between the norfloxacin DDD and the number of IUC on the overall level of CHLS but also at the Surgery and Medicine sectors. So it would seem that the increased IUC causes an increased risk of UTI represented here by the increase of norfloxacin DDD. This study, based on the combination of HEU and Pharmacy service data has highlighted prescribing practices for specific services and the impact of these requirements on the incidence rate of BSI-UTI. This work shows the richness of the exploitation of epidemiological survey data and consumption of drugs and medical devices.

**Keywords** epidemiological survey, indwelling urinary catheter, norfloxacin, nosocomial bacteremia, urinary tract infection

## PPH-18

### Analysis of the real availability of the orphan drugs in the Slovak Republic

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**Introduction** The research and development of the drugs for treating rarely occurring diseases with prevalence not more than 5 in 10 000 persons in the European Union (EU)–orphan drugs (OD) have become the priority of the medical and research programs of several EU Member States (1,2). The aim of this analysis was to identify the availability of OD in the Slovak Republic (SR). Since in SR the drugs are available for the patients when they get their reimbursement class—are categorized, we analyzed the duration of implementation into the categorization list.

**Materials & Methods** We analyzed data between May 2004, when SR joined EU, and December 2009. We used data from the European Medicines Agency website (list of authorized orphan drugs) and Slovak Ministry of Health website (categorization list). Further used data were ATC codes, date of authorization and date of implementation into the categorization list. Real availability of the OD was calculated as the difference between date of EU authorization and date of categorization in SR.

**Results** Up to 1. 1. 2010, 59 OD were granted an EU marketing authorization. The most of the OD were authorized in ATC group L – antineoplastic and immunomodulating agents–27 (45.7%) and group A–alimentary tract and metabolism – 12 (20.3%). In the same period, in SR, 24 OD (40.7% all OD) were categorized; most of them were from ATC group L (9–37.5%) and group A (6–25%). All OD in SR are 100% reimbursed. However only 8 OD met the legislative demand concerning the time from authorization to categorization of the medical product (12 months). The rest (16 OD) reach the Slovak market with average delay 14 [1–38] months.

**Discussion & Conclusion** Although the Slovak healthcare policy is friendly to OD and all OD have 100% reimbursement, however less than 50% of the authorized OD reached the market. Our analysis also highlighted that there are still limits in fast OD implementation into the categorization list and thus their real availability.

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**Keywords** categorization list, marketing authorisation, orphan drugs, rare diseases, reimbursement

#### PPH-19

##### Identification potential drug- drug interaction in elderly patients receiving polypharmacy prescription

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**Introduction** Polypharmacy can be defined as the use of multiple medications and/or the administration of more medications than are clinically indicated, representing unnecessary drug use. Problems related to polypharmacy (adverse reaction and drug-drug interactions) are most often associated with the elderly. The aim of this study was to evaluate the frequency and severity of potential drug-drug interactions in polypharmacy prescriptions of elderly patients.

**Materials & Methods** A retrospective prescription review was conducted in a pharmacy records between January 1 and December 31, 2007. The study population included elderly patients aged  $\geq 65$  years, who had a prescription with 4 or more medication over a 1-year period. The potential drug-drug interactions were identified by using drug interaction checker in Medscape softwares.

**Results** Among 100 elderly patients, 55% were female and the mean age was 68.42 (range from 65–75). The number of comorbid diseases per patient was  $2.67 \pm 1.04$  (range 1–5). The most common chronic diseases were hypertension (58%), diabetes mellitus (40%), hyperlipidemia (32%), coronary artery disease (25%), heart failure (16%), depression (14%), and chronic obstructive pulmonary disease (11%). The number of medications used by patients was  $6.04 \pm 1.50$  and ranged from 4 to 13. Total of 62 potential drug-drug interactions were determined in thirty-nine of the patients. Angiotensin-converting enzyme inhibitors (43.54%) were most frequently involved in potential drug-drug interactions. The most commonly implicated potential risks were hypoglycemia (29.03%), decrease in antihypertensive effect (25.81%), hypotension (11.29%), and hyperkalemia (8.06%). The most serious drug-

drug interaction were between theophyllines and quinolones (4.84%), which may result increase in the toxic effects of theophylline, digoxin and kaluretics (11.29%), which may result digitalis toxicity, and warfarin and quinolones (6.45%), which may result increased risk of bleeding.

**Discussion & Conclusion** Elderly patients receiving polypharmacy prescription are greater risk of potential drug-drug interaction. Patient oriented services providing by clinical pharmacists such as taking drug profile, patient education, drug therapy monitoring will reduce the frequency of drug-drug interaction. In the present study, the prescribed medications were only evaluated; in further studies, we consider to evaluate the OTC and dietary supplements using in elderly patients which may cause potential drug-drug interaction.

**Keywords** Geriatrics, Polypharmacy, Prescribing, Prescribing

#### PPH-21

##### Distribution of serum 25-hydroxyvitamin D levels in a sample of geriatric long term care unit patients before and after supplementation

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**Introduction** In literature, several physiological processes involving vitamin D are described<sup>1</sup>: bone metabolism and neuromuscular function but also in the immune system, glucose metabolism and prevention of cardiovascular diseases. Its interest is documented on reducing the risk of falls and fractures in the elderly. By the Bischoff-Ferrari and als meta-analysis<sup>2</sup>, the optimum threshold of 25-OH vitamin D required to prevent falls in older individual is upper 60 nmol/L.

Our objectives were:

- to estimate the vitamin D deficiency incidence in a 86-bed geriatric unit where the patients were not supplemented,
- to estimate the rate of patients whose serum levels of vitamin D is greater than 60 nmol per liter after administration of 2 three monthly 200 000 UI oral vitamin D3 supplementations.

**Materials & Methods** A prospective observational study was carried out. The serum levels of serum 25-hydroxyvitamin D were measured before and after supplementation.

**Results** The study included 43 subjects (33 ♀ 10 ♂), with a mean age of 85.3 [65; 102] before supplementation and 26 after supplementation (20 ♀ 6 ♂), with a mean age of 84.3 [65; 96]. Before supplementation, the mean estimated creatinine clearance (MDRD) was 82.5 ml per minute [40;185].

Before supplementation, all patients were found to be vitamin D-deficient: 27/43 had vitamin D levels below 10 nmol per liter and 16/43 a level between 10 and 42 nmol per liter. The mean 25-hydroxyvitamin level was 10.4 nmol per liter.

After supplementation, 13/26 patients were over the clinically meaningful threshold of 60 nmol per liter. The mean serum 25-hydroxyvitamin D level was 57.8 nmol per liter [19; 98].

**Discussion & Conclusion** Our study goes on. We can now record the impact of the adjusted vitamin D level on the number of falls in the unit.

The oral administration of 2 three-monthly vials of 200 000 UI vitamin D allows us to improve the serum 25-hydroxyvitamin level. Because of the vitamin D properties, physicians should be encouraged to check and monitor patients' serum levels of 25-hydroxyvitamin D.

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**Keywords** Elderly, falls, geriatric hospital, Vitamin D supplementation

## PPH-22

### Study about the behaviours of the population of “Pays de la Loire” to the antibiotics

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**Introduction** To get a better knowledge of the consumption of antibiotics by the people living in the region “Pays de la Loire”, an opinion survey was done in 2003, in 2004 and in 2005.

This study was done again in 2010 in order to highlight the evolution of people’s behaviours towards antibiotics since 2005.

Questions aiming at measuring the impact of the French campaign « Les antibiotiques, c’est pas automatique » and the awareness level of the population were added to the previous survey.

**Materials & Methods** The study was carried out on people representing a good sample of the region’s population by the MedQual centre and by the department of Clinical Pharmacy and Public Health of the Pharmacy Faculty of Nantes with the 3rd, 4th, 5th and 6th year students’ participation.

**Results** 1257 people answered the survey (average age: 38.4 years old, man/woman ratio: 0.78). The consumption of antibiotics is the same as in 2005 but people respect more the length of the treatment: 37.1% of the people questioned took antibiotics during the last 6 months (37.3% in 2005; *p* no significant) but 79% of the people said that they respect the length of the treatment for 75% in 2005 (*p* = 0.01). Patients’ requests for antibiotics to their doctor did not decrease (16.9%; *p* no significant) but the doctors seem to have refused more often (48.6% for 43.4% in 2005; *p* < 0.001). As in 2005, behaviours of self-medication with antibiotics exist for a quarter of the people who took the survey. In 2010, almost half of the people who used self-medication used antibiotics, available in their home, in order to protect themselves against pathologies they say they know (46.2%) and 23.5% for a recidivism.

The awareness campaign was declared “useful” by 65.3% of the people. Among them, the proportion of people using self-medication and asking antibiotics to their doctor is the same as the total population questioned. The survey showed that 61.4% of the people who took the survey thought that bacteria are developing because of an excessive consumption of antibiotics. Those figures are the same as the ones of the “Assurance Maladie” (French National Health Service) in 2005. The number of people questioned thinking that they are using too many antibiotics decreased significantly (16.2% in 2005 against 8.7% in 2010; *p* < 0.001).

**Discussion & Conclusion** The past studies highlighted a strong awareness of the people due to the campaign done by the “Assurance Maladie” since 2002. We notice that 5 years after the last study, the behaviours seem to remain the same and this confirms that it is important to keep this action going in time with another awareness campaign.

**Keywords** Antibiotics

## PPH-23

### Qualitative and quantitative exposure to QT-prolonging antibiotics in 3 geriatric hospitals from 2006 to 2009

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**Introduction** Various antibiotics may prolong the cardiac QT interval and increase the risk of torsades de pointes (TdP), which is a rare but potentially lethal cardiac arrhythmia. However, the risk profile of each agent is variable (1). Previous studies have shown various trends in the use of QT-prolonging antibiotics among European countries (2). The objective of this work was to assess the evolution of the qualitative and quantitative patients’ exposure to antibacterials with QT liability in our clinical setting, over a four-year period.

**Materials & Methods** Fifteen QT-prolonging antibacterial agents available in our institution (Hospices Civils de Lyon, HCL) were studied. Those agents were classified in 4 groups according to their QT-prolonging potential, from B (any evidence of QT prolongation) to E (strongest clinical evidence of long-QT and TdP), using the classification proposed by Raschi et al. (2). The consumption data from 2006 to 2009 of those 15 antibiotics, used by both oral and parenteral routes, were retrieved using the information system of 3 geriatric hospitals (903 beds) of HCL. This system also provided the number of days of hospitalization over the same period. For each antibiotic, the annual data were expressed as Defined Daily Doses (DDDs), using the method recommended by the World Health Organization (WHO) ([http://www.whocc.no/atc\\_ddd\\_index/](http://www.whocc.no/atc_ddd_index/)). For antibiotics for which no DDD was available, we considered the DDDs to be equal to the recommended daily doses. Finally, data were expressed as DDD per 1000 days of hospitalization, which is a measure of patients’ exposure. The uses of the four groups of antibiotics were compared over the four-year period.

**Results** From 2006 to 2009, the total consumption of the 15 agents decreased from 63.41 to 59.56 DDDs per 1000 days of hospitalization (-6%). In 2009, the patients were mainly exposed to group D drugs (70%, *n* = 6 drugs), followed by group E (18%, *n* = 6), B (12%, *n* = 2) and C (*n* = 1). Over the four-year period, exposure to group E agents (highest QT-prolongation risk) increased from 7.92 to 10.89 (+38%). In this group, consumption of clarithromycin and erythromycin increased twofold, from 0.7 to 1.43 and from 0.87 to 1.70, respectively. By contrast, the use of antibacterials with a lower risk profile decreased from 10.49 to 6.95 (-34%) for group B and from 44.86 to 41.54 (-7%) for group D. Exposure to group C drugs (telithromycin only) was quite stable (0.14 in 2006 and 0.18 in 2009).

**Discussion & Conclusion** This study showed substantial exposure of geriatric patients to antibiotics with QT liability in our institution. From 2006 to 2009, a trend towards an increasing use of antibiotics with the highest risk of QT-prolongation was observed. Our results are consistent with those from the European study of Raschi et al. (2). This trend might result in more cases of long QT and TdP due to antibiotics. Pharmaco-epidemiological studies are required to confirm this hypothesis.

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**Keywords** Antibacterial agents, Drug use, QT liability, Torsades de pointes

## PPH-24

### Antihypertensive drugs and the risk of developing Alzheimer's disease

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**Introduction** Alzheimer's disease (AD) is the most frequent form of dementia and constitutes an important cause of morbidity in the elderly. Angiotensin (AT)-II receptor antagonists and other antihypertensive drugs have been postulated to reduce the risk of developing AD [1]. However, findings from different studies are inconsistent [2]. **Materials & Methods** We conducted a case-control analysis using the UK-based General Practice Research Database (GPRD). We identified cases aged  $\geq 65$  years with an incident diagnosis of AD between 1998 and 2008 who were  $\geq$  three years on the database prior to the index date. We matched one control patient to each case on age, sex, general practice, calendar time, and years of history in the database. We compared exposure prevalence to various antihypertensive drugs prior to the index date between cases and controls and stratified by duration and intensity of use. Corresponding odds ratios (ORs) with 95% confidence intervals (CI) were calculated using conditional logistic regression.

**Results** For all classes of antihypertensive agents analysed (beta-blockers, calcium channel blockers (CCBs), angiotensin converting enzyme (ACE) inhibitors, AT-II receptor antagonists, diuretics, and their combinations), exposure prevalence in controls was higher than in cases, across all levels of duration and intensity of use. The odds ratios (ORs) for current users (last prescription  $\leq 90$  days prior to the index date) of 20 or more prescriptions for an AT-II receptor antagonist or for an ACE inhibitor were 0.49 (95% CI 0.40 to 0.60) and 0.58 (95% CI 0.52 to 0.65), respectively.

**Discussion & Conclusion** In the current study population, use of AT-II receptor antagonists and other antihypertensive drugs was associated with a reduced risk of developing AD. It remains unclear whether the observed association of considerable magnitude is causal.

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**Keywords** Alzheimer's disease

## PPH-25

### Effect of pharmacist intervention on patient compliance in treatment of upper respiratory tract infections in children

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**Introduction** Upper respiratory tract infections (URTIs) are the most common reasons for children to visit the physician's office and antibiotics are frequently prescribed for URTIs despite the fact that most URTIs have a viral etiology. The aim of our study was to determine the treatment profiles of children suffering from an URTI and assess the impact of clinical pharmacist-led-antibiotic-education on compliance.

**Materials & Methods** Patient profile form, knowledge assessment form (applied at the first encounter) and antibiotic compliance assessment form (applied by phone on the final day of antibiotic treatment) were applied on both the control group and the study group. The study group consisted of 48 parents of children suffering from URTIs and having an antibiotic suspension prescription. Parents were contacted face to face during their visit to the pharmacy with their child's prescription. The control group consisted of 43 parents who previously visited the pharmacy with their child's prescription including an antibiotic suspension and had a routine dispensing. The participants in the control group were contacted only by telephone. The study was conducted in 3 community pharmacies in Kocaeli-Turkey between September 2008 and November 2008.

**Results** 66% of the participants' children ( $n = 91$ ) were diagnosed with "tonsillopharyngitis" and the most commonly prescribed antibiotic was amoxicillin-clavulanate (34%). Analgesic-antipyretics were prescribed for 63% of the children and the most common was ibuprofen. The study group was found to be more compliant to dosage intervals and dosage amounts compared the control group ( $p < 0.05$ ). It was also found that the study group was more careful about correct storage conditions of the antibiotic suspensions compared to the control group ( $p < 0.001$ ).

**Discussion & Conclusion** Results of the study suggest that parents knowledge about antibiotic treatment is insufficient and clinical pharmacist-led education had positive impact on compliance.

**Keywords** Children, Clinical Pharmacist Interventions, Compliance, Patient Education, Upper Respiratory Tract Infections

## PPH-26

### Psychometric evaluation of a family psoriasis specific quality of life instrument

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**Introduction** Assessing HRQoL in family members is a new concept in dermatology. PFI-15 has been produced to assess the affect psoriasis has on families of patients<sup>1</sup>. The aim of this study is to validate PFI-15.

**Materials & Methods** 50 pairs of patients and their family members were recruited from outpatient and day care clinics at the Dermatology Department of UHW, Cardiff. Patients and family member's completed 3 different QoL questionnaires each in presence of the investigator. Patients completed Dermatology Life Quality Index (DLQI), Impact of Psoriasis Questionnaire (IPSO) and Patient's Global Assessment of Disease Severity. Family member's completed Family Dermatology Life Quality Index (FDLQI), Psoriasis Family Index (PFI-15) and Family Member's Global Assessment of Disease Severity. Participants were fully briefed and study info sheets read before giving written consent. In absence of family member, questionnaires were given to patient for family member to complete and return. Total score of each questionnaire calculated by adding

individual item scores. A higher score represented greater impairment of QoL.

**Results** 50 pairs of patients and their family members were recruited from outpatient and day care clinics at the Dermatology Department of UHW, Cardiff. Patients and family member's completed 3 different QoL questionnaires each in presence of the investigator. Patients completed Dermatology Life Quality Index (DLQI), Impact of Psoriasis Questionnaire (IPSO) and Patient's Global Assessment of Disease Severity. Family member's completed Family Dermatology Life Quality Index (FDLQI), Psoriasis Family Index (PFI-15) and Family Member's Global Assessment of Disease Severity. Participants were fully briefed and study info sheets read before giving written consent. In absence of family member, questionnaires were given to patient for family member to complete and return. Total score of each questionnaire calculated by adding individual item scores. A higher score represented greater impairment of QoL.

**Discussion & Conclusion** The principal caregiver's in this study were female partners and spouses. Item seven with the highest mean score relates to psychological aspects of family QoL. Convergent validity was assessed by comparing PFI-15 questionnaire and FDLQI questionnaire as they both measure the same attribute i.e. the affect psoriasis has on family member's QoL. A very strong correlation between these two questionnaires was shown. Reliability of this scale was very close to one deeming the PFI-15 to be highly reliable as closer the Cronbach's Alpha is to one, the more reliable a scale is<sup>3</sup>. PFI-15 is a simple, easy-to-use and valid questionnaire for measuring family QoL in psoriasis.

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**Keywords** Psoriasis, Psoriasis Family Index, Quality of Life, Questionnaire

## PPH-27

### Prescription of Intravenous immunoglobulins: what is our practice? Description of a one-year cohort of patients in a French university hospital

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**Introduction** IntraVenous Immunoglobulins (IV IG) are expensive drugs. To be reimbursed by the French Social Security, indications have to be conformed of the National Best Practice Guideline (NBPG) published by the Health Authorities (version 1, January 2009). However this guideline needs regular updates to include emerging indications. Since several years the IVIG committee followed the emerging indications in our hospital and collected bibliographic and scientific proves for each new indication. We defined an emerging indication as a non labelled indication in the NBPG.

**Objective:** To describe the HCL IVIG prescriptions in regard to the NBPG during one year and to identify emerging indications (proportion ant type). Each patient was included one time.

#### Materials & Methods

**Design:** Retrospective observational study led during 1 year (2009).

**Setting:** We included all patients who were admitted in our hospital for, at least, one prescription by IV IG in 2009 (January 1<sup>st</sup> to December 31<sup>th</sup>).

**Main outcome measure:** Proportion of indications in the third group of the NBPG (Class I: Market Access Authorization, Class II: Temporary Therapeutic Protocol, Class III: misuse) and proportion of emerging indications. We divided them in 2 groups: emerging indication known by the IVIG committee and the others.

**Results** 653 patients were included in our study. 87% (570 patients) of the indications were conformed to the NBPG. 73% (n = 476 patients) of indications were Market Access Authorizations. Secondary immune deficit was the main indication of this class. Temporary Therapeutic protocols represented 14% of the indications (n = 93 patients): the proportion of Acute Myasthenia and corticosteroid resistant dermatomyositis were respectively 39% (36 patients) and 30% (28 patients). There was only 1 misuse (Autoimmun neutropenia). 13% (83 patients) were emerging indications. 7% of these indications (44 patients) were known by the IVIG committee because patients were treated since several years in our institution. The main indication was curative and/ or prophylactic humoral renal graft rejection. 6% were unknown emerging indications (38 patients) and were composed of 16 different indications. In this subgroup bacterial toxin diseases represented 24% (9 patients), pulmonary graft rejections were 11% (4 patients) and cardiac graft rejection were 8% (3 patients). Other indications of this subgroup were represented by a poor number of patients (mean 1 patient).

**Discussion & Conclusion** This evaluation is necessary for us to know our cohort of patients in order to search scientific proves and to inform the Health Authorities to update the NBPG. It is also important for us to promote national clinical studies led by our hospital.

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**Keywords** emerging indications, evaluate, intravenous immunoglobulins, national best practice guidelines

## PPH-28

### Re-assessment of Antialzheimer drugs in a long term care unit

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**Introduction** The management of neurodegenerative diseases in long term care units (LTCU) is a major public health concern, according to the increasing age of population and cost expenditure associated with anti-Alzheimer (AA) drugs. A serial re-assessment of clinical neuropsychological staging may improve appropriateness of maintaining therapy with AA drugs overtime.

**Materials & Methods** Setting: A 180 beds geriatric long term care facility belonging to a university hospital group (René Muret hospital, CHU Paris 13, APHP, Seine St Denis, France).

Retrospective study of medical charts: All patients treated by acetylcholinesterase inhibitors (AChEIs) and / or memantine in 2008 were included. The following data was collected: age, disease diagnosis, dosage and re-assessment of AA drugs, associated prescription of psychotropic, score of Mini Mental State Examination (MMSE).

**Results** Among 180 hospitalised patients in 2008, 31 patients received AA drugs. The mean age was 84 years [75; 98]. The neurodegenerative disease diagnosis lasted for a mean of 4 years +/- 2. Diagnosis of probable Alzheimer disease was retained in 18 cases

(58%). Among 31 patients receiving AA drugs, 20 (64%) were treated by memantine, 6 (19.5%) by AChEI and 5 (16%) by memantine + AChEI. All patients received anti-Alzheimer drugs at recommended dosage. Otherwise 19 patients (61%) had concomitant prescription of neuroleptic and 22 (71%) received antidepressant or minor tranquilizer. The re-assessment of therapy indication used the MMSE scoring, which was however performed in 5 patients only (16%), was not suitable for major cognitive impairment in 14 patients (45%), but also was not performed in 12 patients (39%) for unexplained reason.

**Discussion & Conclusion** Probably due to numerous severe stages of neurodegenerative diseases, many prescriptions of memantine were observed. The 5 concomitant prescriptions of memantine + AChEI are arguable. The annual assessment of patients receiving AA drugs to maintain therapy may be reinforced, as patients in substantial number concomitantly received neuroleptic and / or minor tranquilizer failed to be re-evaluated appropriately.

**Keywords** Acetylcholinesterase inhibitors, Alzheimer disease, long term care unit, memantine

## PPH-30

### Determination of Knowledge and Attitude of Pregnant Women about Drug Usage in Pregnancy

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**Introduction** Drug usage in pregnancy is frequent and a remarkable issue for both the mother and the fetus. One of the aims of our study was to determine the maternal knowledge, attitude and practice on drug usage in pregnancy. The other aim of our study was to point out the lack of patient education by health workers about maternal drug usage.

**Materials & Methods** The questionnaire was completed by face to face interview with 100 pregnant women who visited the Obstetrics and Gynecology Clinic of Kocaeli University Hospital and agreed to participate in our study. The study was conducted between November 2008 and March 2009.

**Results** It was found that only 2% of the women had self-medicated without consulting a doctor. 24% of the participants suffered of one or multiple chronic diseases and 17% of the participants were being treated for their chronic disease. 31% of them developed gestational disease. 24% of the women thought that drug usage in pregnancy was unsafe while 75% of them thought that it was safe. 87% of them stated that vitamins and mineral supplements were safe during pregnancy. 23% of women had never heard about folic acid and 37% of women had never used folic acid during pregnancy. 44% of the participants had no idea about the importance of iron intake during pregnancy. 87 women used iron supplements and we found that only 40% of them were using it correctly. 59% of the women (n = 87) had never been educated about correct usage of iron supplements and only 7% (n = 87) had been informed by a pharmacist. Drug usage prevalence during the first trimester was 30%. The most commonly prescribed drugs were iron supplements, multivitamins, analgesics, antibiotics, folic acid and antihypertensives. FDA classes of drugs used by the participants were as follows: A was 31%, B was 35%, C was 16%, D was 7% and X was 1%.

**Discussion & Conclusion** Our study showed that knowledge about drug usage during pregnancy is insufficient among pregnant women and this leads to non-compliance. Results of our study suggest that pharmacists must have an important role in educating and informing the patient about drug usage before and during pregnancy.

**Keywords** Clinical pharmacist, Drug usage profile, Patient knowledge, Pregnancy, Teratogenicity

## PPH-31

### Computerized Physician Order Entry (CPOE) of injectable antineoplastic drugs: factors and outcomes of residual prescribing medication errors

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**Introduction** Medication errors occur commonly in hospitals, increasing morbidity and mortality with an economic impact. Their prevention constitutes a public health priority. CPOE of antineoplastic drugs has improved the quality of physician order entry and has limited the risk of prescribing medication errors (PME). Commonly, standardization of protocols by computerized systems aims to secure practitioner prescription. However, one of the main possible residual errors is linked to the prescription step. In this context, objectives of the present study were to determine the incidence of PME and to analyse PME related to antineoplastic treatment in university teaching hospital.

**Materials & Methods** All consecutive prescribing medication orders over one year were analysed prospectively. Clinical impact was quoted according to the Hatoum scale: no, significant, very significant and vital clinical impact. Several potential risk factors for prescription error occurrence were tested: patient characteristics, prescription characteristics, number of injectable antineoplastic drugs per prescription, duration of cycle, clinical trial or not, status of the physician and setting of treatment. The relationship between potential risk factors and the PME was analysed using the logistic-regression model.

**Results** A total of 14,854 prescriptions were analysed. The PME incidence was estimated at 1.5% [1.3–1.7], with a significant or very significant clinical impact in 62.9% of cases. Potentially death-threatening events were avoided in 3.7% of cases. Overall, PME incidence related to significant, very significant or vital clinical impact was estimated to be 1.0% [0.8–1.2]. The most common type of error was related to the dose of antineoplastic drug (61.0%): wrong adaptation (43.1%), not taking alarms into account (16.1%), incorrect weight (0.9%), incorrect unit (0.9%). More than 20% of PME are medication errors directly linked to the prescribing medication order (choice of regimen, duplication, forgotten or not validated by physician). Occasional users and residents were identified as main risk factors of PME.

**Discussion & Conclusion** Despite optimal and efficient organisation, a residual risk of PME was identified and explained, in part, by risk factors. Software improvement and efforts to raise prescribing physicians' awareness could improve the quality and security of the CPOE.

**Keywords** Cancerology, Chemotherapy, Computerized Physician Order Entry, Medication error, Quality policy

## PRS-1

### Evaluation of a pharmacist collaborative care program in pulmonary arterial hypertension (ETHAP study): rationale and study design

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**Introduction** Pulmonary arterial hypertension (PAH) is a rare disease characterized by vascular proliferation and remodelling of pulmonary arteries. Despite the increasing number of specific medications for PAH, poor compliance, pharmacotherapy misuse and insufficient drug monitoring may limit their benefits. Therefore we implemented a pharmaceutical care program for PAH inpatients extended to outpatients [1]. We aim at assessing the impact of this program on clinical and patient-reported outcomes.

**Materials & Methods** We implemented a prospective, randomized (Zelen design), controlled, multicenter study. Inclusion criteria are PAH with New-York Heart Association functional class II to IV (diagnosed <6 months) and specific treatment for PAH. One group is followed by a structured multidisciplinary team including a clinical pharmacist, whereas the control group gets conventional follow-up. One pharmacist and one nurse in each center were specifically trained to drive collaborative care with the physicians. Pharmacist interviews with patients are planned at inclusion, M6 and M12. Outcomes are collected by another pharmacist, not directly involved in patient care, at M6, M12 and M18. Main outcome is overall medication errors (assessed with triggers and classified with NCC MERP method) and adverse drug events. Secondary outcomes are patient-reported satisfaction with treatment (SatMed-Q<sup>®</sup>) and quality of life (SF-36<sup>®</sup>), time to clinical worsening and adherence to treatment (using a Morisky-Green derived questionnaire and drug dispensations).

**Results** Height centers are involved in the ETHAP study. All participants were invited to participate in a 3-day training program before including patients. Inclusions started in March 2010.

**Discussion & Conclusion** This study should determine whether a pharmacist collaborative care program improves outcomes in PAH patients. An economic ancillary study is being designed.

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**Keywords** Clinical pharmacy services, Pharmaceutical Care Issues, pharmaceutical consultation, Pulmonary arterial hypertension, Study Design

## PRS-2

### Medication review in patients using automated drug dispensing systems reduces drug related problems

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**Introduction** There are concerns that automated drug dispensing may increase inappropriate drug use. Automated dispensing could lead to perpetual repeating without necessary re-evaluation. Our objective was to examine the effect of a pharmacist-led medication review on drug-related problems (DRPs) in older patients receiving their drugs by automated dispensing.

## Materials & Methods

**Design:** A pragmatic randomised controlled study.

**Setting:** Primary care.

**Patients:** Patients were recruited from six Dutch community pharmacies. Patients were eligible if they were home-dwelling, aged 65 years and over and used five or more different drugs of which at least one had to be dispensed in an automated system.

**Intervention:** Patients were randomly allocated to receive a medication review at start of the study (intervention group) or after six months (waiting-list group). Each patient was independently reviewed by two pharmacists. The results of these medication reviews were sent to the community pharmacist to be discussed with the patients' general practitioner (GP).

**Main outcome measures:** The primary outcome measures were: 1. the total number of drug changes 2. the number of drug changes related to a recommendation and 3. the number of DRPs leading to a drug change recommendation. In order to analyse drug changes, medication records were collected six months after the medication review or index date in the Waiting-list Group. Potential DRPs were classified using the D.O.C.U.M.E.N.T. classification<sup>1</sup>.

**Results** There were no baseline differences between the 63 patients in the intervention group and 55 patients in the waiting-list group regarding age, sex, number of drugs per patient and type of drug prescribed.

At baseline, the mean number of DRPs leading to a drug change recommendation was 4.5 per patient and did not differ between both groups. After six months, patients in the intervention group had more drug changes compared to patients in the waiting-list group (2.2 vs. 1.0 per patient,  $p = 0.02$ ). The number of drug changes related to a recommendation was also higher (1.3 vs. 0.2,  $p < 0.01$ ). The number of DRPs leading to a drug change recommendation decreased by 29% in the intervention group vs 5% in the waiting-list group ( $p < 0.01$ ). Recommendations for cessation of a drug were more frequently accepted than recommendations to add a new drug (82% vs. 44%,  $p = 0.01$ ).

**Discussion & Conclusion** This study shows that patients using automated drug dispensing have a high number of DRPs. Medication review decreases the number of DRPs among these patients. We recommend that all patients with automatic drug dispensing should have a thorough medication review by pharmacists and prescribers.

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**Keywords** automated medication-dispensing system, drug related problem, medication review, pharmacist intervention

## PRS-3

### Clinical pharmacist&nephrologist, dual management of stage 3-4 pre-dialysis chronic kidney disease patients

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**Introduction** Drug-related problems (DRP) are common in chronic kidney disease (CKD) patients. In order to screen drug interaction and disadaptation, we instauraed a coupled consultation, clinical



pharmacist & nephrologist (CP-N), to develop a customized disease management program aimed to prevent causes of acute renal failure. CP-N takes place twice a week. The pharmacist establishes, together with the patient, a therapeutic profile, checks for drug-drug & drug-disease interactions, and runs dose-adaptation according to renal function, biological results and self-medication. Pharmacist interventions (PI) are discussed during the following medical consultation.

The aim of this study was to identify DRP, PI, and consequences on patients' knowledge & behaviour concerning treatment and CKD.

**Materials & Methods** Prospective study realised in the Nephrology ward in a university hospital with full time clinical pharmacist.

Each intervention was quoted according to the act IP document of the French society of clinical pharmacy (SFPC) <sup>(1)</sup>. Patients' knowledge were evaluated according to a questionnaire.

**Results** 67, stage 3 or 4 CKD patients, 66% male, age 70 [59; 75] with  $2.6 \pm 1.2$  co morbidities,  $10 \pm 3.5$  medications and 76% with diabetes, were included during 6 months. 142 PI were registered; DRP were detected in 93% of patients and mainly concerned untreated indications (31%) and under dosage (19%). The most frequent PI concerned addition of treatment (34%) and adaptation of dose (25.5%). Main drugs involved concerned, cardiovascular (31%), digestive-metabolic (27%), and hematopoietic (21%) systems. DRPs correlated significantly with the number of medication ( $p = 0.049$ ), and with patient age ( $p = 0.0027$ ). 41 patients, (61%), were asked about their knowledge: 80.5% did not know anything about nephro-protective care, 85% did not know situations at risk (dehydration, vomiting, diarrhoeas), and 29% declared self-medication habits.

**Discussion & Conclusion** CP improves recognition of DRP by adding pharmaceutical and medical skills. Moreover, CP allows a pharmacist systematic follow-up that improves therapeutic education of CKD patients. From these observations, we plan to create a network between health care providers in order to avoid inappropriate management or DRP.

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**Keywords** chronic kidney disease, Drug-drug interaction, Drug-related problems, Multidisciplinary team, Pharmaceutical care

#### PRS-4

##### Adherence by community pharmacists to a guideline on the treatment of minor ailments

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**Introduction** Community pharmacists' counseling on minor ailments must be provided according to evidence based guidelines in order to assure the quality and safety of patient health care (WHO, 1998).

Although clinical guidelines enable health professionals at evidence based decision-making, important barriers have been found on its implementation.

Pharmacists and general practitioners developed in Spain a consensus guideline on the management of 27 minor ailments at the

community pharmacy. The aim of this study was to describe the adherence by pharmacists to the guideline for treatment of minor ailments, and to identify the associated factors

#### Materials & Methods

**Design** Cross-sectional study

**Setting** Community pharmacies in Spain from June to November 2008.

The study population consisted of minor ailments consultations attended by participating pharmacists.

**Main Outcome Measures** Adherence by pharmacists to referral criteria and to agreed best treatment selection set out in a consensus guideline for minor ailments. Two independent experts reviewed each pharmacist intervention against the consensus guideline, establishing the adherence. When a disagreement was found, a third expert took the final decision.

Those consultations on minor ailments not included in the guideline were excluded. Participating pharmacists received a copy of the guideline as well as a 4-hour training session for using it. They subsequently registered the consultation, as well as their intervention. **Statistical analysis** Collected data were analyzed using SPSS 15.0. The OR was used as measure of association, at a level of confidence of 95%. The type of analysis and statistical tests used were multiple logistic regression and the Hosmer-Lemeshow statistic. The level of statistic significance was  $p < 0.05$ .

**Results** 140 pharmacists participated in the study. The total number of minor ailment consultations was 1806, of which 330 (18,02%) were excluded. 847 of the 1476 (57,4%) consultations included were considered adherent to the guidelines.

The following factors independently showed an association with adherence by pharmacists: Not being the owner of the establishment, (OR:0,630; IC95% 0,503–0,790), counseling on moderate pain (OR 0,310; IC95% 0,226–0,425) or on digestive symptoms (OR 0,567; IC95% 0,388–0,829) or other symptoms (OR 0,649; IC95% 0,468–0,900) and, being older (OR 0,986; IC95% 0,977–0,995). On the contrary, a higher number of staff pharmacists was found to be associated with a higher risk of being non-adherent to the guidelines (OR 1,213; IC95% 1,103–1,335).

**Discussion & Conclusion** The age of the pharmacists and the ownership of the pharmacy were found to be associated to a greater adherence. Besides, interventions on certain minor ailments, namely, digestive and moderate pain symptoms showed a higher adherence

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**Keywords** Community pharmacy services, Minor ailment, Non-prescription drugs., Practice guidelines

#### PRS-5

##### Pharmaceutical care in an inpatient pediatric intensive care unit: an international multicentric study

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**Introduction** Pediatric intensive care patient represent a population at high risk for drug-related problems. Our objective is to describe drug related problems and intervention of four decentralized pharmacists in pediatric and cardiac intensive care unit.

**Materials & Methods** Multicentric, descriptive and prospective study over a six-month period (August 1<sup>st</sup> 2009–January 31<sup>st</sup> 2010). Drug-related problems and clinical interventions were compiled in four pediatric centers using a tool developed by the Société Française de Pharmacie Clinique. Data concerning patients, drugs, intervention, documentation, approval (if needed), and estimated impact were compiled. The four pharmacists participating were from Belgium (B), France (F), Quebec (Q) and Switzerland (S).

**Results** A total of 996 interventions were collected: 129 (13%) in B, 238 (24%) in F, 278 (28%) in Q and 351 (35%) in S. These interventions targeted 269 patients (median 22 month-old, 52% male): 69 (26%) in B, 88 (33%) in F, 56 (21%) in Q and in S. These data were collected during 28 non consecutive days in the clinical unit in B, 59 days in F, 42 days in Q and 63 days in S. The main drug-related problems were inappropriate administration technique (293, 29%), untreated indication (254, 25%) and supra therapeutic dosage (106, 11%). The pharmacist's interventions concerned mainly administration mode optimization (223, 22%), dose adjustment (200, 20%) and therapeutic monitoring (164, 16%). The three major drug classes leading to interventions were anti-infectives for systemic use (233, 23%) and alimentary tract and metabolism drugs (218, 22%). Interventions concerned mainly residents and all clinical staff (209, 21%). Among the 879 (88%) interventions requiring a physician's approval, 731 (83%) were accepted. Interventions were considered as having a moderate (51%) or major (17%) clinical impact. Among the interventions provided, 10% were considered to have an economical positive impact. Differences and similarities between countries will be presented at the poster session.

**Discussion & Conclusion** Decentralized pharmacist at patient bedside is a pre-requisite for pharmaceutical care. There are limited studies comparing the activity of clinical pharmacists between countries. This descriptive study illustrates the ability of clinical pharmacist to identify and solve drug-related problems in pediatric intensive care unit in four different francophone countries.

The program has been developed by an grant from Réseau Mère-Enfant de la Francophonie (RMEF)

**Keywords** Intensive care unit, Pediatrics, Pharmaceutical care

## PRS-6

### Patient satisfaction with medication as an outcome for clinical pharmacists

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**Introduction** Adherence to treatment is a major issue in most chronic diseases. Several studies have suggested a relationship between adherence and patient satisfaction with medication. Moreover, patient satisfaction with medication usually explores dimensions such as side effects, efficiency and ease of use, which are central issues in clinical pharmacy. Although most of the tools currently available are disease specific, a generic self-administered questionnaire (SatMed-Q<sup>®</sup>) [1] was recently designed to assess satisfaction with medication in patients with any chronic disease. The primary objective of this study is to test whether that questionnaire is correlated with adherence and quality of life.

**Materials & Methods** After linguistic validation of the SatMed-Q<sup>®</sup> into French, the questionnaire was administered to patients with various chronic diseases and treated for at least two months. Two other questionnaires were used to assess adherence to treatment and quality of life (Morisky-Green derived questionnaire and SF-36<sup>®</sup>, respectively). Treatment characteristics and socio-economic data were also collected.

**Results** Sixty-nine patients (rheumatic diseases, HIV, B/C hepatitis, type 2 diabetes and transplantation) were enrolled in this study. Mean age was 52.8 and 50.7% (n = 35) were female. Mean satisfaction score was 73.7% (19.4). We observed significant correlation with SF-36<sup>®</sup> physical and mental scores (r = 0.48; P<0.001 and r = 0.4; P = 0.001, respectively; Pearson correlation test). Satisfaction with medication was also correlated with adherence (r = 0.29; P = 0.01; Pearson correlation test). However, the disease, disease duration, the presence of injectable drugs and socio-economic characteristics had no influence on satisfaction.

**Discussion & Conclusion** Patient satisfaction with medication assessed with the SatMed-Q<sup>®</sup> is correlated to quality of life and adherence to treatment. Therefore, it could be used as a predictive tool for clinical pharmacists to target patients needing special care.

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**Keywords** Adherence, Clinical outcomes, Pharmaceutical Care, Quality of Life, Satisfaction with medication

## PRS-8

### Adherence assessment in Chronic Myeloid Leukaemia patients treated by tyrosine kinase inhibitors

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**Introduction** Prognosis of Chronic Myeloid Leukaemia (CML) has been dramatically improved with the development of tyrosine kinase inhibitors (TKI) targeted to bcr/abl fusion protein. These 3 TKI (imatinib, dasatinib, nilotinib) are used in oral treatment, which is convenient for patients in a chronic setting. However preliminary studies underline possible adherence factors that may affect treatment efficacy and subsequent patient survival [1]. Aims of this study were to evaluate TKI side-effects at home, and to estimate CML treatment adherence.

**Materials & Methods** CML patients treated by TKI for 6 months or more at July 1<sup>st</sup>, 2009 were selected. A self-reported adherence (SRA) questionnaire was elaborated from previous studies on other diseases [2]. Three questionnaires on side-effects of each TKI were created. Side-effects were reported from a patient perspective, with a rating scale. Adherence and side-effect questionnaires were mailed to patients. Adherence was also estimated by determination of the Medication Possession Ratio (MPR) from dispensation data by community pharmacists over a retrospective 6 month-period. Demographic and clinical data, including haematologic, cytogenetic, and molecular responses, were obtained from patients' medical files.

**Results** Sixty-eight CML patients under TKI treatment were identified. From those, 64 patients (94%) returned their questionnaires, and were enrolled in the study. Mean patient age was 60 years [range 27-90], with a 0.82 sex ratio. 72%, 20% and 8% of patients were treated by imatinib, dasatinib and nilotinib respectively. Results from

SRA questionnaires classified patients as fully adherent (10/10 score) 34.4%, minor adherence issues (8–9/10) 53.1% and non-adherent (<8/10) 12.5%. Mean adherence score was 8.8 [range 4–10]. 72.5% of patients had a MPR  $\geq$  90% and 27.5% < 90%. A statistically significant correlation was identified between SRA questionnaire and MPR data, with a significant predictive positive value for questionnaire results. Side-effects experienced by patients for all TKI were mainly nausea, skin reactions, diarrhoea, headaches, fatigue and muscular-skeletal disorders. No patient experienced a grade 4 side-effect. Grade 3 reactions (8% of patients) were related to weight modification (imatinib, nilotinib), and to digestive disorders (nilotinib). No significant correlation was observed between adherence results and patient data (sex, age, treatment history, disease response).

**Discussion & Conclusion** This is the 1<sup>st</sup> study to assess adherence characteristics of all CML TKI in daily life. Promising results have been obtained by the self-reported adherence questionnaire although a final statistical validation should be performed on a larger cohort. Identifying possible non-adherent patients is in fact paramount to provide patients with targeted clinical pharmacy services for patient education.

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**Keywords** adherence, chronic myeloid leukemia, Side effects, tyrosine kinase inhibitor

### PRS-9

#### Influence of a structured process for assessing minor ailments in the referral to a physician, in Spanish community pharmacies

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**Introduction** The treatment of minor ailments consumes a significant amount of physicians' time and capacity. There could be a potential benefit to the health care system through the transfer of consultation responsibilities in these cases to pharmacists [1]. However, physicians believe that significant diagnostic delays result from pharmacists' referrals of patients with minor ailments on only few occasions. The aim of this study was to determine the influence of a structured process for assessing minor ailments used in clinical interventions by community pharmacists, and to identify the associated factors.

**Materials & Methods** Multi-centred study, quasi-experiment with control group. The study population included patients with minor ailments that used the participating Spanish community pharmacies from June to November 2008.

**Main Outcome Measures** Interventions by community pharmacists that result in a referral to a physician or indicated a treatment with non prescription drugs or other therapies. The intervention group pharmacists conducted a semi-structured interview with their patients and used a clinical guideline for minor ailments previously developed in

association with physicians, to support their decision making [2]. The control group applied the traditional process of pharmacist consultations.

The odds-ratio (OR) was used as measure of association, with a 95% confidence level. The statistical analyses used were multiple logistic regression and the Hosmer-Lemeshow test. The level of statistic significance was  $p < 0.05$ .

**Results** The total number of minor ailment consultations was 4215 of which 13.7% were referred to a physician.

In the multivariate analysis (Hosmer and Lemeshow goodness-of-fit test: 0.139) it was found that the intervention group were more likely to refer the patient to the physician (OR 1.273, 95% CI 1.058 to 1.532) than the control group. Similarly, the factors that were independently associated with the referred patients were: the length of symptom duration (OR 1.004, 95% CI 1.000 to 1.007), taking more than 5 drugs per day (OR 2.188, 95% CI: 1.481–3, 234), the use of the pharmacy for moderate pain symptoms (OR 3.787, 95% CI 2.848 to 5.034), other minor symptoms (OR 2.147, 95% CI 1.569 to 2.939) or non-trivial health problems (OR 5.952, 95% CI 3.896 to 9.094). It should be noted that the relationship between patients taking between 3 and 5 drugs per day (OR 1.209, 95% CI 0.983 to 1.486) and their likelihood to be referred was approaching significance. Additionally the relationship between pharmacist's ownership status and the likelihood to refer was also approaching significance (OR 0.833 95% CI 0.674 to 1.039).

**Discussion & Conclusion** The structured process for assessing minor ailments was shown to be effective in the number of patient referrals to the physician.

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**Keywords** Community pharmacy services, Minor ailment, Non-prescription drugs., self-medication

### PRS-10

#### Recommendations by pharmacy case managers to inpatient physicians designed to reduce re-hospitalizations

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**Introduction** Adverse events are common in hospitalized patients and pharmacy case managers may reduce these events. The objective of this study was to evaluate if recommendations made to inpatient physicians by dedicated pharmacy case managers reduced future re-hospitalizations.

**Materials & Methods** This prospective trial randomized patients to either a control group or one of two intervention groups. Blinded pharmacy case managers made drug therapy recommendations to inpatient physicians who either accepted or rejected recommendations. All patients received phone calls from blinded research staff at 30 and 90 days after discharge to determine if they had subsequent emergency room visits, hospital readmissions, and/or unscheduled clinic visits.

**Results** Pharmacists made 409 recommendations to inpatient physicians for 129 patients; 181 (44%) were accepted and 228 (56%) were denied. Physicians were significantly less likely to accept the pharmacists' recommendation for patients who received more medications on admission (OR = 0.95, CI = 0.92–0.98,  $p = 0.001$ ). Physicians were more likely to accept pharmacist recommendations concerning a record update ( $P < 0.001$ ) such as after a medication reconciliation, but they were significantly less likely to accept the recommendation if it involved the proper indication for a medication ( $p = 0.003$ ) or the efficacy of a medication ( $p = 0.021$ ). Physicians were less likely to accept recommendations for disease state monitoring ( $p = 0.038$ ). There was no significant correlation between acceptance of recommendations and fewer re-hospitalizations or emergency visits ( $p = 0.364$ ).

**Discussion & Conclusion** On average, pharmacists provided over three recommendations per patient but only 44% were accepted. Patients admitted with a higher case complexity had fewer recommendations accepted by inpatient physicians. Pharmacist recommendation acceptance showed no significant correlation with fewer re-hospitalizations. Future studies are needed to determine the significance of pharmacist recommendations relative to patient outcomes in the hospital setting.

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**Keywords** clinical pharmacy intervention

## PRS-11

### Prescription indicator tools and drugs associated with medication review in patients using automated drug dispensing

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**Introduction** In a previous study we showed that patients using automated drug dispensing who had a medication review had more drug changes compared to patients in a waiting-list group (2.2 vs. 1.0 per patient)<sup>1</sup>. The number of drug changes related to a recommendation in the medication review was also higher (1.3 vs. 0.2). The present study is an in-depth analysis into the type of recommendations for patients who received a medication review.

Our first objective is to examine which drug groups are associated with recommendations resulting in drug changes. Our second objective is to examine which prescribing indicator tools are associated with these recommendations.

### Materials & Methods

#### Design

Cross-sectional analysis within the intervention arm of a pragmatic randomised controlled study.

#### Setting

Primary care.

#### Patients

Patients were recruited from six Dutch community pharmacies. Patients were eligible if they were home-dwelling, aged 65 years and over and used five or more different drugs of which at least one had to be dispensed in an automated system.

### Intervention

Patients were randomly allocated to receive a medication review at start of the study (intervention group) or after six months (waiting-list group).

### Main outcome measures

The primary outcome measures were: 1. the number of recommendations resulting in drug changes; 2. the number of recommendations not resulting in drug changes.

**Results** Fifty-five patients in the intervention group received 246 recommendations leading to a drug change (4.5 per patient). Seventy-two recommendations resulted in drug changes (33%).

The three drug groups with the most recommendations resulting in drug changes were agents acting at the renin-angiotensin system (3 out of 5, 60%), psychoanaleptics (5 out of 9, 56%) and beta blocking agents (7 out of 14, 50%). Drug groups with the most recommendations not resulting in drug changes were analgesics (0 out of 5, 0%), psycholeptics (1 out of 18, 6%) and drugs for acid related disorders (1 out of 14, 7%).

The three prescription indicator tools resulting in the most drug changes were 'too low dose of lipid lowering drug' (2 out of 2, 100%), 'aspirin without gastroprotection' (8 out of 13, 62%) and 'use of ineffective drugs for dizziness' (3 out of 5, 60%) and 'heart failure without ACE-inhibitor' (2 out of 5, 40%). The three indicator tools not resulting in drug changes were 'ischemic heart disease without lipid lowering drug' (0 out of 14, 0%), 'diabetes without lipid lowering drug' (0 out of 7, 0%) and 'too high dosage of proton pump inhibitor' (0 out of 10, 0%).

**Discussion & Conclusion** This study shows a wide range in uptake of recommendations during a medication review. Additional research is needed to identify reasons why specific recommendations are not acted upon.

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**Keywords** automated medication-dispensing system, drugs, medication review, prescription indicator tool

## PRS-12

### Impact of the Lund Integrated Medicines Management model on medication appropriateness

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**Introduction** Inappropriate prescribing among elderly patients may increase the risk for drug-related problems. The objective of this study was to examine the impact of the Lund Integrated Medicines Management (LIMM) model on medication appropriateness in hospitalised patients.

**Materials & Methods** A prospective controlled study of 210 elderly patients, from three internal medicine wards in a Swedish hospital. We compared patients receiving Medication Reviews, including Admission Medication Reconciliation, according to the LIMM-model, with patients receiving standard care. The LIMM-model was implemented at one ward at a time between January 2007 and March 2008. We chose four dates for inclusion of patients during this period, one date before implementation and three dates about one month after implementation on the first, second and third ward, respectively. All patients who were staying at any of the wards on



these dates were eligible for inclusion. The main outcome measure was the change, from admission to discharge, in the number of drugs with at least one inappropriate rating, according to the Medication Appropriateness Index (MAI). The MAI consists of 10 criteria: indication, effectiveness, dosage, correct directions, practical directions, drug-drug interactions, drug-disease interactions, duplication, duration and expense. For intervention patients, the MAI assessment at discharge was performed in two steps. Step 1, which was a blinded assessment based on information in the patient's medical record, was used in the main analysis. In step 2, the drugs were reassessed (unblinded), by adding information from the pharmacists' Medication Review Forms that had not been documented in the medical records.

**Results** The control and intervention group were similar regarding baseline demographic data. The mean number of drugs with at least one inappropriate rating decreased from 3.0 at admission to 1.5 at discharge in the intervention group, and from 2.8 to 1.7 in the control group. This represented a 51% (95% CI, 43–58%) decrease in the intervention group (step 1 assessment), compared to a 39% (95% CI, 30–48%) decrease in the control group ( $p = 0.0446$ , Poisson regression). In the assessment step 2, the MAI rating was changed from 'inappropriate' to 'appropriate' in 23% of the drugs (27/117). The mean decrease per patient between step 1 and 2 in number of drugs with at least one inappropriate rating was 0.38 (95% CI 0.22–0.54). In both control and intervention patients the most common MAI problems involved 'expense', 'indication' and 'duration'.

**Discussion & Conclusion** This study showed that medication appropriateness at discharge from hospital improved in patients receiving Medication Reviews and Reconciliation, according to the LMM-model. In order to take full advantage of the work done by the clinical pharmacists, the information documented in the Medication Review Forms should also be documented in the medical records.

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**Keywords** Drug-related problems, Implementation, Medical care, Pharmaceutical Care Issues, Prescribing

#### PRS-13

##### Are the guidelines usually followed in patients with unstable Angina?

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**Introduction** Clinical pharmacy services have become part of the patient care all over the world. One of the roles of the clinical pharmacists is to audit the drug charts and the discharge prescriptions to verify whether it is following the guidelines. In Malaysia, coronary artery disease accounts for 40% of the cardiovascular burden. The number of acute coronary syndrome admissions was therefore 47.1 per 100,000 in 2006 and it is increasing. This study aims to evaluate the therapeutic management of unstable angina patients and assess the outcome of implementing the American College of Cardiology/American Heart Association (ACC/AHA) guideline on unstable angina medication management in terms of the length of hospital stay and the incidence of complications.

**Materials & Methods** A cohort of one hundred unstable angina patients admitted to Penang General Hospital, Malaysia was recruited

in the study in a six-month period. Beside full medical history, clinical assessment and investigations of patients, data was collected regarding their in-hospital medication management. Assessment of implementing ACC/AHA guideline was carried out.

**Results** The study comprised 100 patients diagnosed with UA with a mean age of  $62.1 \pm 11.3$  years. The main risk factors of unstable angina in this cohort study were: dyslipidemia (86%), hypertension (85%), diabetes mellitus (56%), other heart and vascular diseases (57%). The majority of patients (65%) were treated according to ACC/AHA guideline. Most unstable angina patients (85%) have three or more Thrombolysis In Myocardial Infarction (TIMI) risk scores. The mean length of hospital stay was  $6.86 \pm 3.99$  days. An important observation was failure of 35% of diabetic patients to achieve tight glycemic control during the hospital stay. Complications occurred more frequently in the group in which the guidelines were strictly followed than those who did not (number of complications 7 vs. 3, respectively,  $p$ -value = 0.04).

**Discussion & Conclusion** Despite the fact that implementation of acute coronary management guidelines is the cornerstone in treating UA patients, finer tuning is required. Some studies suggested risk stratification and bleeding scores<sup>1</sup>. In our study there was statistically significant difference between the group followed the guideline and the group who did not strictly follow it in terms of length of in-hospital stay and complication incidence.

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**Keywords** Clinical Pharmacy, Guidelines, Coronary artery disease, unstable angina, drug therapy, Malaysia

#### PRS-14

##### Pharmacists'ability to identify drug-related problems and the contribution of patient home consultation to medication review

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**Introduction** There is no gold standard for the most effective type of medication review. We currently perform a randomised controlled clinical trial to investigate the effects of a clinical medication review that incorporates a patient home consultation. We now present baseline data aiming to investigate the number and types of drug-related problems (DRPs) identified by patient's pharmacists and an independent pharmacist panel. Moreover we examine to which extent the patient home consultation contributes to the identification of DRPs.

#### Materials & Methods

##### Design

Cross sectional study within a randomised controlled trial

##### Setting

Primary care.

##### Patients

Patients were recruited from ten Dutch community pharmacies. Patients were eligible if they were home-dwelling, aged 65 years and over and used five or more different drugs, including at least one cardiovascular or anti-diabetic drug.

#### Intervention

The pharmacist visits the patient at home for an interview about the patient's medicines and to identify possible drug related problems. A medication review was performed by the patient's pharmacist. Medication reviews were evaluated, if necessary adjusted, and completed by an independent pharmacist panel. Potential drug related problems were discussed by the patient's pharmacist and patients' general practitioner (GP).

#### Main outcome measures

The primary outcome measures were: 1. the number of DRPs identified by the patient's pharmacists and by the independent pharmacists panel 2. The number of DRPs identified by medication home visits, medication lists, GP clinical records or combination of medication lists and clinical records.

Potential DRPs were divided in two main categories: DRPs leading to a drug change recommendation and other DRPs (monitoring and patient education items).

**Results** Data were collected for 147 intervention patients. The mean number of DRPs was 9.9 per patient from which 5.4 were DRPs leading to a drug change recommendation.

34% of DRPs were identified by patient's pharmacists, while half of these DRPs were adjusted by the independent pharmacists panel. 66% of DRPs were solely identified by the panel. For DRPs leading to a drug change recommendation, 38% were identified by patient's pharmacists.

26% of DRPs were identified during home consultations against 30% from medication lists, 7% from clinical records and 36% from the combination of these two sources. For DRPs leading to a drug change recommendation, 36% was identified during home visits.

**Discussion & Conclusion** This study shows that the identification of DRPs in clinical medication reviews by patient's pharmacists can be improved. Patient home consultations have a major contribution in the identification of DRPs and are even more important for DRPs leading to a drug change recommendation.

**Keywords** Drug-related problems (DRPs), home consultation, medication review, pharmacist

## PRS-15

### What do physicians expect from clinical pharmacists?

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**Introduction** Clinical pharmacy is developing positively in Belgium since few years. At the CHU of Liège, a pilot project of the Federal Public Service for Health began in July 2007 and the department of clinical pharmacy was created in February 2008. Currently, the presence of a clinical pharmacist is provided in various departments (geriatrics, oncology, hematology, intensive care). Echoes of pilot projects showed that besides the common characteristics of some patients (heavy conditions, heavy treatments), the success of a project also depends heavily on the context in which it develops (openness and desire of collaboration of other health professionals).

After 2 years of activity, we wanted to compile an inventory on the perceptions, needs and expectations for clinical pharmacy in 2010 in our institution.

**Materials & Methods** In December 2009, we sent a questionnaire to 600 doctors (professors, assistants and seniors) and 60 nursing unit

heads of our hospital. In this questionnaire, partially inspired by Ampe et al. [1], people were asked to position themselves on the needs, activities to develop and expected benefits of clinical pharmacy.

**Results** The response rate is 25.3%, or 167 forms filled (out of 660 sent)

48% of respondents have already had contact with a clinical pharmacist. 88% are in favor of the presence of a clinical pharmacist in their service and 79% feel that a clinical pharmacist would be interesting in their unit. Only 17% believe that the clinical pharmacy represents an obstacle to their therapeutic freedom.

The most interested services are Geriatrics, Nephrology, and Intensive Care. The less interested services are Medical Psychology and Emergencies.

Of the 16 planned activities, the five most frequently requested activities are: to signal interactions (99%), pharmacovigilance activities (97%), inform / train staff (97%), propose alternatives (96%) and suggest adjustments to therapy (92%).

The greatest benefits are expected for quality and security of the therapy mainly by preventing drug interactions and adverse drug reactions, and by improving knowledge.

Profits are expected to be weaker on costs reduction associated with length of stay and compliance with guidelines, protocols and recommendations.

**Discussion & Conclusion** The results of this survey allowed us to identify the services most interested by clinical pharmacy and the type of activities to develop in priority. It also help us to make our services most appropriate and most complementary to the expectations and needs of other healthcare professionals.

Recognition of specific competences of the clinician pharmacist and contributions of its presence in the units can still be greatly improved.

In repeating this survey in 5 or 10 years, we hope to assess progress and find new ways of development for clinical pharmacy.

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**Keywords** Activity, clinical pharmacist, Hospital pharmacy, Implementation, pharmacy student, clinical pharmacy

## PRS-16

### What knowledge do patients on warfarin have about their treatment, and may patient education by a pharmacist improve their knowledge?

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**Introduction** Warfarin is used as treatment or as a prophylaxis in thromboembolic disorders. Warfarin saves many lives but due to its narrow therapeutically window it requires individual adjustment of dose and frequent monitoring.

The objective of the study was to describe patients' knowledge about warfarin treatment, and to evaluate if a pharmacist may improve patient knowledge.

**Materials & Methods** The study is controlled, randomised, quantitative and prospective. SPSS 16.0 was used to analyse the outcomes. One hundred patients were included and randomised to either control group (n = 50) or intervention group (n = 50). A questionnaire with 21 questions regarding treatment with warfarin was used. The patients

were interviewed by a pharmacist on admission to the hospital. The intervention group were educated on warfarin by a pharmacist during their hospital stay. The same questionnaire was used in a telephone interview as a follow-up 6 months later for both groups.

**Results** On admission the average score was 12,26 (SD = 3,33) of 21 answers for all patients. At follow-up the control group scored 12,56 (SD = 4,12) whereas the intervention group scored 14,68 (SD = 3,60) ( $p = 0,002$ ).

In general the patients knew how to take their warfarin tablets.

On admission 12% of the patients knew that black stool and dark urine could be a side effect of warfarin. At follow up 2,8% of the control group and 34% of the intervention group answered this question correctly ( $p = 0,000$ ).

Furthermore, on admission 14% of the patients knew that they should contact their physician after the occurrence of other potential warfarin-related side effects. At follow up 11% of the control group and 39% of the intervention group answered this satisfactorily ( $p = 0,005$ ).

**Discussion & Conclusion** These results indicate that patients on warfarin know how to take their medicine. Patients, who receive education from a pharmacist, may improve their knowledge on warfarin compared to patients who do not receive any education.

**Keywords** clinical pharmacy, drug use, knowledge, patient education, warfarin

## PRS-17

### Evaluation of patients' knowledge about warfarin in a teaching hospital in Qatar

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**Introduction** Patient education to ensure safe and effective therapeutic management is an important part of healthcare. This study was carried out to evaluate the extent and quality of the patients' education about warfarin and its possible impact on the international normalized ratio (INR).

**Materials & Methods** This was a cross-sectional study using a 20-item, self administered questionnaire, offered to patients who were taking warfarin for at least 2 months and attending the medical or cardiology anticoagulation clinics between August and November 2008.

**Setting:** Anticoagulation clinics in Hamad General Hospital, Hamad Medical Corporation, Doha, State of Qatar.

**Main outcome measures** Patients' knowledge score, relation of knowledge about warfarin with their INR values and their reported bleeding or re-clot episodes during warfarin therapy.

**Results** A total of 140 patients completed the questionnaire, 116 patients (83%) reported that they received warfarin education and overall 61 patients (44%) had a controlled INR. Of the 79 patients with a satisfactory knowledge score about warfarin (i.e. overall score of at least 75%), 49 (62%) had a therapeutic INR compared with 12 (20%) having an unsatisfactory knowledge score ( $p < 0.0001$ ). The number of clinic visits within 2 months was less in the satisfactory knowledge group (SKG) compared with the unsatisfactory knowledge group (UKG) (mean 3.7 vs. 4.7,  $p = 0.0029$ ). The time spent within a therapeutic INR range in the last 6 clinic visits, was 73% in the SKG and 53% in the UKG. There was no difference between the two groups regarding their bleeding/re-clot episodes. The lowest scores were for participants' knowledge about the interactions between warfarin and other drugs (76% incorrect), followed by the effect of a missing dose and its management (58% incorrect) and which healthcare provider to inform about their warfarin therapy (49% incorrect).

**Discussion & Conclusion** An integrated and multidisciplinary education program may improve the patients' knowledge about warfarin as well as patient's compliance. This might lead to a better anticoagulation control, fewer clinic visits and a decrease in healthcare service load.

**Keywords** Anticoagulation clinic, clinical pharmacy, Patient knowledge, Qatar, Warfarin

## PRS-18

### Why are recommendations of the clinical pharmacist rejected?

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**Introduction** Acceptance rates of in-hospital pharmaceutical recommendations vary between 83.9% and 98.0%. Less is known about the reasons for non acceptance and the possible consequences if the advice was followed. Aim of the study: reasons for non acceptance and associated harm if implemented.

**Materials & Methods** Ghent University Hospital, a 1062 bed tertiary care hospital with 1536 uplisted interventions in a databank (Klinor) by periodical registration through 2005-2009, by 7 pharmacists at 16 different wards (surgical wards (32.1%), paediatrics (21.9%), ICU adults (16.8%), ICU paediatrics (15.5%), general internal medicine (13.5%)). We selected the rejected recommendations for which input of the reason for non-acceptance was obligatory. An independent pharmacologist and clinical pharmacist rated the possible patient outcome.

**Results** 146 recommendations out of 1536 (9.51%) interventions were "rejected" by the clinician with rejection most present at surgical wards (45.2%), followed by the ICU adults (17.1%). Reasons for non acceptance were in descending order: not clinically relevant (81 (55.5%)), erroneous proposal because of insufficient clinical knowledge (literature) with possible harm (22 (15.1%)), other interpretation of the pharmacist because of lacking information in patient file (21 (14.4%)), other risk benefit interpretation (12 (8.2%)), similar interpretation of patient data by clinician and pharmacist but the clinician already aware (8 (5.5%)) and not accepted recommendation focused on increased safety (2 (1.4%)). In terms of safety: 20 (13.7%) erroneous proposals could have caused harm to the patient, if accepted; while 44 recommendations (30.1%) were judged as relevant for clinical practice despite their refusal.

**Discussion & Conclusion** Most of the rejected pharmacist's recommendations (55.5%) were rated by the attending physician as irrelevant for clinical practice. Independent analysis showed that 13% of the non accepted advices in fact could have decreased the clinical patient outcome while in 1 out of 3 recommendations, the proposal was relevant to improve the clinical outcome. Registration of clinical pharmacy interventions is meaningful in order to support improvement of clinical pharmacy practices.

**Keywords** Clinical outcomes, Documentation, Hospital pharmacy, Pharmaceutical Care Issues, undesirable effects

## PRS-19

### Therapeutic education of HIV+ patients: quizzes for evaluation and learning

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**Introduction** Therapeutic Patient Education (TPE) implies an assessment of patient knowledge before and after the learning phase. In that respect, true / false tests are one validated tool. The objective of this work is to develop quizzes adapted to the diversity of patients living with HIV and supported in the TPE programme of our institution.

**Materials & Methods** Several sets of questions were developed, focusing on different areas of education around HIV. These questions have been reviewed by a committee of experts, including clinicians, nurses, pharmacists, psychologists, anthropologists, patients associations, and a sample of 1,000 people from general population asked via the Internet. The opinion of the expert committee was aimed at the value, the form and the interest of the quiz. The analysis of responses and spontaneous suggestions enables to identify the most relevant issues. Many multiprofessional meetings allowed to choose precisely the semantics better suited to avoid confusion and misinterpretation, taking into account socio-cultural representations and beliefs of patients. The quizzes are finally validated by infectious disease specialists and psychologists.

**Results** The four currently proposed quizzes approach the areas of prevention, pathophysiology, daily management of treatment and side effects, while assessing the validity of responses using a degree of certainty. They are accompanied by argued and documented answers to ensure the scientific validity of responses and consistency of care by different caring staff members.

**Discussion & Conclusion** These quizzes will have to evolve according to changing behaviours and medical responses. They are intended to be used before and after learning, in response to the expressed needs of patients throughout the sessions. These quizzes are part of the interview guide and help, in a playful way, the acquisition of knowledge and development of self-care capacities by the patient. They provide a response to the requirements of assessment and learning in TPE, necessary for autonomy and compliance, leading to improved quality of life.

**Keywords** Patient evaluation, Patient learning, Quality of Life, Quiz, Therapeutic Patient Education

## PRS-20

### A guide for the therapeutic patient education interview: an organised liberty

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**Introduction** Interviews in Therapeutic Patient Education (TPE) should be organised and included in a sequential process of educative diagnosis, learning and patient evaluation. The aim of this work was to design a specific guide, offering patients living with HIV a quality interview in TPE, while keeping the discussion natural.

**Materials & Methods** Pharmacists implemented the TPE programme in 2008 and drafted a first document suggesting a variety of evaluation tools deriving from existing TPE methods. This document has been tested with patients by pharmacists and nurses leading this programme. Afterwards, it was progressively improved by adding scales and scores deriving from previous publications. The guide was also completed with assessment tools stemming from an experimental work due to the necessity to interpret results and to objectively measure patients' feelings.

**Results** The guide comes as a 8-page book suggesting questions to ask in order to realise the educative diagnosis. This diagnosis is set up by scores measuring social, emotional and behavioural cofactors, self-

care, conative and meta-cognitive competences. It also measures the patient's treatment adherence. The evolution of scores is thus registered from one session to another. An iconography about illness and its treatment, and a cognitive evaluation quiz is provided with the guide to build educative medium suiting patients' socio-cultural representations.

**Discussion & Conclusion** A logical flow chart was added to let the user freely progress in the guide in order to meet patients' needs, complying with the thread of learning and leading to autonomy and compliance which are factors of enhancing quality of life. This flow chart also plays an important didactic part in promoting the use of the guide among initially doubtful nursing staff. While enabling to perform a natural interview, the guide helps to structure the discussion and facilitates the transmission of information, which is needed for a multidisciplinary care. A prospective evaluation of the programme efficiency will now be performed.

**Keywords** Interview guide, Patient evaluation, Quality of Life, Therapeutic Patient Education

## PRS-21

### Pharmaceutical care needs in patients on long-term corticosteroids: Analysis of risks of diabetes, osteoporosis and cardiovascular events

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**Introduction** Long-term corticosteroid use is associated with hypertension, hyperglycaemia, dislipidaemia and electrolyte disturbances and consequently risk of cardiovascular disease (CVD), diabetes mellitus (DM) and/or osteoporosis (OP). Patient 10yr risk of contracting each of these common conditions can be obtained using validated on-line tools. The aim was to use risk assessment for targeting pharmaceutical care in users of long-term oral and/or high-dose inhaled corticosteroids

**Materials & Methods** 176 patients from one medical practice (four general practitioners serving 7000 patients) - all users of long term corticosteroids defined as; >3months use of oral doses (n = 48) or high dose inhaled steroids alone- (equivalent to ≥0.8–2 mg daily of beclometasone dipropionate; n = 128). The sample represented 20% of the 860 patients currently on any corticosteroid. CVD, DM and OP event risks were calculated from free access to computerised clinical records (GPASS<sup>®</sup>). CVD risk estimate was calculated by the Scottish Intercollegiate Guideline Network (SIGN) method (ASSIGN score [www.assign-score.com/estimate-the-risk](http://www.assign-score.com/estimate-the-risk)). The DM risk and OP risk estimates were from QD score ([www.qdscore.org](http://www.qdscore.org)) and FRAX<sup>®</sup> score ([www.sheffield.ac.uk/FRAX](http://www.sheffield.ac.uk/FRAX)).

A 30 criteria Medication Assessment Tool (MAT) was developed to assess adherence to quality criteria associated with corticosteroid therapy (current guidelines SIGN 71, 97, 101) and NICE 12 (National Institute of Clinical Excellence). The MAT comprised 18 preventive medication use criteria in CVD, DM and OP. The MAT also included corticosteroid treatment criteria for CVD (eight criteria) and respiratory disease (four criteria)

**Results** Patients were defined to be at 'high' risk if estimates were ≥20% for CVD subjects, (n = 105 eligible); ≥10% for DM (n = 141 eligible); ≥10% for OP (n = 141 eligible). There were overall 29% (CI: 17, 33), 34% (CI: 27, 42) and 24% (CI: 22, 37) in the 'high' risk groups for CVD, DM and OP respectively. For oral steroid users those



at high risk were 22% (CI: 9, 42), 44% (CI: 29, 59) and 47% (CI: 31, 63). The effect of oral compared with high dose inhaled steroid use was only statistically significantly higher for OP relative risk 2.0 (CI 1.2, 3.3;  $p = 0.016$ ). The adherence to corticosteroid prescribing quality criteria in 176 patients was 51% (CI: 47, 54;  $n = 1031$  applicable criteria). Only 18% (CI: 15, 22;  $n = 515$ ) non-adherences had a recognised/recorded justification. Consequently 420 (41%; CI 38, 44) of all assessed criteria (mean 2.4 per patient) indicated a need for inclusion in treatment review

**Discussion & Conclusion** The use of risk assessment tools among steroid users might help target patients for review of their preventive medication needs. There was an important apparent gap in the adherence to published guidelines affecting corticosteroid use that deserves a targeted pharmaceutical care response

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**Keywords** corticosteroids, Pharmaceutical Care Issues

### PRS-22

#### Analysis of the efficacy of analgesic drugs in the post-operative pain

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**Introduction** It is recognized that pain influences negatively surgery prognosis. Data obtained from a research in our hospital are an observatory for evaluate the use of analgesics in relation with effectiveness in pain relief.

**Materials & Methods** The first two days of postoperative analgesic therapy after cardiac, abdominal surgeries and transplants were analyzed in three departments: Intensive Care Unit, Cardio Thoracic Unit and Abdominal Surgery Unit. Six different analgesics (morphine chloridrate injection and drip, tramadol IV and drip, ketorolac IV, acetaminophen IV and epidural bupivacaine) were used in relation of pain level reported by patients using the numeric pain scale from 1 to 10. Pearson test was used to investigate the correlation between analgesic drugs and pain scale.

**Results** 242 surgeries were performed from January 1st to March 15th. Of these, 191 (79.2%) were supported by analgesic therapy and 51 (20.8%) were not. The types of surgery effected were: 125 (51.6%) abdominal (nephrectomies, hepatectomy, pulmonary lobectomy, adrenalectomy, splenectomy, gastrectomy, resection of hernias, liver and kidney transplant), 117 (48.3%) cardiothoracic (heart valve replacement and repair, valvuloplasty, bypass) and 22 (9.1%) transplants (liver, kidney, heart and lung transplant).

For those 191 surgeries, patients were supported by different kinds of analgesic drugs. Among analgesics opioids 17 (7.05%) patients were treated with intravenous bolus of morphine and 2 (0.8%) with continuous infusion, 11 (4.5%) with fentanyl patch, 4 (1.65%) with tramadol continuous infusion and 111 (46%) with tramadol bolus; among patients treated with non steroid antinflammatory drugs (NSAIDs) 21 (8.71%) had ketorolac bolus; 118 (48.7%) patients were treated with acetaminophen bolus and 13 (5.4%) patients with local anaesthetic (epidural bupivacain 0.25%) .

A correlation of 88.5% and of 37% was observed in a patient that underwent abdominal surgery and cardiothoracic surgery,

respectively: when the use of analgesic drugs increased, the pain scale decreased.

During the first 48 h after surgery 42,14% (102) of the therapies showed to be effective against pain instead 8,6% (21) were not. For 49,2% (119) of the therapies it was not possible to evaluate the pain scale.

**Discussion & Conclusion** Despite 20,8% of surgeries were not supported by analgesic therapy, the use of four classes of control pain drugs analyzed, showed a good effectiveness (88.5%) of the pain relief therapy in abdominal patients but insufficient (37%) in cardiothoracic patients.

Although the progress that has been made in understanding the importance of acute pain control, for clinicians and all medical staff it is important to implement evidence-based procedures, specific analgesic protocols and better training to improve the quality of pain relief provided to patients.

**Keywords** Implementation

### PRS-24

#### Estimation of the clinical impact of the pharmacist in a Geriatric Cru

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**Introduction** Based on a real will of collaboration between doctors and pharmacists, activities of clinical pharmacy have been organized within a geriatric Care and Rehabilitation Unit (CRU).

The objective of this work was to estimate the clinical impact of the pharmacist activities during 18 months in the care unit.

**Materials & Methods** The method leans on original tools and on the patient monitoring during his hospitalization: at the entrance (specific form, pharmaceutical maintenance and research of drug historical), during (pharmaceutical interventions (IP)) and at the discharge (creation of a form targeting the prescription, sent to the city professionals (regular doctors and pharmacists)).

The data collected at the entrance and the IP have been analyzed. The satisfaction of the medical and paramedical teams concerning the pharmacist presence, as well as the one of the city professionals towards the forms which have been sent to them, was estimated.

**Results** On 83 patients included, 66% are women (85 years old average). 60% of the patients present a renal failure. In 60% of cases, a return at home has been possible.

The knowledge of their treatment by the elderly is poor: 60% of them are unable to name their medications and 63% do not know why they take it. 9 patients (11%) indicate unwanted effects related to their medications. At home, 1 patient out of 2 took care of the preparation of their medicines. Only 31% of the patients go to the pharmacy. The observation is considered “non-existent” for 1 patient out of 3. 18% of the patients are subject to the self medication. The medicine formulations appreciated by the elderly are capsules (78%), tablets (69%) and effervescent tablets (65%).

Over 9 months, 188 IP have been realized for 79 patients. The 3 main identified problems are an “untreated indication” (30%), “path or improper administration” (18%), and an “overdose” (13%). The 3 main types of IP emitted are proposals for medication addition (31%), stop of medication (29%), and the demand for dose adjustment (14%). The rate of acceptance of the IP by the medical teams is high (96%). 5 doctors judged that 87% of the IP have had a clinical impact for the patient. The clinical pharmacy activities are appreciated by health care teams (16/17 doctors and 17/23 paramedicals). The city

professionals (17/56 doctors, and 22/29 pharmacists) are also attracted by this approach.

**Discussion & Conclusion** This study confirms the success of a collaboration between doctors and pharmacists, focusing on the patient. The created pharmaceutical tools used, allow to combine essential data for the continuity of the patient treatments. The originality of this work is based on the pharmaceutical monitoring of the patient throughout his hospitalization, in narrow link with the city professionals. The appraisal is very positive and confirms the results of similar experiments described in the literature.

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**Keywords** clinical impact, Elderly Patient, pharmaceutical intervention, satisfaction survey

#### PRS-27

##### stability study of a topical cidofovir cream

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**Introduction** Cidofovir (CDF) is a nucleotide analogue with a wide antiviral spectrum, prescribed in infusions for the treatment of CMV induced retinitis to HIV infected patients, in case of aciclovir (ACV)resistance. According to the literature, CDF has a potent antiviral activity against other DNA viruses. The pharmacy of the Georges Pompidou Hospital compounds topic form containing CDF, prescribed for HIV infected patients with herpes genital warts resisting to the classic treatments<sup>1</sup>. The aim of this work was to study the stability of this preparation to bring a safety of use and to improve compounding quality and care efficiency for these patients.

**Materials & Methods** *Preparation:* CDF 0.375% (m/m) vistide® (Gilead Sciences): 2.5 mL (75 mg.mL<sup>-1</sup>) mixed with 50 g diprobace® crème (Schering-Plough).

*Extraction:* 500 mg samples (n = 3) of CDF cream were prepared and 64µL (12,5 mg.mL<sup>-1</sup>) of ACV, used as internal standard, were added,. After mixing, time of contact was set up at 2 h. Extraction is performed with 4 mL of 0,1 M phosphate buffer, pH = 6,0 with 30 min of time of contact at 60°C. The samples were spin-dried at 6000 rpm, 7 min at 4°C. The liquid phase was diluted in 4 mL of phosphate buffer and filtered by a 0,22 µm filter. The extraction procedure was validated based on International Conference on Harmonization guidelines.

*Analysis of the CDF:* The samples were analysed with a previously validated ion exchange high-performance liquid chromatographic method<sup>2</sup> (column: nucleosil SB 250x4.6 mm; 5µm; mobile phase: ammonium acetate 0.2 M pH = 6.0 F = 1 mL.min<sup>-1</sup>; detection at λ = 274 nm; V<sub>inj</sub> = 50 µL). The dosage of internal standard was validated based on ICH.

*Forced degradation:* the stress conditions were temperature (40°C); acid (pH = 2), basic (pH = 10) and oxidizing environment (H<sub>2</sub>O<sub>2</sub> 10 vol).

*Stability study:* conservation at three temperatures: 4°C; 22.5°C; 32.5°C (n = 3).

**Results** The validation of extraction procedure reported correct extraction efficiency (56,8%) and reproducibility (standard deviation 2,3%). Chromatographic retention times were specific (Tr<sub>CDF</sub> = 4.9 min ± 0.01 min; Tr<sub>ACV</sub> = 6.6 min ± 0.01 min;). The CDF/ACV areas ratio is 1,20 ± 0,07 sd. After 15 days in all storage stressed conditions, none products of degradation appeared. Moreover, the percentage of extraction remain constant, like the cidofovir/internal standard areas fraction. The cidofovir cream, non-stressed, is stable after 45 days of conservation at the three temperatures.

**Discussion & Conclusion** At day 15 the creams under stress conditions are not degraded and the method is reported to be stability indicating<sup>2</sup>. The topic's preparation is stable more than 1 month. Moreover the stress conditions show good stability, allowing us a supported answer to inadequate storage conditions. A stable preparation will allow us preparation in advance and a longer use of the same preparation, which are advantages for patient's time and economically for the hospital.

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**Keywords** cidofovir, stability, topical use

#### PRS-28

##### Evaluation of risk perception related to drug use during pregnancy: a Swiss survey

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**Introduction** Health care professionals' perception of risk may impact on therapeutic management of women during pregnancy. Since the thalidomide tragedy, the use of drugs during pregnancy generates fear. This concern might affect the estimation of the risk associated with drug intake during pregnancy, leading to premature discontinuation of a required treatment, superfluous anxiety or pointless termination of a desired pregnancy. Although data regarding the security of drugs during pregnancy are still scarce, a few specialized information sources exist providing reliable recommendations for daily practice. This study aimed at characterizing the risk perception associated with drugs during pregnancy in a sample of Swiss health care professionals.

**Materials & Methods** An online French and German survey was sent by email to the Swiss professional societies of Pharmacists, Gynecologists, Mid-wives and Pediatricians. The questionnaire was constructed to assess (a) the characteristics of the population and the opinion of the professionals regarding the medication use pattern in their pregnant patients, (b) to evaluate the sources of information used during their practice and finally (c) to assess their risk perception associated with drugs during pregnancy. Results were analyzed by descriptive statistics.

**Results** A total of 1,310 questionnaires were collected (18% response rate). Most health care professionals believe that 30–60% of their

pregnant patients are taking at least one treatment during their pregnancy and that 80% are adherent to it. A large majority think, however, that women are anxious when they must take their medication. More than 80% of health professionals commonly use the Swiss Drug Reference Book (*Compendium*) to assess the risk associated with drugs during pregnancy, despite the uniformly low level of credibility and utility they express about this reference. Except for some gynecologists, the majority of professionals are not aware of or do not use specialized books. The majority of participants think wrongly that more than 30% of drugs are teratogenic. About 20% of them are not aware of the risk associated with paracetamol intake during pregnancy. More than 70% agree that phytotherapeutic mixtures are not safer than conventional drugs, with the exception of midwives who tend to overestimate the safety of such drugs. With the notable exception of gynecologists, the risk related to drug intake was overall overestimated.

**Discussion & Conclusion** Swiss professionals differ in their perception of the risk associated with drugs during pregnancy and tend to overestimate it. The differences might be attributed to the level of training and awareness of specialized sources offering a realistic estimation of the risk. Further efforts are needed to expand the training and the tools for health care professionals to optimize drug use during pregnancy.

**Keywords** drugs in pregnancy, risk perception

## PRS-29

### Descriptive analysis of a clinical pharmacy intervention to improve the appropriate use of stress ulcer prophylaxis in a hospital infectious disease ward

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**Introduction** Stress ulcers are acute superficial inflammatory lesions of the gastric mucosa induced when an individual is subjected to high physiologic demands. In recent years, use of acid suppression therapy (AST) for stress ulcer prophylaxis (SUP) in inpatient settings other than intensive care has become increasingly common, leading to increased drug cost and an avoidable increased risk of adverse events such as hospital acquired pneumonia.

**Materials & Methods** This was an exploratory, prospective pre- and post-intervention study of all patients admitted to the infectious disease ward of Imam Hospital, the major referral one for infectious disease patients in Iran. The study intervention consisted of the use of an internal guideline for SUP that was prepared by clinical pharmacists in accordance with ASHP guidelines, followed by education provided to the physicians who monitored and visited the hospitalized patients. For the 4-month pre-intervention and post-intervention periods, the following data were collected: admitting diagnoses, number and type of SUP risk factors for AST, and type of AST medication used (omeprazole or ranitidine). Exclusions included (a) patients using AST for appropriate gastrointestinal diagnoses at admission, and (b) patients who died during the hospital stay because of a cause other than a gastrointestinal disorder. Rates of AST use were measured for the sample overall, and for patients with and without an indication for SUP. Appropriate use was defined as 1 primary (“absolute”) risk factor (i.e., coagulopathy, mechanical ventilation, or history of gastrointestinal bleed in the last 12 months) or 2 or more secondary (“relative”) risk factors (e.g., use of heparin). Pre- and post-intervention results were compared using the Pearson chi-square test.

**Results** AST use declined from 80.9% (212 of 262) infectious disease ward patients in the pre-intervention period to 47.1% (113 of 240) patients in the post-intervention period ( $P < 0.001$ ). Of 23 patients in the preintervention period with an indication for SUP according to our ASHP-based guideline, 78.3% ( $n = 18$ ) received AST versus 85.7% ( $n = 12$  of 14) in the post-intervention period ( $P = 0.575$ ). Of the patients without an indication for SUP, 194 of 239 (81.2%) received AST in the pre-intervention period versus 101 of 226 (44.7%) in the post-intervention period ( $P < 0.001$ ). Of the patients who received AST, 194 of 212 (91.5%) did not have an indication for SUP in the pre-intervention period versus 101 of 113 (89.4%) in the post-intervention period ( $P = 0.528$ ).

**Discussion & Conclusion** In this pre- and post-intervention study, the introduction by pharmacists of a treatment guideline for SUP in the infectious disease ward of Imam Hospital was associated with reduction in use of AST overall and in patients without an absolute indication for SUP.

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**Keywords** Implementation, Pharmaceutical Care Issues, Protocols

## PRS-30

### Is deep vein thrombosis prophylaxis appropriate in the medical wards: a clinical pharmacist team interventional study?

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**Introduction** Venous thromboembolism is a major cause of mortality and morbidity in hospitalized patients. To evaluate physicians' approach to patients' thrombosis risk assessment and practice of thromboembolism prophylaxis in a teaching hospital, we designed an interventional prospective study.

**Materials & Methods** This pre and post interventional study was conducted in the infectious diseases ward of Imam Khomeini referral hospital, Tehran, Iran. Patients' risk factors for thromboembolism during hospitalization course and physicians' thromboembolism prophylaxis approaches were evaluated in a pre and post clinical pharmacists' interventional study. An internal guideline for prescribing anticoagulants as deep vein thrombosis (DVT) prophylaxis was prepared by clinical pharmacists and the appropriateness of anticoagulants' prescription was evaluated and compared before and after the implementation of consensual guideline.

**Results** In the pre-intervention phase 69.9% of patients had appropriate indication and received thromboembolism prophylaxis and in 31.1% of enrolled patients anticoagulants were prescribed inappropriately. In the post interventional phase of the study, 88.4% of patients had appropriate prescription of anticoagulants for thromboembolism prophylaxis and 11.6% of admitted patients received prophylaxis inappropriately. A decrease in the number of patients who had the criterion for DVT prophylaxis but anticoagulants were not administered after the implementation of internal guideline was statistically significant ( $p = 0.001$ ).

**Discussion & Conclusion** The implementation of clinical pharmacists' prepared protocol for stratification of patients in low, moderate and high risk groups for the development of deep vein thrombosis in the infectious diseases ward of Imam Hospital helped to a great extent in the improvement of administrating DVT prophylaxis appropriately in patients.

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**Keywords** Deep Vein Thrombosis, Implementation, Pharmaceutical Care Issues

#### PRS-31

##### Determination of knowledge and attitude of self-care among patients with hypertension

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**Introduction** The aim of the study was to determine the knowledge and attitude of self-care among patients with hypertension.

**Materials & Methods** The study was conducted in consecutive patients with hypertensive, who attended to community pharmacy between March and May 2010. The demographic, clinical and medication history was directly obtained from patients and medical records. The questionnaire designed by investigators was applied to patients to assess knowledge, perception and attitudes of patients about various lifestyle changes, appropriate blood pressure measurement, attitudes in hypo- and hypertension conditions, and knowledge about antihypertensive agents.

**Results** Among 40 patients with hypertension, 52.5% of patients were female and the mean age of the patients was  $58.88 \pm 7.86$ . The most of the patients were married and of a low education level. The mean of the body mass index of patients was  $28.69 \pm 4.31$ . 25% of patients had hospitalization in the last year. 65% of patients have never taken daily regular exercise. The number of patients who received patient education by health care providers about hypertension and antihypertensive medication was 6 and 9, respectively. Most of patients knew the normal value of blood pressure as  $\leq 130/80$ . Most of the patients knew the symptoms of hypertension, target organ damage of hypertension and aware cause of hypertension under less control. 80% of patients knew the importance of the salt restriction during hypertension management; but none of the patients knew the amount of salt intake must take daily. 67.5% of patients told that they did not check the amount of sodium in other medications and dietary supplements. 13 patients declared that they stopped taking antihypertensive medications when they felt better. The antihypertensive therapy was changed in 11 patients with the reason of adverse effect ( $n = 6$ ) or inadequate response ( $n = 5$ ). 50% of patients took their medication when their blood pressure rose and 17% of patients consume salty fluids when their blood pressure lowered. Most of patients knew the importance of right cuff size based on the size of their arm, raising left arm to the level of their heart, and resting for least 5 min before

measuring blood pressure; but only little number of patients aware not drinking caffeine include fluids 30 min before measurement of blood pressure, sitting in a comfortable position, with their legs and ankles uncrossed and their back supported, measurement of blood pressure at the same time daily and recorded the result of blood pressure after 2-3 readings.

**Discussion & Conclusion** Considering the low knowledge level of patients about that pharmacologic and non-pharmacologic therapy in hypertension management, pharmacist-led patient education may have a major importance in disease management and prevention of hypertension induced complications.

**Keywords** Hypertension, Self care

#### PRS-33

##### Clinical pharmacist interventions at a nephrology and diabetology ward

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**Introduction** A position of a clinical pharmacist at hospital wards is not fully established in the Czech Republic. In 2008 we have started a clinical pharmacy project. Its aim is to place a clinical pharmacist into a therapeutic team to maximize rationality and safety of drug therapy. Since 2009 we have started to record all the drug interventions to be able to evaluate the project.

**Materials & Methods** Once a week pharmacists attend a nephrology and diabetology ward where they review patients' medical records, take part in a ward round and discuss drug related problems (DRP) with doctors or nurses. DRP are recorded according to Pharmaceutical Care Network Europe (PCNE) classification. Outcomes of interventions at the level of doctors or nurses and the ATC (Anatomical Therapeutic Chemical Classification system) codes of discussed drugs are recorded as well.

**Results** On the whole, in 2009, 175 interventions were made during 46 ward rounds. Only 8% of them were directly requested by a doctor or nurse, the rest of interventions was suggested by a pharmacist and more than a half of them (53, 1%) accepted by medical staff. Only 5% of interventions didn't meet with approval and the outcome of 34, 3% of interventions is not known. Right choice of a drug and dosing regimen were the most discussed problems (32% and 35%, respectively). Considering pharmacological groups DRP were most often referred to antihypertensives, antibiotics and mineral supplements.

**Discussion & Conclusion** The results of the project show that clinical pharmacist is an essential member of therapeutic team who can significantly contribute to rationality and safety of the drug therapy. However, our project has several limits. As the pharmacists attend the wards just once a week a lot of DRP remain unrevealed. Unavailability of the clinical pharmacist whenever needed prevents from building a close collaboration between clinical pharmacists and doctors or nurses.

**Keywords** Clinical pharmacy services, Drug-related problems, Hospital pharmacy

#### PRS-34

##### Development of a new tool to handle the medicines not referenced in a geriatric hospital

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**Introduction** The pharmacy of our geriatric hospital is divided in three sites and allocated 63 495 euros to medicines not referenced in our therapeutic booklet (“off-book drugs”). Off-book drugs management is time-consuming for the residents and pharmacists. Besides, the differences between the three sites and the frequent change of the residents raises concerns about practices uniformity. The aim of this study was to imagine and build a support tool to help us solve these problems.

**Materials & Methods** We first referenced in a database the different requests for off-book drugs and the criteria taken into account by the residents and pharmacists to replace or not an off-book drug. These criteria were environmental (medical unit, personal treatment of the patient), economic (drug cost), or related to the healthcare quality (relationships between medical practitioners and pharmacists, treatment importance, equivalent drugs in the therapeutic booklet). And for each criteria, there were two or three possible situations (short stay or long stay unit, cheap or expensive drug, etc). Using Netica® software, we built a bayesian neurons network based on the conditional probability properties and representing the interactions between the criteria. The network structure and the probability tables were filled with our experience and knowledge. For each off-book drug request, we entered in the network the situation for each criteria, and the network gave a decision score. That way, forty off-book drugs requests were analyzed in one month.

**Results** Patients for who off-book drugs were requested had the following characteristics: 20% arrived at the hospital with their treatment, 92.5% were in short stay units, the average cost of the medicines units was one euro, 65% requests were made by medicine interns. Based on the SMR (service medical rendu), 65% of the treatments were considered as important for the patient care, 22.5% had a perfect equivalent molecule referenced in the therapeutic booklet and 45% had a molecule from the same family referenced. Finally, 60% of the treatments requested were bought, the 40% left were either stopped or replaced by an equivalent drug. Based on these datas, our network had a 92% sensibility and an 87% specificity to predict the off-book drugs replacements.

**Discussion & Conclusion** The use of this network is expected to standardize the practices concerning off-book drugs management in our structure but also to reduce the costs associated by 10% while healthcare is still insured. This cost reduction could be all the more important so as this network would be applied to other hospital structures.

**Keywords** neurons network, off-book drugs, support tool

## PRS-35

### Analysis of 161 pharmaceutical interventions during clinical validation of parenteral cytotoxic prescriptions in a French cancer treatment center

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**Introduction** Our institute is one of the largest French research and cancer treatment center. Consequently, the production of chemotherapeutics represents a very important flow of 75,000 batches a year. The prescription of chemotherapy is computerized and the manufacturing is centralized in the pharmacy according to a global quality assurance program. 3 pharmacists work in the centralized unit that allows for analysis of each prescription with further possible

access to each medical computerized files (diagnostic, history and current protocol of treatment, biological datas). The aim of this study was to identify the characteristics and the frequency of pharmaceutical interventions (PI).

**Materials & Methods** A prospective observational study was carried out from 01/01/10 to 05/31/10. Prescriptions were analyzed and PI were recorded and codified according to the French Society of Clinical Pharmacy tool. Simple complementary requests to complete the prescription analysis were not recorded.

**Results** 11980 prescriptions were analysed. 161 PI were registered. The PI mainly concerned prescriptions for outpatients treated in a day hospital (48%), inpatients (32%) and paediatrics patients (14%). The most frequently PI encountered were overdoses (54%), inappropriate conditions of administration (16%), underdosages (11%), incomplete prescription with drug missing (9%). 57% of the PI led to a dose adjustment after discussion with physicians. In 15% of the cases, an optimization of the therapeutic modalities was selected by physicians. 13% of the PI concerned a problem with the end of the treatment and a stopped drug in the therapeutic sequence after toxicity and prescriptions were cancelled or modified consequently. In 11% of the PI a drug was added to the initial prescription. 94.4% of the PI led to a prescription change. But in 5.6% of the PI, no modification were realised by physicians.

**Discussion & Conclusion** This study shows that the frequency of PI is 1.3% of the computerized injectable cytotoxic prescriptions. Physicians have mainly accepted the PI, but some of them don't modify their prescription because of the poor or limited impact on the health patient. The clinical activity of pharmacists with a validation of prescription indicates considerable impact on the safety level for the patients. The PI allowed a pharmacist-physician relationship improvement. However the tool developed by the SFPC does not assess the relevance and clinical impact of PI; in the future we will try to develop this tool which will include an evaluation of these items. Thus we will be able to determinate the clinical benefits of using hospital pharmacists to control the parenteral cytotoxic medicine and justify this activity which appears initially very expensive in human resources.

**Keywords** cytotoxic drugs, pharmaceutical interventions, prescriptions

## PRS-36

### Pharmacotherapeutical follow-up enhances HRQL and pharmacy sales to chronic patients

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**Introduction** Elderly are the main group implied in the recent increase of drug consumption in industrialized countries. In Spain, people older than 65 years are responsible for 70% of the pharmaceutical cost, due to their prevalence of chronic diseases. 85% of the chronic patients use a daily average between 4-8 drugs per person. The chronic patients with polypharmacy have high probability of developing negative outcomes associated with drugs which can be identified, be avoided or be solved by pharmacotherapeutical follow-up. The aim of our work was to investigate the outcomes associated with medication of chronic and polymedicated patients. Also, we measured the change on the health-related quality of life (HRQL) and the evolution of community pharmacy sales to these patients.

**Materials & Methods** Quasi-experimental pre-test post-test with control group study. Using Dader method, a pharmacist practiced free pharmacotherapeutical follow-up on the intervention group during a year and Health-related Quality of Life was measured on both

groups before and after this year by the Questionnaire Profile of Health of Nottingham. Total shopping on the pharmacy of both groups was accounted using a personal card and the time expended by the pharmacist was noted.

**Setting** Patients of a community pharmacy in Castellon, Spain, from April, 2009 to March, 2010.

**Results** (Preliminary results) Pharmacist practicing pharmacotherapeutical follow-up detected and solved negative outcomes associated with medication. Medicine consumption and health problems of patients were reduced after intervention with respect to the control group. At the same time, health-related quality of life increased after pharmacotherapeutical follow-up session. Shopping on the pharmacy was greater for the intervention group. The prevalence of negative outcomes per patient of intervention group at the beginning of the study was of 2.81. 59% of detected negative outcomes were solved, and 89% were classified as avoidable. Around 18% of negative outcomes were related to drug neediness, and 39% and 43% related to drug effectiveness and drug safety, respectively. Around 15% suspicions of negative outcomes were not accepted by the doctor and we observed a 4.2% decrease of the total number of drugs per patient. We observed an increase on the health-related quality of life for the patients after pharmacotherapeutical follow-up. The intervention group spent 29% more money on the pharmacy with respect to the control group.

**Discussion & Conclusion** Therefore, we concluded that pharmacotherapeutical follow-up is a pharmacy practice that reduces the drug use of chronic and polymedicated patients increasing their health-related quality of life. This pharmaceutical service enhances the shopping of these patients with respect to the control group being cost efficient for the community pharmacy.

**Keywords** Clinical outcomes, Community pharmacy services, Pharmaceutical Care, pharmacoconomics, Quality of Life

## PRS-37

### RASP criteria. Content validation and inter-rater variability among Belgian pharmacists

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**Introduction** Potential inappropriate prescribing in older persons is highly prevalent and is associated with an increased risk of adverse drug reactions, hospitalizations, morbidity and mortality. Several screening tools have been developed to aid caregivers in identifying this issue. We formulated the *RASP-list* (*Reduction of drugs on Admission by an adjusted STOPP-list in the elderly Population*) to detect inappropriate overprescribing in a Belgian geriatric population.

In order to use the RASP-list in daily clinical practice, the content validity and the inter-rater variability were examined and evaluated.

**Materials & Methods** The *content validity index (CVI) method* was used to establish the content validity. Nineteen experts in geriatric pharmacotherapy were selected to evaluate the content of the RASP-list. The item-CVI (I-CVI) and the modified kappa statistic ( $k^*$ ) were calculated for each item on the list. The  $k^*$  was used to decide whether an item should be retained, eliminated or revised (fair:  $k^*$  of 0.40 to 0.59, good:  $k^*$  of 0.60 to 0.74, excellent:  $k^*$  of >0.74). The average I-CVI (=scale-CVI/Ave = S-CVI/Ave) was calculated to decide whether the different raters found the global construct of the list to be valid.

An *inter-rater variability* analysis using Cohen's kappa statistic was performed to determine consistency between hospital

pharmacists. Ten pharmacists were given 20 detailed patient profiles. Each pharmacist applied the RASP-list to each patient record. The results from each pharmacist were compared with those of 3 academic pharmacists who were highly familiar with the application of the RASP-instrument.

**Results** Ten (5 pharmacists, 5 geriatricians) of the 19 raters responded. The evaluation resulted in S-CVI/Ave of 0.94. Three items were scored with a  $k^*$  of <0.74 (0.72, 0.52, 0.60) and were revised accordingly.

Inter-rater reliability is favorable with a median Cohen's kappa-coefficient of 0.69 between pharmacists.

**Discussion & Conclusion** The RASP-list is a valid and reliable screening tool that enables the caregiver to appraise an older patient's drug chart in the context of his concurrent diagnoses.

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**Keywords** Elderly, Inter-rater variability, Polypharmacy, Validation

## PRS-38

### Qualitative analysis of pharmacists' experiences during the implementation of an adherence program

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**Introduction** Adherence to therapies has been identified as an important factor for clinical success<sup>1</sup>. In Switzerland, the community pharmacy of the Department of Ambulatory Care and Community Medicine in Lausanne runs an adherence clinic, which combines repeated and short motivational interviews with electronic pill-organizers for monitoring adherence. In 2007, twenty Swiss community pharmacies participated in the implementation of a similar adherence program within the settings of ambulatory care. The initial objective was to include 60 patients with 3 cardiovascular medications, but only 7 subjects in total were finally able to be included due to the complexity of implementations of new Cognitive Pharmaceutical Services (CPS)<sup>2</sup>. This qualitative study aimed to identify the factors influencing the execution of this adherence program.

**Materials & Methods** Two interviews were conducted in each pharmacy, one with the pharmacist in charge of the adherence program and one with a technician involved. The researcher asked open-ended questions about topics emerging from the interview and other questions linked with a schedule of topics identified in the literature. Interviews were limited to one hour and were audio recorded with the permission of the interviewee. The researcher transcribed the audio recordings verbatim in transcription software (Express Scribe, NCH) with the help of voice recognition software (Dragon Naturally Speaking, NUANCE). The textual data was transferred to qualitative

data analysis software (Weft-QDA, A. Fenton). Finally, the researcher performed a thematic analysis.

**Results** The following identified areas of concern were discussed: organisation of the pharmacy, skills and knowledge of the staff, patients' expectations, collaboration with physicians, experiences with specific material and processes. The researcher interviewed 20 pharmacists and 4 technicians.

The first results of the thematic analysis are as follows. Pharmacy staff had good relationships with patients; nevertheless, adherence was a difficult subject to discuss. Patients often didn't expect to talk about their medication consumption. The confidentiality of the interviews required that two pharmacists had to be simultaneously available, one for interviewing the included patient in a private room and one for the routine work. Patient adherence is perceived to be important, but it is not a priority for pharmacists given the amount of routine work that needs to be done.

**Discussion & Conclusion** A better understanding of factors influencing the execution of this adherence program will contribute to the successful implementation of future CPS in Switzerland. Implementation of new CPS in Swiss ambulatory care is a recent initiative. Pharmacists need time and confidentiality to perform CPS.

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**Keywords** Cognitive pharmaceutical services, Community pharmacy, Implementation, In-depth interviews, Medication adherence

#### PRS-39

##### The evaluation of the use of pharmacy cupboards on medical wards: audit of two procedures

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**Introduction** The provision of and the storage of medicines in pharmacy cupboards are the two keys points to consider in order to obtain an effective pharmacy system.

At Chambéry hospital, the concept of “full-empty” has been in place since 2003. This concept assures a reliable system of the storage, availability of medicines and management of pharmacy stocks. Thus avoiding expired medicine.

Naturally, problems have occurred when the system has not been put into place properly.

The objective of this study is the evaluation of the practicalities of the “full-empty” system with regards to the two procedures: provision and storage. The two procedures are recognised and validated by those who implement the system. A practical training session is offered four times a year.

**Materials & Methods** This audit targetted the two procedures. It evaluates the knowledge of nurses from six medical wards which were chosen at random from seventeen wards. The nurses were interviewed and observed; and the pharmacy cupboards were controlled.

**Results** 1. *Rules of the use of pharmacy cupboards*: 30 nurses were interviewed. 48% had knowledge of the procedures. Yet 37% knew how to locate the procedure book. 30% had attended the training session. 90% knew that the list of available medicines is located in the pharmacy cupboard. The system rules were respected in more than

80% of cases, the exception being medicines in simple boxes, which were known of the 45% of cases.

2. *The storage of medicines*: 6 nurses were interviewed. 50% had knowledge of the procedure. 50% knew how to locate the procedure book. Only 33% of nurses checked newly delivered stock against the order form. 100% of nurses stored the pharmacy correctly.

3. *Observation of pharmacy cupboards*: 0% of cupboards were found to be locked. 100% were clean. In 98% of cases the labelling conformed with the regulation. 27% of opened blister packs did not reveal the date of expiry nor the lot number. 50% of wards overstocked injectable drugs.

**Discussion & Conclusion** Finally, this audit shows that on the whole, pharmacy cupboards are quite well-used inspite of some worrying problems. For instance, the cupboards cannot be locked and simple boxes are not properly used. This evaluation shows the failure to recognize the procedures and to locate the procedure book.

So, these procedures must be updated if necessary and must be made available to the users.

A new audit will have to be made in a year's time to assess the efficiency of the measures taken to correct the problems.

**Keywords** cupboards, practicalities evaluation, procedure audit

#### PRS-43

##### Enhancing adherence of cancer patients to oral chemotherapy

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**Introduction** Efficacy of orally administered chemotherapy depends on a high level of patient adherence. In this prospective multi-centre observational cohort study, we investigated the effect of an intensified multidisciplinary pharmaceutical care programme on the adherence of cancer patients treated with capecitabine, a prodrug of fluorouracil, available as film tablets and routinely used in the treatment of colorectal and breast cancer patients.

**Materials & Methods** Twenty-four colorectal and twenty-four breast cancer patients participated in this study. Patients of the control group (n = 24) received standard care, patients of the intervention group (n = 24) received intensified pharmaceutical care consisting of written and spoken information. Adherence to capecitabine chemotherapy which is taken twice daily for 14 days with a seven days break between the cycles was measured using an electronic medication event monitoring system (MEMS<sup>TM</sup>).

**Results** Patients in the intervention group exhibited an enhanced but not significantly different mean overall adherence compared to the control group (97.9% vs 90.5%,  $p = 0.069$ ). Mean daily adherence was significantly higher in the intervention group (96.8% vs 87.2%,  $p = 0.029$ ). Variability of both adherence parameters was considerably reduced when pharmaceutical care was provided. At the end of the observation period of 126 days, the probability of still being treated with capecitabine was found to be 48% in the control group and 83% in the intervention group ( $p = 0.019$ , log-rank test). The relative risk for a deviating drug intake interval, i.e. <10 or >14 instead of 12 h, in the intervention group was found to be 0.51 (95% CI, 0.46–0.56) compared with the control group ( $p < 0.05$ , Chi-square test).

**Discussion & Conclusion** The provision of intensified pharmaceutical care can enhance adherence to and prolong treatment with capecitabine. However, not every patient is in need of an adherence-enhancing intervention. Based on these conclusions, we designed a follow-up study which is currently ongoing. After completion of the first cycle of capecitabine chemotherapy (run-in phase) patients are divided into two groups based on measured adherence. Initially non-adherent patients (adherence < 90%) receive an intensified adherence enhancement intervention. Initially adherent patients (adherence ≥ 90%) will only be monitored to reveal whether they remain adherent during the entire course of their chemotherapy.

**Keywords** adherence, cancer oral chemotherapy, capecitabine, Pharmaceutical Care

## PRS-44

### Pharmaceutical interventions in antibiotic therapy: first quarterly report by using French Society of Clinical Pharmacy (SFPC)'s form

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**Introduction** In our hospital, Antibiotics (ATB) prescriptions have been daily analyzed by a pharmacist since 2007. Each pharmaceutical intervention (PI) is recorded on a monitoring patient form. In order to standardize, analyze and promote pharmaceutical interventions, we decided in March 2010, to use the SFPC tool for managing IP related to ATB.

**Materials & Methods** For each PI, the pharmacist fills in a form with medical service, molecule, problem identification, type of intervention and clinical impact of the intervention. Each form is then captured on the SFPC computer program. A data extraction allowed us to conduct a first quarterly review (March-April-May 2010).

**Results** Validation of ATB prescriptions generated 132 PI for all services among patients of average 73 years old (14–96 years old): 48 women and 84 men. The most frequently involved services were geriatric (30%), internal medicine services (23%) and surgery (11%). PI concerned mainly cephalosporins (33 PI - 25%), aminosides (27 PI - 20%) and fluoroquinolones (20 PI - 15%) antibiotics. The main type of pharmaceutical problem was non-compliance to recommendations, it represented 51% of PI (68/132) and included the mismatch between ATB and sensitivity or long prescription of aminosides. In 35% of cases, proposed PI was a therapeutic substitution; stopping the treatment was recommended in 19% of cases; 15% of PI were for adding a treatment and other interventions were dosage adaptation, choice of way of administration, therapeutic monitoring and optimization of administration. In total, 40% of PI was accepted, 14% not informed (get-out patients) and 46% not accepted. Among “non accepted” PI, 11 were motivated by a specialized advice, 9 PI for only aminoside prescriptions were actually associated with another ATB (unspecified on prescription) and 5 patients showed clinical improvement despite the mismatch between ATB and sensitivity.

**Discussion & Conclusion** This experience has allowed us to share our difficulties about routine quotation and to standardize it. A quarterly and annual report will be provided to each pharmacist, and a booklet is being written to guide pharmacists during validation of ATB prescriptions. Finally, analysis of IP can highlight recurrent drug problems in order to propose and implement corrective measures and working base for Committee of Antibiotics within a goal of improving quality of medical care.

**Keywords** Antibiotics, pharmaceutical interventions, sfpc form

## PRS-45

### Evaluation of professional practices: relevance of fluoroquinolones prescriptions

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**Introduction** Fluoroquinolones (FQ), widely prescribed in hospitals, are affected by the increasing emergence of resistances. The use of FQ in our hospital is greater than the median consumption of comparable institutions. In order to monitor consumption and evaluate good practices, the Committee of Antibiotics (CAI) and the pharmacy established, as part of an evaluation of professional practices, a review of relevant prescriptions of FQ.

**Materials & Methods** The EPP was performed on two periods of 15 days and focused on Medicine/Critical Care services and Geriatrics (total: 10 services). During pharmaceutical validation of ATB' prescriptions, every prescription of FQ brought about the creation of an information form including: molecule, dosage, indication, way of administration, associated molecules, duration of treatment. Then, each sheet was analyzed by the resident and the pharmacist, in collaboration with the physician of CAI and compared with local and national recommendations and consensus conferences.

**Results** 36 FQ prescriptions were analyzed in patients of average 78 years old. Levofloxacin and ofloxacin were the most prescribed molecules, respectively 36 and 33%. The most common indications were pulmonary infections: 47% (17/36) and urinary: 36% (13/36). 69% of FQ prescriptions were done on probability theories.

In 58% of cases (21/36), FQ were prescribed orally, oral voice took over from intravenous prescriptions for 87% of cases and 53% of intravenous prescriptions were justified. In 92% of cases (33/36), dosage was complying with recommendations. In two cases it was not appropriate to renal function but in one case, pharmaceutical calling led to a dose adjustment.

FQ were not recommended in 25% of cases. Among the 27 conformed prescriptions, there were 15 associations to another antibiotic with 6 non-compliant associations. Cephalosporin and amoxicillin-clavulanic acid were the most associated molecules with ofloxacin or levofloxacin for the treatment of pulmonary infections. The treatment length was found to be standard in 64% of prescriptions. And the prescription was found to be fully compliant (on all measures: indication-association-way of administration-dosage-length) in 33% of cases (12/36).

**Discussion & Conclusion** These results show an evolution of practices: increasing of orally FQ prescriptions, but also reveal a lack of compliance with recommendations: length of treatment, associations, over-consumption of ofloxacin. After diffusion of the latest recommendations to all physicians, a second audit will be repeated in the same way. This monitoring of FQ prescriptions contributes to the proper use of antibiotics in an overall goal of preventing resistance's development and the excessive and inappropriate use of antibiotics into the hospital.

**Keywords** antibiotics, Fluoroquinolones, prescriptions, professional practices evaluation

## PRS-46

### Problems with self-injecting low-molecular-weight Heparins in primary care

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**Introduction** Outpatient subcutaneous (s.c.) therapies are becoming more and more common in the treatment of different diseases. Low-molecular-weight heparins (LMWH) are frequently used for the prevention and treatment of venous thromboembolism. A literature search failed to find studies on application problems concerning self-injection of LMWH in a heterogeneous outpatient population under daily life conditions. Thus, we designed this study to record drug use problems, patient satisfaction, compliance, problems arising from the injection site (abdomen vs. thigh) and residual drug volumes in the used pre-filled syringes.

**Materials & Methods** Patient recruitment and data collection were carried out in community pharmacies by 95 skilled, graduating pharmacy students. Data were collected through structured questionnaire-based telephone interviews both at the beginning and at the end of the LMWH treatment. Drug use problems comprised handling difficulties with the injection-device, discomfort, confidence, degree of effort required to inject and experience of side effects. Compliance was assessed based on patient's self-report. The returned sharps collectors allowed investigation of illegitimate recapping, residual drug volume and use of needle guards.

**Results** Median age of the 213 patients was 54 years (range: 18–88); 50.7% were male and 41.8% had previous outpatient s.c. injection therapies. A total of 15.5% had their injections administered by another person. The rate of self-reported non-compliance was 17.1%. At least one relevant problem with self-injecting was recorded in 85.0% (e.g. lack of knowledge concerning injection site or technique, recapping). At the end of treatment, 38.9% of patients stated the injections required them some effort. The preferred injection site was the thigh with 68.5%. We found no differences between those injecting into the abdomen and those into the thigh. The needle caps of Fragmin<sup>®</sup> were rated as significantly easier to remove than those of Clexane<sup>®</sup> and Fraxiparine<sup>®</sup>. Of patients using Fraxiparine<sup>®</sup> or Fraxipor<sup>®</sup>, 31.3% did not use the post-use needle guards. A total of 46.1% of patients had no residual drug in any of their syringes. The overall mean residual drug volume was negligible. However, in 59.8% of the cases where some residual drug was present, an average of  $\geq 10\%$  (median: 6.7%; range: 3.7–79.6%) of the total drug volume had not been injected. Patients injecting into the thigh showed a higher risk of leaving residual medication.

**Discussion & Conclusion** Problems encountered in patients with LMWH applications may affect the injection itself or handling of the injection-device and have to be evaluated on an individual basis. From the patient's point of view, injections required some effort. Patient support was appreciated, but there is still a need for improvement. Injection-free solutions for patients on chronic LMWH use would be appreciated.

**Keywords** drug use problems, injection site, low-molecular-weight heparin, outpatients, subcutaneous injections

## PRS-47

### First experience of a medication reconciliation program in a French military hospital

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**Introduction** The process of medication reconciliation has been showed to reduce adverse drug events at points of transition in the

patient care process in the hospital, such as admission, transfers and discharge. The aims of this work are to describe the implementation of a medication reconciliation program in an internal medicine ward of a French military hospital and to present the first results.

**Materials & Methods** The implementation of this process first required a review of literature: we developed medication conciliation paper forms basing ourselves on Canadian experience. Then, we identified the sources of information required to conduct medication reconciliation at admission (patient interview, community pharmacies, medical charts, primary care physicians). Afterwards, we explained our project to the medical staff of the pilot unit.

**Results** We chose to apply medication reconciliation to patients over 65 years old. This process is totally pharmacist-conducted: in the first 48 h after admission, a pharmacy intern collects the list of all medications the patient is taking including name, dosage, frequency and route. The medication history is then compared with the physician's medication orders. All medication variances are brought to the prescriber's attention and are classified as intended or unintended variances. Moreover, we assess the level of compliance of the patients during the interview with a standardized questionnaire and report the results to the physician. The patients' discharge medications are also compared with preadmission and hospitalization medications and all discrepancies are clarified with the prescriber. At discharge, the pharmacy intern provides explanations to the patients concerning medication changes made during the hospitalization. Our project began three weeks ago and currently involves 21 patients. The mean number of unintended variances was 0.6 per patient. 7 patients had one or more unintended variances at admission. 70% of the unintended variances resulted in order changes by the physician. The average duration to conduct medication reconciliation at admission was 45 min. This project was received favourably by the physicians, community pharmacists and patients.

**Discussion & Conclusion** These first results are consistent with previous studies showing that medication errors at transitions in care are frequent and can be prevented by medication reconciliation. The evaluation of patient compliance included in the reconciliation medication process should give us the opportunity to develop a project of therapeutic education. Medication reconciliation improves patient safety but is also a time consuming process. To ensure the sustainability and expansion of this project, new personnel arrangements should be explored, such as pharmacy technicians and nurses partnering with pharmacists to facilitate medication reconciliation.

**Keywords** medication reconciliation, Pharmaceutical care

## PRS-48

### Cardiovascular disease risk assessment among patients with hyperlipidemia at a community pharmacy setting

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**Introduction** The aim of the study was to evaluate 10-year cardiovascular disease risk in patients with a former diagnose of hyperlipidemia at a community pharmacy setting.

**Materials & Methods** The study was carried out between March and April 2010 at a community pharmacy located in Üsküdar District of Istanbul. Patients with a former diagnose of hyperlipidemia, who attended to community pharmacy for supplying their medications were included. The demographic, clinical and medication history was directly obtained from patients and medical records. Framingham

Risk Equations was applied to calculate 10-year risk of cardiovascular disease.

**Results** A total of 50 patients with hyperlipidemia (52% of female) were screened for cardiovascular disease risk assessment. Most of the patients were married. 30% of patients were of high level education. The mean age of the patients was  $57.40 \pm 9.04$ . 76% of patients had no smoking history. 10% of the patients had a family history of hyperlipidemia. 58% of patients had comorbid disease especially diabetes mellitus and hypertension. The mean of hyperlipidemia duration was  $4.40 \pm 2.45$  years; and parallel to this, the length of antihyperlipidemic drug used was  $4.32 \pm 2.49$  years. 34% of patients had a 10-year risk of developing cardiovascular disease greater than 20%, including 12% who had a 10-year risk above 30%. According to last laboratory result, the mean of total cholesterol, LDL cholesterol, HDL cholesterol, triglyceride level were  $241.00 \pm 37.20$ ,  $173.00 \pm 22.46$  mg/dL,  $40.00 \pm 8.71$ , and  $198.00 \pm 91.44$ , respectively.

**Discussion & Conclusion** The cardiovascular disease risk assessment will be implemented at community pharmacy setting. After obtaining the high risk patients, clinical pharmacists may provide recommendations about life style changes and medications and early refer to physicians for further assessment.

**Keywords** Cardiovascular, Hyperlipidemia, Pharmacy, Risk assessment

## PRS-49

### Development of a multiprofessional tumor therapy management

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**Introduction** Systemic cancer therapy is complex and associated with a high incidence of treatment-associated risks. Patient education and counseling regarding supportive therapy may help minimize these treatment-associated risks. Projects conducted at the University of Bonn have shown positive effects of patient counseling on outcomes such as quality of life or medication adherence. [1] The aim of the current project is to define the role of physicians, pharmacists and nurses in a multiprofessional tumor therapy management model including shared education and counseling.

**Materials & Methods** Focus group meetings were held to identify different tasks as part of the multiprofessional tumor therapy management model. The modified Delphi technique was used to allocate these tasks to physicians, nurses and pharmacists by local cancer care teams. Additionally the professions' perceptions on benefits and problems of multiprofessional teamwork were explored. Afterwards physicians, nurses and pharmacists have been approached nationwide by the German Cancer Society and the German Society of Oncology Pharmacy via an online-questionnaire to assess the acceptance of the presented multiprofessional tumor therapy management model.

**Results** Two focus group meetings of six clinical pharmacists and one moderator identified 38 multiprofessional tumor therapy management tasks. The Delphi questionnaire was pre-tested by all three professions and found to be feasible. Two Delphi rounds with 12 participants (five nurses, four physicians, three pharmacists working together in three different cancer care teams) allocated these tasks to the different professions: while 27 of the tasks should be shared, 11 should be carried out by one profession alone. The exploration of perceptions showed that from the professions' viewpoint problems of teamwork occur if the professions have e.g. lacking assignment or acceptance of each other's competencies leading to overlapping task

completion. On the other hand, it was recognized that a better organisation of teamwork might considerably improve patient education and treatment outcomes. The online survey is currently ongoing.

**Discussion & Conclusion** The analysis of problems and benefits of teamwork stated by the different professions emphasized the need to structure multiprofessional teamwork. A multiprofessional tumor therapy management model has been developed promoting the communication between the professions to reconsider work structures and to improve patient education and counseling. Based on our model, more specialized models concerning e. g. medication adherence and supportive therapy strategies such as fatigue and nutrition can be developed and implemented according to the patient's needs.

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**Keywords** multiprofessional cancer care

## PRS-50

### Prevalence of unreachd biomarker targets under antihypertensive and lipid modifying therapy in community pharmacies in Switzerland

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**Introduction** A significant proportion of patients with prescribed medicines for antihypertensive (AHT) and lipid modifying therapy (LMT) do not reach their biomarker targets as defined by the respective guidelines. Patients not on target are at increased risk of therapy failure. Community pharmacists are in an excellent position to address factors that are associated with a lack of target achievement, such as non compliance, unfavourable lifestyle and nutrition, drug drug interactions, incorrect dosing, and inheritance of drug response. Pharmacological biomarkers could help to identify patients who can profit from pharmaceutical care interventions. Our aim is to describe the prevalence of patients not on target with AHT and LMT. **Materials & Methods** In a community pharmacy based screening programme for cardiovascular risk factors in Switzerland, blood chemistry, blood pressure (BP), body mass index, and lifestyle factors of participants were collected. Blood chemistry analysis included total cholesterol (TC), HDL-cholesterol (HDL-C), LDL-cholesterol (LDL-C), and triglycerides (TG).

Patients with a prescription for AHT were labelled as "not on target" if their BP was  $> 140/90$  mmHg (systolic/diastolic BP), or  $> 150$  mmHg (isolated systolic BP), while LDL-C  $> 3.4$  mmol/l was the respective criterion for patients with LMT. Patients with LMT were further labelled as "optimisable" if LDL-C was  $\leq 3.4$  mmol/l, but HDL-C was  $< 1.0$  mmol/l, TC/HDL-C  $> 5$ , and/or TG  $> 2.5$  mmol/l. **Results** From a total of 4380 screened subjects, 863 (19.7%) were selected because they had a prescription for either AHT ( $n = 537$ , 12.3%; age =  $67.9 \pm 10.3$  years; 68.5% females), LMT ( $n = 157$ , 3.6%; age =  $64.9 \pm 10.1$  years; 56.7% females), or both ( $n = 169$ , 3.9%;  $68.6 \pm 9.9$  years; 55.6% females).

Of 706 patients with AHT, 256 (36.3%) were not on target because they violated either the systolic/diastolic ( $n = 165$ , 23.4%) or the isolated systolic BP ( $n = 91$ , 12.9%) criterion. LMT was prescribed in 326 patients, of which 84 (25.8%) were not on target, while the management was optimisable in another 85 patients (26.1%).

**Discussion & Conclusion** BP and LDL-C are established surrogate outcomes of AHT and/or LMT. A gap between measured biomarker levels and target values according to the guidelines indicates sub-optimal therapy effectiveness. 33.0% of the 1032 therapies observed in 863 patients with AHT and/or LMT failed to reach the biomarker targets in at least one of the treatments. In this substantial number of patients, unreachd biomarker targets could serve as triggers to address issues such as compliance, drug drug interactions, and dosing either directly to the patient or to the prescribing physician. In patients with optimisable management of LMT, interventions regarding life-style and nutrition could further contribute to an optimised risk.

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**Keywords** Community pharmacy, Drug Effectiveness, Pharmaceutical Care Issues, Pharmacological Biomarkers

#### PRS-51

##### How patients perceive new pictograms about medicines and driving ability

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**Introduction** Risk communication is a two way exchange of information, leading to a better understanding of risk. It can make use of visual aids, such as pictograms which help patients to make decisions about their medicines. This study is part of the DRUID\* project and will make use of pictograms related with medicines and driving.

\* “Driving Under the Influence of Drugs, alcohol and medicines” is financed by the European Community within the framework of the EU 6<sup>th</sup> Framework Program. This abstract reflects only the authors’ views. The European Community is not liable for any use that may be made of the information contained therein.

**Materials & Methods** A structured interview involving 270 patients visiting 1 of 4 Dutch community pharmacies, in the city of Groningen, where two studies using a 2x3 design were conducted. In the first study, the respondents (patients with a driving license visiting a community pharmacy) were exposed to a condition in which the pictogram (DRUID\* or homologue French pictogram) and the risk category (category I, II or III) were manipulated. In this study, both pictograms were accompanied by the same side-text. In the second study, the added value of the side-text was examined. Here, the respondents were exposed to a DRUID pictogram with or without side-text and again one of the three risk categories.

**Results** 50.7% of the respondents were male with a mean age of 48.4 years-old and with a high education level (45.6%). After observing either the DRUID and the French pictograms, respondents recognized the risk of driving while taking driving impairing medicines. 78.8% of the respondents stated being likely to change their behaviour in the presence of a medicine with such pictograms. 36.3% of the respondents said they would drive less frequently and 40.7% wouldn’t drive anymore. 81.5% of the respondents stated it would be unlikely to change the intake of their medicines. Patients showed preference for the 3 categories presented in the DRUID pictogram and

73.3% of the respondents felt that the side-text of the DRUID pictogram was helpful.

**Discussion & Conclusion** Both the DRUID and the French pictograms appeared to be effective in communicating risk. The majority of the respondents recognized the risk of driving while taking driving impairing medicines and were willing to change their driving behaviour by driving less frequently. The pictogram didn’t influence respondents’ way of taking their medicines. When comparing the DRUID and the French pictograms, respondents preferred the DRUID one. It was also clear that the side-text in the DRUID pictogram was perceived as added value when compared to the other DRUID pictogram, without any side-text.

**Keywords** Driving impairing medicines, Pictograms on medicine boxes, Risk communication, Structured patient interviews

#### PRS-52

##### How far are the pharmacists in North Carolina prepared to extend their role in immunisation?

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**Introduction** The primary objective of the study was to determine the level of support of North Carolina pharmacists for opportunities of providing additional vaccine-related services. Secondary objective was to measure whether there were any differences to obtain information to establish pharmacists’ opinions regarding expansion of pharmacist provided immunization services.

**Materials & Methods** Quantitative, prospective study. Data collection tool: electronic questionnaire consisting of 13 questions titled ‘The NCAP immunization survey of NC Pharmacists’. Pilot study was conducted among several registered pharmacists within the NCAP immunization taskforce. An electronic link to the on-line study questionnaire was distributed to all active, registered pharmacists on the North Carolina Board of Pharmacy (NCBOP) database on February 16th to be returned by February 27th 2010. No reminders were sent due to time constraints and the legislative timeline.

**Results** 952 questionnaires were completed, a response rate of 10.03%. 496 (52.1%) respondents are currently certified to provide vaccines. 54.5% of respondents’ practice sites offer pharmacist-provided immunization services. 802 (89.5%) pharmacists were supportive of an increase in the scope of vaccines. The majority of the respondents chose the category ‘14 and above’ for the age of patients which they would be comfortable immunizing. 661(73.8%) pharmacists were willing to undertake additional training in the area of travel vaccines. 701 (78.2%) pharmacists were supportive of a rule change to allow pharmacists to administer non-vaccine injectables. 599 (67.2%) participants stated they ‘had no concerns’ with practicing under an open protocol. 523 (58.6%) participants had no real concerns with providing vaccines to patients aged under 18.

**Discussion & Conclusion** Understandably, active immunizers showed greater support for role expansion than non immunizers. Significant concerns and barriers across all groups still remain. These include administrative support, physical space, reimbursement and physician support. Opportunities to provide travel vaccines and non-vaccine injectables were also popular among respondents.

North Carolina pharmacists support the advancement of the profession with the majority of pharmacists keen to see a legislative change targeting the scope of vaccinations and age limitations. On the basis of the findings of this study and discussions with interested parties, the NCAP will request submission of a new bill for

consideration at the North Carolina state legislature. Bill shall request a modification of current directives with the aim of increasing scope of vaccinations and lowering age requirements.

**Keywords** electronic questionnaire, Immunisation

## PRS-53

### Leveling an area of pharmaceutical care: example with neonatology

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**Introduction** While the concept of clinical pharmacy was developed in the sixties, clinical outpatient and inpatient programs are characterized by their great variety and disparity when it comes to the presence of pharmacists in healthcare sectors. This article aims to describe a method in which pharmaceutical care sectors in healthcare facilities can be upgraded.

**Materials & Methods** This is a descriptive study supporting the upgrade of pharmaceutical care practiced in the neonatology sector of a 500-bed mother-child university hospital center, the Centre hospitalier universitaire Sainte-Justine (CHUSJ). The CHUSJ's Pharmacy Department employs more than 70 healthcare professionals. The study involved these proposed upgrading steps: (1) a review of the literature, (2) a description of the profile of the sector and (3) a description of the upgrading of pharmacist practice in neonatology.

**Results** A total of 121 articles were compiled, 16 of which were selected to evaluate the impact and 54 a description of the pharmacist's role in neonatology. The authors did not identify any particular pharmaceutical activity based on very good quality data (A). However, there were six based on good quality data (B) and eight that lacked adequate proof (C, D) in relation to the practice of neonatology. Nevertheless, a number of other authors described the development of the pharmacist's clinical role in neonatology. This study described the sector profile and upgrading of pharmaceutical practice that resulted from the literature review and a subsequent discussion among pharmacists.

**Discussion & Conclusion** There are few data on the impact of pharmacists in neonatology. This descriptive study proposes a number of steps aimed at upgrading pharmaceutical care within a Quebec university hospital center.

**Keywords** Neonatology, Pharmaceutical Care

## PRS-54

### Drug substitution associated with a hospital stay

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**Introduction** Problems of seamless care are frequently associated with transitions between settings of care. One aspect is the prescription of generic versus originator drugs due to different prescription rules in hospital and in ambulatory care. This study aims to quantify substitution between generic and originator drugs associated with a hospital stay in Belgium.

**Materials & Methods** The study focused on drug use in ambulatory care of patients who have been admitted and discharged from Belgian acute hospitals. Data were extracted from the 2006–2007 dataset of the Belgian Agency of Health Insurance Funds. The study database contained information about demographic characteristics, drug claims and hospitalizations. Drug substitution was identified as a switch from a generic drug to an originator drug or vice versa during the three months before and after hospitalization. The study was limited to all compounds in drug classes that answered to all of the following criteria: with the highest public expenditure in 2008; that may lead to transition-related problems between ambulatory care and hospital; that are administered for chronic indications; and that included generic drugs.

**Results** The database related to 17,764 patients: the mean age of patients was 65.9 years and 60% of patients were female. In 71% of cases, an originator drug was purchased prior to and following hospitalisation. Similarly, a generic drug was purchased prior to and following hospitalisation in 25% of cases. Some form of drug substitution occurred in 3.9% of cases: a generic drug was replaced by an originator drug in 2.4% of cases and an originator drug was replaced by a generic drug in 1.5% of cases. Drug substitution was most likely to occur for anti-inflammatory and anti-rheumatic products; opioids; potassium-sparing agents; low-ceiling diuretics; high-ceiling diuretics; selective calcium channel blockers with mainly vascular effects; and antidepressants.

**Discussion & Conclusion** This study has shown that hospitalisation is not a trigger for substitution between generic and originator drugs.

**Keywords** Drug-related problems

## PRS-55

### Influence of a medication history and a pharmaceutical opinion at admission of geriatric hospitalized patients on inappropriate drug prescribing

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**Introduction** Adverse drug events are very common in elderly and are a public health concern. It's possible to limit the adverse effects of medication through appropriate prescribing. Specific tools, such as lists of Beers and Laroche are useful to assess the inappropriate character of medications in elderly patients.

The purpose of this study is to evaluate the influence of a medication history and a pharmaceutical opinion underlining potentially inappropriate prescriptions realized by a pharmacist at the admission of geriatric patients in a teaching hospital on inappropriate drug prescribing at discharge.

**Materials & Methods** Prospective study with historical control.

Treatments at admission and discharge for patients hospitalized between October and December (2008 = historical control; 2009 = intervention) in the geriatric ward of the University Hospital of Li ge were reviewed. All patients coming from the home and consuming a minimum of 3 drugs at arrival at the hospital were eligible. Prescriptions were considered potentially inappropriate if they were included on a pre-established list, based on the lists of Beers and Laroche. Data on treatment at admission were collected from the computerized medical record for the historical group and from the medication history realized by the pharmacist for the intervention group. Medications at discharge for the 2 groups were collected from the medical record.



**Results** 50 patients were recruited in each group. The mean age ( $82.9 \pm 6.0$ ) and distribution men/women (34/66) are similar between groups.

The average number of drugs at admission and discharge does not differ between both groups (Admission:  $7.7 \pm 2.9$  vs.  $8.4 \pm 3.2$ ,  $p = 0.26$ ; Discharge:  $8.2 \pm 3.0$  vs.  $7.7 \pm 2.5$ ,  $p = 0.33$ ). However, there is a reduction in the number of drugs between admission and discharge in the intervention group ( $0.52 \pm 2.6$  vs.  $-0.72 \pm 2.9$ ,  $p = 0.03$ ).

The average number of potentially inappropriate medications at admission is similar between both groups at admission but significantly decreases at discharge in the intervention group (Admission:  $1.2 \pm 1.02$  vs.  $1.1 \pm 1.02$ ,  $p = 0.78$ ; Discharge:  $0.94 \pm 0.82$  vs.  $0.56 \pm 0.54$ ,  $p = 0.02$ ). The reduction of potentially inappropriate medications between admission and discharge is significant in both groups, but greater in the intervention group (2008:  $p = 0.04$ ; 2009:  $p < 0.0001$ ).

The median length of stay is also reduced (17.5 vs. 13 days,  $p = 0.008$ ).

**Discussion & Conclusion** These results demonstrate the added value of a medication history and a pharmaceutical opinion at admission on the quality of drug prescription at geriatric hospitalization discharge. The influence on the length of stay will be analyzed more in details in further work.

This expertise contributes significantly to support multi-disciplinary approach of fragile elderly patient.

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**Keywords** geriatrics, Inappropriate medications, length of stay, medication history, Pharmaceutical Care

#### PRS-56

##### Prescriptions and renal function of the elderly subjects in acute geriatric medicine

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**Introduction** The elderly subjects hospitalized in the Acute Geriatric Medicine unit (MAG) are polymedicated. They present a special risk of having a depressed glomerular function rate (DFG) making drugs prescription complex in order to avoid adverse drug reaction. A current situation of elderly subject's prescriptions and renal function was done in MAG unit. The objective of this study was to analyze the agreement between drugs prescriptions and renal function measure of elderly patients using 3 different formulas.

**Materials & Methods** This study was carried out in 3 different days and in 3 steps. Firstly, Clinical (weight, age), biological (creatinemia, uremia, albuminemia) and therapeutic (prescriptions) data were collected for each patient of MAG unit. Secondly, the GFR (Glomerular Filtration Rate) was estimated using the Cockcroft-Gault (C&G), the Modification of Diet in Renal Disease (MDRD) and the MDRD simplified formula. Finally, pharmaceutical analysis was done using the following reference tables:

Adequacy of the prescriptions to the elderly subjects with comparison to the list of potentially inappropriate drugs in geriatrics<sup>1</sup>.

Adequacy between prescriptions and renal function of patient (comparison of 3 estimated clearances) by leaning on the RCP drugs.

**Results** In this study, 90 patients were selected. In consequence of a lack of data (particularly the weight) only 32 (>65 years old) were included. A total of 283 lines of treatment were prescribed. 95.76% (271) complied with the different references, 1.77% (5) were unadapted to geriatrics, 0.7% (2) were unadapted to clearance whatever the formula used and 1.77% (5) presented conflicting results depending GFR formula used.

**Discussion & Conclusion** According to these results, prescriptions realized in MAG unit were suited to the elderly subject and adapted to the renal function of the patients. Renal Failure is a common health hazard in older people (31 on 32 patients present a GFR depression according to one of the 3 formulas). Lack of data particularly the weight act as check on the posological adaptation of treatments. C&G formula is less precise than MDRD in most cases because it underestimates GFR value. Although MDRD seems to be adapted to elderly subjects<sup>2</sup>, the C&G is currently used in MAG in reference to French National Authority for Health (HAS) and geriatricians recommendations. For elderly patients confined in bed without weight, it's possible to use MDRD formula. In this study, we use the Laroche standards<sup>1</sup> which are derived of criterias of Beers.

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**Keywords** Clearance, Drugs, Elderly subject, Renal function

#### PRS-57

##### Safe and efficient administration of IVIG in neuromuscular diseases

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**Introduction** Intravenous immunoglobulin (IVIG) is used for a plethora of pathologies, as described by the core SPC (Summary of Product Characteristics) for human IVIG by the EMA (European Medicines Agency). In the University Hospitals Leuven patients with certain neuromuscular diseases are treated with *Sandogloblin*. The nursing staff and the patients inquired whether it would be possible to expedite the administration, resulting in a *shorter infusion duration*. Although it is a drug with a good safety profile, the pharmacy team developed a new protocol to insure the safer and more efficient administration, according to the latest guidelines and the information given by the package insert.

**Materials & Methods** The current protocol was reviewed and several *ward rounds* were performed to examine the infusion-related issues and to determine how the infusion protocol could be improved. Current *literature* was reviewed. The Belgian *Federal Agency for Medicines and Health Products* (FAMHP) was contacted to determine if there had ever been any Belgian reports on adverse events with IVIG. In accordance with the research results a new *administration protocol* was developed as an Excel spreadsheet (MS Office 2007). The face validity of the latter was ascertained by a group of 4 in-house specialist nurses and a specialist pharmacist. There was an extensive cooperation with the medical managers of CSL Behring in

finalizing the protocol. Eight consecutive patients (dose of 1g/kg) were selected and a paired t-test was performed to determine whether the new protocol resulted in a faster infusion. The **utility** of the instrument was promoted by giving several obligatory sessions for the nursing and prescribing staff.

**Results** The preliminary protocol review and ward rounds resulted in key questions that drove the following literature search. The higher salt level of Sandoglobulin was taken into account, as well as the use of sucrose as a stabilisator and the FDA reports on adverse events with IVIG. The initial risk assessment for acute renal failure and thrombo-embolic events was omitted after contacting the FAM-HP. No incidents with IVIG have been reported in Belgium. Face validity was established for the final protocol after some minor revisions. There was a significant difference between the mean infusion durations (old versus new protocol) of **2h31min** (95%CI: 2.42, 4.63;  $p = 0.002313$ ,  $p < 0.05$ ). The infusion protocol was fully implemented after three information sessions.

**Discussion & Conclusion** There is an average gain of 2h31min per patient. This protocol also improves the planability of the patients because the nursing staff now also know how long the infusion will take. It takes into account all the relevant variables so it can provide an elegant solution for the nursing staff, without hampering them with unnecessary calculations. The protocol has further been adopted by CSL Behring to implement in the Dutch-speaking Belgian hospitals.

**Keywords** administration method, IVIG, neuromuscular, safety

## PRS-58

### A study on the factors affecting the Outpatients' Compliance for Donepezil in community pharmacy

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**Introduction** While many patients of Alzheimer's dementia (AD) are taking medication at home in Japan. The purpose of this study is to identify specific issues in which pharmacists should be engaged to solve problems by closely investigating the actual situation of the prescribing practice and compliance to identify the factors affecting compliance.

**Materials & Methods** 122 pharmacies in 21 regions were randomly selected, to whom self-recording questionnaires were distributed, requesting information on medication records ('YAKUREKI' in Japanese). Major survey items were 1. patients' attribution, 2. type of facility (hospital or clinic), 3. prescription details, 4. number of coadministered drugs, 5. number of days on prescription, 6. visiting cycle to the pharmacy, 7. dispensing method, 8. key person(s), 9. who visiting the pharmacy to receive prescribed medicine, 10. patient's status of physician visit, 11. compliance, 12. 4 questions related to key person's adherence (efficacy of Donepezil, administration and dosage, side effects, and understanding of AD), 13. perception of efficacy, and 14. positivity of attitude toward the medication. In this analysis, the distribution of responses to the above questions 1 through 14 was compared between the complying and non-complying groups.

**Results** Data of 432 patients were collected. Drugs prescribed were as follows: 88.8% took the drug once a day (after breakfast). A majority, 57.4%, Donepezil tablet was dispensed separately without one-dose-packaging. In 22.0% of the cases, the key person was the patient himself/herself. In 21.8% of the cases, it was their spouses, and in 12.7%, it was their daughters. For compliance, 80% responded that

the patients took the drug as instructed. 10.9% said they forgot to take it once or twice a week. 1.0% said they took the drug only once or twice a week, with 0.2% not taking it at all. 7.9% was unknown.

In the complying group, more patients visited hospitals themselves. This group understood the 4 items related to adherence to a greater degree. They also perceived a higher degree of efficacy, as well as having a higher degree of positivity of attitude toward treatment, showing significant differences between the two groups. However, no significant differences were found in regards to prescription details, number of coadministered drugs, or dispensing method.

**Discussion & Conclusion** It was found that the key persons' understanding of Donepezil, perception of efficacy, understanding of the AD symptoms, and positivity of the attitude toward the treatment affected compliance or noncompliance, rather than prescription details and dispensing method. Therefore, it is important that pharmacists assist the patients and key persons in feeling the efficacy and improving their positive attitude toward treatment by accurately identifying the key persons and being engaged in such a way that improves adherence.

**Keywords** adherence, Alzheimer's disease, Community pharmacy, compliance

## PRS-59

### Evaluation of stat orders in a teaching hospital

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**Introduction** One of the major objectives of pharmaceutical care is rational use of drugs which means "prescribing the right drug, in an adequate dose for the sufficient duration and appropriate to the clinical needs of the patient at lowest cost".

Stat orders are common among physician orders. Stat medications need to be fulfilled immediately or within a limited time frame.

This process can be time and expense consuming. Stat medications are prescribed as the highest priority orders in life-threatening situations.

The goal of this study was to evaluate the indication for applying stat to medications in a teaching hospital and to assess of the rationale of the stat order.

**Materials & Methods** The study was carried out between July and August 2009 in Masih Daneshvari Hospital. Masih Daneshvari is a 466-bed, tertiary care, multidisciplinary respiratory hospital. The hospital is a university affiliated center. All patients' charts were reviewed and records of all inpatients who received at least one stat order were included in this study.

Detailed analyses were undertaken to examine the stat use of agents and for the rationale of the prescription. Several different guidelines were used to evaluate the rationale of the prescriptions. SPSS versions 17 (SPSS, Chicago) were used for all analyses.

**Results** A total of 175 subjects were reviewed. Among all, 109 (62.28%) patients had a total of 220 stat orders. The mean number of stat orders in each chart was 2.01. Stat orders were divided into two categories: 146 (66.4%) were administered only once and 74 (33.6%) were reordered. The internal medicine ward accounted for the most stat medications (35%). The major reasons for stat medications orders were: emesis management (22.3%), control of dyspnea (15.9%), preoperative medications (8.2%) and COPD exacerbation (7.2%). Hydrocortisone (14.1%), dexamethasone (11.3%), granisetron (9.5%) ceftriaxone (8.6%), and morphine (6.8%) accounted for the most common stat orders.

**Discussion & Conclusion** In our study granisetron was the most common medication which was prescribed for nausea management. The prompt management of a CINV (chemotherapy induced nausea & vomiting) and stat order is acceptable and applicable.

The result of this study showed that 133 out of the total 220 stat orders were prescribed appropriately at Masih Daneshvari hospital. We could not evaluate rationale for 19 orders. This study may be used to identify the need for further education or other interventions of clinical pharmacist, concerning rational inpatient prescribing of stat orders.

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**Keywords** Rational drug use, Stat order

#### PTE-1

##### How to choose the appropriate anti-osteoporotic drug? A practical tool in the Belgian setting

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**Introduction** Osteoporosis is a highly prevalent and often under-treated disease in the elderly. Osteoporosis-related fractures are associated with significant morbidity and mortality. As anti-osteoporotic drugs are only reimbursed by the Belgian government if strict conditions are fulfilled, our aim was to create a practical tool to determine the most appropriate pharmacological treatment for osteoporosis.

**Materials & Methods** Pubmed (search terms: osteoporosis, bisphosphonates, postmenopausal, elderly population, geriatric, alendronate, risedronate, ibandronate, etidronate, zoledronic acid, strontium ranelate, raloxifene, calcium and/or vitamin D, glucocorticosteroid-induced) and bibliographies of articles retrieved were used as data sources. A total of 92 references, published from 1990 to april 2010, of which 47 randomized controlled trials, 5 meta-analyses and 20 reviews were included.

Based upon Belgian reimbursement criteria, two flowcharts were created. The different flows lead to potential anti-osteoporotic agents, which are ranked according to evidence, compliance and cost.

**Results** Both tools provide an overview of the potential pharmacological agents in the management of osteoporosis in male and in female patients and can guide the physician and other health care professionals to make the most appropriate choice. Even so, decisions must be made for each patient individually and according to patients preferences.

We believe that clinical pharmacists are especially suited to develop and implement such instruments, since they take into account reimbursement conditions as well as evidence, compliance and drug prices.

The flowcharts will be presented on the poster.

**Discussion & Conclusion** Both flowcharts are practical tools, which can be used to determine the most appropriate agent in the management of osteoporosis. Further research is needed to evaluate the feasibility and utility of these tools.

#### Bibliographic references

Belgian reimbursement criteria ([www.riziv.be](http://www.riziv.be))

**Keywords** anti-osteoporotic medication, Flowchart, reimbursement criteria

#### PTE-3

##### Stress ulcer prophylaxis in non-critically ill patients: a prospective evaluation of the practice in a surgical ward

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**Introduction** The benefit of stress ulcer prophylaxis (SUP) in non-critically ill patients has not been proved. Over-prescription of SUP is not devoided of risks (i.e. drug-drug interactions, adverse events). This prospective study aimed to evaluate the use of proton pump inhibitors (PPIs) for SUP in a visceral surgery ward.

**Materials & Methods** Data collection was performed prospectively during a 8-week period on patients hospitalized in a visceral surgery ward (58 beds). Patients with a PPI prescription for the treatment of ulcers, gastroesophageal reflux disease, esophagitis or epigastralgia were excluded as well as patients hospitalized twice during the study period. The American Society of Health-System Pharmacists guidelines on SUP were used to assess the appropriateness of *de novo* PPI prescriptions.

**Results** Among 255 patients in the study, 138 (54.1%) received a prophylaxis with PPI, of which 86 (62.3%) were *de novo* PPI prescriptions. 93.5% of patients received esomeprazole (according to the hospital drug formulary) mainly orally at 40 mg qd. 79.1% of patients had no risk factors for SUP. 17.9% and 3.0% had one and two risk factors, respectively. 95% of the patients with PPI were not hospitalized in the intensive care unit (ICU) before their stay in the visceral surgery ward. At discharge, PPI therapy was continued in 34.2% of patients with a *de novo* PPI prescription.

**Discussion & Conclusion** This study highlights the over-utilization of PPIs in non-ICU patients and the inappropriate continuation of PPI prescriptions at discharge. The PPI dosage prescribed for prophylaxis was probably too high compared with the data of the literature. Treatment recommendations for SUP are needed to restrict PPI use for justified indications.

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ASHP *Therapeutic Guidelines on Stress Ulcer Prophylaxis*. ASHP Commission on Therapeutics and approved by the ASHP Board of Directors on November 14, 1998. *Am J Health Syst Pharm*, 1999. 56(4): p. 347–79.

**Keywords** prescribing practice, proton pump inhibitors, stress ulcer prophylaxis

#### PTE-5

##### Sequential therapy of levofloxacin, clindamycin and paracetamol: a pro-active project

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**Introduction** Clindamycin, levofloxacin and paracetamol are bio-equivalent drugs and very suitable for an early switch from

intravenous to oral administration in patients whose gastro-intestinal absorption is intact. A lot of advantages are associated with this switch like a more easy administration, a lower risk of catheter related infections, more comfort for the patient, a shorter length of stay. The impact of an early switch in terms of cost is also important, especially in countries, like Belgium, where drug expenditure in hospitalised patients is financed by a fixed budget. We were interested in evaluating the impact of contacting the prescribing physician in order to promote sequential therapy.

**Materials & Methods** The project was initiated with a poster, clarifying sequential therapy and mentioning the project. The poster was communicated via the hospital's intranet and handed over to every hospital ward. During a study period of three weeks, all prescriptions for intravenous levofloxacin, clindamycin and paracetamol were evaluated, using the electronic patient file. The treating physician was contacted by phone, if switch to oral administration was possible. Patient's demographics and treatment information were collected. The study was carried out at a 2000-bed tertiary care hospital, the evaluation of the treatment and the phone calls were performed by a clinical pharmacist.

**Results** In total, physicians were contacted in 378 cases. In 53,17% of cases (201 patients) the route of administration was immediately switched after the call. More in detail, a switch was carried out in 55,96% (183 of 327 patients) for paracetamol, 45,45% (5 of 11 patients) for clindamycin and 32,50% (13 of 40 patients) for levofloxacin. Patients' demographics, detailed information about the switch and data about reduction in cost will be shown on the poster. Compared with utilisation of the drugs in the same period in 2009, a decrease of 8,61% in absolute number of intravenous vials was seen. More in detail, the decrease was 9,73% for paracetamol, 10,83% for clindamycin and 5,59% for levofloxacin, as compared to the data of 2009. The same comparison was performed in "adjusted" defined daily doses (DDD); adjusted DDD of 0.5 g, 1.8 g and 4 g were used for levofloxacin, clindamycin and paracetamol respectively. This comparison resulted in an overall decrease of 7,3% compared to utilisation data expressed in DDD during the same period of last year, corresponding to a decrease of 9,37%, 13,59% and 5,59%, for paracetamol, clindamycin and levofloxacin, respectively.

**Discussion & Conclusion** A poster campaign followed by direct contact with the prescribing physicians is definitely useful to promote an early IV to oral switch. The advantages and the economic impact of sequential therapy are of great importance and should be regularly brought under attention. Pro-active projects, like ours, are especially suited to repeat several times a year.

**Keywords** sequential therapy

## PTE-6

### Minocycline as a potential alternative for linezolid: a case report

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**Introduction** Prosthetic joint infections (PJI) are severe infections which are often caused by methicillin resistant *Staphylococci* (MRS). The management of this type of infections include adequate and long-term treatment with antibiotics. PJI caused by MRS are usually treated with vancomycin during hospitalization. As soon as the patient is discharged, vancomycin can be switched into oral linezolid, if susceptibility is proven. Since linezolid is very expensive and associated with some toxicity, especially during long-term treatment, we were interested in evaluating minocycline as an alternative option for treating PJI caused by MRS.

**Materials & Methods** Case report, analysis based on clinical data and literature review.

**Results** A 82-year old man, who presented earlier with loosening, luxation and infection of a total hip prosthesis, was admitted for revision of the prosthesis. Upon admission, physical examination revealed pain and redness, laboratory findings confirmed inflammation. A X-ray of the hip showed loosening of the prosthesis. Perioperative wound cultures showed MR-*Staphylococcus epidermidis* susceptible to vancomycin. Vancomycin was started (1g tid) and adequate plasma levels were achieved. After 6 weeks of treatment, the patient was ready to be discharged from the hospital.

As the guidelines for treatment of PJI advice to treat for a total duration of 3 months, an oral antimicrobial agent was needed to continue his treatment. Since recently, linezolid is an attractive option in this setting, as it is characterized by potent in vitro activity against MRS and a good penetration in bone and biofilms. However, because of its high cost and potential toxicity, such as pancytopenia, lactic acidosis and peripheral neuropathy, long-term treatment with linezolid is not always straightforward. Minocycline, for which susceptibility was also documented in our patient, was therefore evaluated as alternative.

Minocycline has significant in vitro activity against *Staphylococci*, including methicillin-resistant strains. Moreover, this tetracycline was shown to accumulate in bone and is highly active against MRSA isolates embedded in biofilms, suggesting a good bone and biofilm penetration.<sup>1</sup> In general, minocycline has a low toxicity profile, only liver function tests should be followed up. Moreover, it is 60 times less expensive than linezolid.

The patient was discharged with minocycline 100 mg bid. The patient is doing well, signs and symptoms of infection completely disappeared.

**Discussion & Conclusion** Minocycline, a safe and cheap antibiotic, can be used as an alternative for linezolid in the prolonged treatment for prosthetic joint infections caused by methicillin resistant *Staphylococci*. More research should be undertaken to explore the role of this old drug in shortening intravenous vancomycin administration and consequently length of stay in patients with prosthetic joint infections caused by resistant Gram positive strains.

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**Keywords** linezolid, methicillin resistant *Staphylococci*, minocycline, prosthetic joint infections

## PTE-7

### Plasma vitamin C concentrations in patients on routine hemodialysis and its relationship to patients' cardiovascular comorbidities

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**Introduction** Epidemiologic studies hypothesized that vitamin C administration may have beneficial effects in patients with end stage renal failure (ESRD). Its prescription was associated with improvement in hemoglobin levels and a decrease in erythropoietin requirements which may lead to lessen the potential adverse outcome



associated with anemia and the use of recombinant erythropoietin. From the other hand, the results of previous studies were some encouraging but not overwhelming for vitamin C as a protector against cardiovascular diseases. Furthermore, increasing evidences support a role of oxidative stress and impaired antioxidant defense in pathogenesis of accelerated atherogenesis in these patients. Aim of the study was to investigate the level of plasma vitamin C concentration in ESRD patients to see if we could encourage the prescription of vitamin C as supplement in these patients.

**Materials & Methods** A cross-sectional study was conducted on the patients headed for Imam Khomeini Hospital a referral center in nephrology in Tehran, Iran. The patients' plasma concentration of vitamin C was determined by high performance liquid chromatography (HPLC). It was investigated whether any association existed between the level of vitamin C concentration and patients' demographic data, co-morbidities or cause of chronic renal failure. Chi-square test was used to see if there is any correlation between the mentioned factors that the level of vitamin C. In this study the normal range of vitamin C concentration was defined as 6–20 mcg/mL.

**Results** From 91 patients included in our study who were  $56.7 \pm 15.7$  years old, 61 (67.4%) were male. The most frequent cause of end stage renal disease was hypertension in 23 (25.6%) patients followed by diabetes in 10 (11.1%), and 27 (30%) had these two underlying diseases simultaneously. Thirty-one (34.4%) had cardiovascular diseases as the most prevalent co-morbidity. Forty-one (45.1%) had low plasma concentration of vitamin C, 44 (48.4%) had normal and 6 (6.6%) had high levels of vitamin C. There was a significant relationship between the level of vitamin C and the presence of any co-morbidity ( $p < 0.05$ ). Moreover, 19 (20.4%) patients received vitamin C supplements in their routine medications.

**Discussion & Conclusion** The results provide further evidence that patients with end stage renal disease who suffered from co-morbidities had lower plasma levels of vitamin C and suggest that vitamin C supplementation if justified by future guidelines may be more beneficial in this subgroup of patients.

**Keywords** Hemodialysis, Vitamin C

## PTE-8

### A retrospective review of the management of suspected meningitis at Barts and the London NHS Trust

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**Introduction** Acute meningitis is a potentially life-threatening neurological emergency which requires rapid diagnosis and early administration of appropriate empirical therapy. Around 1.2 million cases of acute meningitis occur every year in the world, resulting in 135,000 deaths. Mortality rates range from 2% to 30% while risk for developing neurologic sequelae (seizures, sensorineural hearing loss, hydrocephalus, etc) is as high as 30% to 50% for meningitis patients. The Barts and the London Trust (BLT) guidelines give recommendations for the clinical and pharmacological management of patients with suspected meningitis/encephalitis. The compliance to these guidelines was assessed along with the use of corticosteroids by prescribers.

**Materials & Methods** A retrospective audit for the time period of 1<sup>st</sup> Jan 2008 to 21<sup>st</sup> May 2009 was carried out in order to determine the level of compliance to the Trust guidelines in empirical treatment and the use of corticosteroids in acute meningitis which was the primary outcome of the study. Clinical assessment, presence of meningitis

signs and symptoms and timing of empirical therapy were also examined. Patients were identified from CSF specimens sent to the Microbiology department from five wards in the BLT.

**Results** 29 patients with suspected meningitis were identified. Two had confirmed diagnosis. Empirical antimicrobial therapy was initiated in line with the BLT guidelines in only 38% of patients. While the choice of antimicrobials was mostly appropriate (88.9% with antibiotics and 76% with antivirals), dose of drugs were often smaller than recommended (in 45% patients on antibiotics and in 35% patients on antivirals). The ward pharmacist intervened for the change of antimicrobial dose to an appropriate one in two patients which was accepted 1 or 2 days after the treatment start. Empirical treatment was delayed more than 6 h from admission in 30% of patients receiving antibiotics and 47% of patients receiving antivirals. Corticosteroids were not used in empirical treatment any of the 29 patients.

**Discussion & Conclusion** After identifying fairly low level of compliance in empirical antimicrobial treatment as well as significant delays in start of therapy, a suitable strategy for the improvement has to be developed. BLT guidelines need to be more specific about treatment start as well as the recommendation for the use of corticosteroids in line with the newest evidence. After guidelines review, education of junior physicians is needed with implementation of better liaison with Microbiology department including the Microbiology pharmacist for obtaining information on proper choice, dosing and timing of antimicrobial and antiinflammatory management of suspected acute meningitis/encephalitis.

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**Keywords** acute meningitis, choice of antimicrobials, corticosteroid use, empirical therapy

## PTE-9

### Clinical practices for treatment of invasive fungal infections

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**Introduction** Incidence and cost of invasive fungal infections (IFI) have been increasing over the past decade. The aim of this study was to describe antifungal strategies of treatment and prophylaxis of IFI in daily clinical practice.

**Materials & Methods** All prescriptions of liposomal amphotericin B (L.AMB), posaconazole, caspofungin or voriconazole made between April and June 2009 were reviewed.

Clinical data, including imaging and mycological data were collected.

Antifungal strategies were defined as prophylactic, empirical, pre-emptive or targeted according to criteria of European Organisation for the Research and Treatment of Cancer and the Mycoses Study Group (EORTC/MSG).

**Results** Ninety one prescriptions, including 3 combinations therapies, in 64 patients were collected. Overall, 88 courses of treatment were reviewed.

Major underlying diseases in patients included hematologic malignancy (14%), allogeneic hematopoietic stem-cell transplant (36%), autologous hematopoietic stem-cell transplant (4.5%), and solid-organ transplant (11%).

Antifungal drugs prescribed were caspofungin (38.5%), voriconazole (32%), posaconazole (18.5%) and L.AMB (10%). A combination therapy was prescribed for 2 patients.

Median duration of treatment was 10 days [1–70].

Among the 88 courses of treatment, antifungal strategies were empirical treatment in 29.5% of cases, pre-emptive treatment in 28.5% of cases, prophylaxis in 21% of cases and targeted treatment in 16% of cases. Two percent were unknown.

Major antifungal drugs received in empirical treatment were caspofungin and voriconazole in respectively 54% (14/26) and 31% (8/26) of cases. Posaconazole was the most common drug used for prophylaxis (15/21).

In pre-emptive treatment, antifungal drugs were prescribed according to the suspected IFI.

Only 10 IFI were documented: 3 pulmonary aspergillosis, 4 invasive candidiasis, 1 histoplasmosis, 1 pneumocystosis and 1 mucormycosis.

A fungus was isolated in 127 mycological tests, and only 7 (5.5%) were isolated from a physiologically sterile site (blood or biopsy). *Candida spp* and *Aspergillus spp* were identified in respectively 83% and 9% of cases.

**Discussion & Conclusion** Antifungal agents, particularly caspofungin and voriconazole, were mainly prescribed for empirical or pre-emptive therapy.

For patients with hematologic malignancy at high risk to develop IFI, prophylactic and empirical strategies are well defined in our local guidelines. Nevertheless, pre-emptive and empirical strategies for intensive care units' patients are not clearly defined in our recommendations. The study results stress the need to update our local guidelines including pre-emptive treatment strategy among non-hematologic patients for an appropriate use of antifungal agents.

**Keywords** Clinical practice, invasive fungal infection, prescribing practice

## PTE-10

### Use review of Erlotinib in advanced non-small cell lung cancer

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**Introduction** Erlotinib (E) was approved for maintenance treatment of patients with locally advanced or metastatic non-small cell lung cancer NSCLC whose disease has not progressed after of platinum-based chemotherapy and after failure of at least one prior chemotherapy regimen. In the BR.21 pivotal study, the median progression-free survival (PFS) and global surveillance (GS) were 9.7 weeks and 6.7 months in patients treated with E vs 8 weeks and 5 months with placebo, respectively. Principal side effects include dermatologic manifestations, fatigue, diarrhoea or pneumonitis. We review the use and cost of E in this study.

**Materials & Methods** Retrospective and descriptive study of patients on E treatment was made from September 2007 to April 2010, in a University Hospital. Data collection was made through the pharmaco-therapeutic profile and medical chart review. Data record included demographics, diagnosis, previous treatments, duration of treatment with E, response to the treatment, PFS and GS. Tolerance was registered on basis of Oncologist's criteria.

**Results** 22 patients (7 women), mean age  $60.7 \pm 10.7$  years, 14 ever smoked. Median time from diagnosed of NSCLC was  $2.9 \pm 2.5$  years. 10 patients were included with stage T4, 3 with T3 and 9 with unknown stage. One patient received maintenance of E after platinum-chemotherapy, 18 due to progression after other chemotherapy and 3 as first line due to their age ( $>75$  years). Dosage was 150 mg/day (only one patient had reduced to 100 mg/day because of dermatologic toxicity). 1 patient had a complete response, 4 partial responses, 3 balanced diseases, and the NSCLC progressed in the rest of them. PFS was  $10.4 \pm 1.6$  weeks and GS was 5 months  $\pm 3.2$ . Patients stopped treatment because of progression of disease (7), adverse events (7), death (7) and others (1). More frequently adverse events were: 12 dermatologic alterations, 8 diarrhoea and 7 other manifestations. A 32% of cases had to stop E because of adverse events (57% of them were dermatologic alterations), 32% because of disease progression, 32% death and 4% other causes. Mean cost of this treatment for patient was almost 6.000 €.

**Discussion & Conclusion** Most of patients stopped the therapy because of the toxicity or disease progression.

Only an 18% of patients had any type of response to the E. Our results are similar to European Medicines Agency recently Assessment report (27 April 2010) of E, that has restricted indications of E as monotherapy for maintenance treatment in patients with NSCLC with stable disease following 4 cycles of standard platinum-based first-line chemotherapy. Pharmacists should get involved in the evaluation of the tolerance and the cost-efficacy of this type of drugs.

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**Keywords** Erlotinib, adverse events, non-small cellular lung cancer, efficacy

## PTE-11

### Applicability of an adapted Medication Appropriateness Index (MAI) for detection of drug related problems in hospitalized elderly patients

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**Introduction** Drug consumption in the elderly is high, among others as a result of polypharmacy. Previous research showed that drug related problems are responsible for a considerable proportion ( $\pm 15\%$ ) of hospital admissions [1, 2]. Clinical pharmacist activities could have an added value in the detection and prevention of drug related problems [3]. In this study, we wanted to evaluate the applicability and validity of a modified version of the Medication Appropriateness Index (MAI) [4], for elderly hospitalized patients.

**Materials & Methods** Explicit review of the prescribed drugs at the time of hospital admission, for 50 patients admitted to the geriatric ward of our hospital, by using a modified version of the Medication Appropriateness Index (MAI). According to the MAI each drug was investigated in terms of indication, contra-indications, appropriate choice, dose, correct modalities, drug-drug interactions, and duration of therapy. Additionally, adverse drug reactions were evaluated, resulting in 8 questions per drug. The highest ponderation was attributed to indication and appropriate choice; moderate ponderation was attributed to contra-indications, dose, and adverse drug reactions. MAI scores were attributed by a geriatrician and by a clinical pharmacist independently, and differences between the two raters were assessed. Furthermore, the relationship between MAI score and drug related hospital admission was explored.

**Results** For 50 patients, a total of 432 drugs were evaluated, resulting in a mean MAI scores of 13.7 (SD 16.8, min 0.5–max 90.5) according to the geriatrician and 13.6 (SD 11.6, min 0.5–max 67.5) according to the clinical pharmacist. The highest scores (most inappropriate therapies) were found for drugs for the central nervous system and for the urinary tract system; the highest scores per question were detected for appropriate choice, adverse drug reactions and interactions. Age and sex seemed no risk factor for a high MAI score; logically the number of drugs was correlated with higher MAI scores. A good agreement between the scores of the geriatrician and the clinical pharmacist was found: intraclass correlation coefficient was 0.91 and overall kappa-value was 0.71. A significant higher MAI score was found for related hospital admission ( $p = 0.04$  for the geriatrician and 0.03 for the pharmacist).

**Discussion & Conclusion** This modified MAI score seems useful for detection of drug related problems in the elderly and seems reliable with low inter-rater variability and with a positive correlation between high score and drug related hospital admission. We consider further application of the modified MAI for teaching and training of starting clinical pharmacists, and as a systematic, identical approach for detection of drug related problems by the clinical pharmacists in our hospital.

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**Keywords** Drug-related problems (DRPs), Elderly, Medication Appropriateness Index

#### PTE-13

##### Evaluation of urinary infections' antibiotherapy at the hospital

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**Introduction** Evaluate prospectively the conformity of antibiotics prescriptions at the hospital compared to the support recommendations of urinary infections.

**Materials & Methods** This investigation has been realised over a two-month period throughout ten clinical services. For each positive urinary cytotbacteriological test (ECBU), information related to the pathology as well as to the patient's treatment have been collected in the service. The items that were evaluated represent the justification for an antibiotherapy, the molecule choice, the posology and the route of administration.

**Results** Over 39 patients with a positive urinary cytotbacteriological test (ECBU), 35 (i.e.: 89.7%) received an antibiotherapy. The most frequently prescribed molecules are ciprofloxacin and cefotaxim. The asymptomatic bacteriuria found in 10.3% of the cases were not treated conformly to the 2008 recommendations related to the communal bacterial urinary infections for adults. The molecule choice was congruent in 88.5% of the cases compared to the sensitivity spectrum of bacteria. Nevertheless, one in two patients could have been treated

by a molecule with a narrower spectrum and seven unnecessary associations were prescribed. The posologies were adequate in 82.8% of the treatments. The underdosing of ciprofloxacin was the most frequent cause of non conformity. As for the route of administration, the relay by oral route was not respected in over half of the cases. The molecules in question were ciprofloxacin and ofloxacin.

**Discussion & Conclusion** This study shows a good support of asymptomatic bacteriuria. The sensitivity of the germ and the pharmacological properties were taken into account as far as the molecule choice is concerned. Additional efforts must be provided in order to prescribe molecules with a narrower spectrum and move to the oral route as soon as possible so that the selection of mutant resistants can be avoided and the infections' cost can be decreased. So, a collaboration between the clinical pharmacist and the prescriber is necessary for a better rationalisation of prescriptions.

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**Keywords** antibiotherapy, urinary infections

#### PTE-14

##### Metastatic colorectal cancer treated by chemotherapy: trends in survival in two patient cohorts treated in 1992–1999 and 2004–2007

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**Introduction** Metastatic Colorectal Cancer (mCRC) is one of the leading causes of death by cancer in Europe. In the 90's, Irinotecan and Oxaliplatin treatments represent the traditional chemotherapeutic treatment for stage IV colorectal cancer while, in the last decade, molecular targeting drugs such as Bevacizumab (BEVA) or anti-EGFR antibodies (Cetuximab and Panitumumab) were introduced in the therapeutic strategy. Since 2004, published phase III trials of combinative treatment regimens of mCRC using these new therapies have demonstrated substantial improvements of the median overall survival (OS). The aim of the study was thus to evaluate overall survival (OS) of patients diagnosed with mCRC before and after the approval of BEVA and cetuximab (CETUX) in France, in current medical practice.

**Materials & Methods** A sample of patients, diagnosed with a mCRC and receiving at least one intravenous anticancer chemotherapy was selected from the Centre Léon Bérard (French National Cancer Institute) cohort. Group A consists of consecutive patients diagnosed between January 1992 and December 1999; group B were diagnosed between January 2004 and December 2007. Tumor type and histological grading, type of drug therapy, number of lines of chemotherapy and patient outcome were compared using the chi-squared test or the log-rank test. A Cox regression analysis was then performed to highlight independent prognostic factors.

**Results** 321 patients were enrolled over the two periods, 142 in the group A and 179 in the group B. 62% of the patients of the group B received at least one molecular targeting drug. The two groups were

comparable (general characteristics of the patients, tumour type and metastasis characteristics) except for the histological grade of the initial tumour. The overall rate of metastasis resection was 43% and no significant difference was observed between the two groups ( $p = 0.31$ ). The median number of lines of chemotherapy was similar in the two groups ( $=3$ ). The median survival time was 28 months for both groups group A and group B ( $p = 0.38$ ). Univariate analysis showed that the factors associated with a significant impact on OS were: Performance Status (PS), age, grade and metastasis resection. A multivariate Cox model showed that metastasis resection was associated with a five fold reduced risk of death (HR: 0.2 [0.14;0.28]).

**Discussion & Conclusion** Despite the implementation of numerous novel chemotherapeutic agents, the overall survival of patients with mCRC has not improved over the last decade on the scale of our institution.

**Keywords** Cancerology, Clinical outcomes, Metastatic colorectal cancer, Monoclonal antibodies, Population based study

## PTE-15

### Use of linezolid at the Lapeyronie-Arnaud de Villeneuve university hospital of Montpellier

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**Introduction** Linezolid is an antibiotic which is indicated in documented Gram + infections. This drug is used in complicated infections of skin and soft tissues (SSTI) and in community acquired pneumonia (CAP).

The objective of this investigation is to review the use of linezolid in university hospital Lapeyronie - Arnaud de Villeneuve of Montpellier.

**Materials & Methods** Investigation was carried out from January 11th till March 11th, 2010. During this period, all linezolid prescription initiations were collected and analyzed according to the medical file. The pediatrics' units were excluded from this collection.

**Results** 48 linezolid treatments were set up for 45 different patients. The average duration treatment was 6,6 days. 79% of treatments were introduced in intensive care unit. This antibiotic was used in 77% of indications in pneumonia. 77% of infections were nosocomial. Most of treatments were prescribed according to the market guidelines. Among 7 antibiotic treatments were off-label: 3 in septic shocks and 4 for antibioprophylaxis. In these 7 cases the patient had a kidney failure.

**Discussion & Conclusion** There is an optimal penetration of linezolid in lung tissues. This is in agreement with the large use of this antibiotic in CAP.

The average duration of the treatments is rather short. It's in favor of a good rate of revaluation and antibiotic treatment adaptation to the documented bacteria.

However, linezolid is bacteriostatic, thus it's not recommended to use it in septic shocks, but for one of this patient no other therapeutic alternative was possible and for another patient linezolid was replaced the same day by a more adapted antibiotic. The antibioprophylaxis treatment were initiated for patients with MRSA carrier (identified or suspected) and kidney failure.

Linezolid prescriptions in university hospital Lapeyronie - Arnaud de Villeneuve of Montpellier are mainly in accordance with the recommended indications. However some treatments were off-label. In some cases, the prescription could be justified by the patient history. Our anti-infective committee must establish guidelines for prophylaxis with this profile of patients (MRSA carrier and kidney failure). Also, a faster treatment revaluation could be considered.

**Keywords** guideline, linezolid, Prescribing

## PTE-16

### Dabigatran etexilate: first step in its use in an orthopaedic surgery department

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**Introduction** Since January 2010, our pharmacy department has referenced a new oral anticoagulant, dabigatran etexilate. It is a direct thrombin inhibitor without specific monitoring. The drug is used to prevent venous thromboembolism events after orthopaedic surgery such as total hip or knee replacement. The objective is to investigate the good prescription and adverse effects of this new anticoagulant in our orthopaedic surgery department. The pharmacist works in a decentralized pharmaceutical unit within the department. The prescription is computerized.

**Materials & Methods** A local protocol PRADAXA is established in collaboration with the anaesthetists. Indications and contraindications are specified. It consists in an injection of enoxaparin 6 h after surgery closure instead of the recommended one capsule 1 to 4 h after surgery, continuing with two capsules of dabigatran at set time (6 pm) orally the days after. Two protocols exist (PRA110 and PRA75) because dosage adaptation can be necessary. A data entry form is established to gather all the details. The study was realized over three months.

**Results** Good prescription: of 119 patients allowed for total hip or knee replacement, 41 had a prescription of dabigatran i.e. 34,5%. On 41 patients, 24 received dabigatran at 110 mg and 15 at 75 mg. All the patients having received the dosage 75 mg were patients of more than 75 years. Parts of the other patients were excluded because of contraindications or risk of non observance. Others because some prescribers did not want or know how to use the protocol. Among the 41 prescriptions, there were 1 cancellation and 3 stops.

Adverse effects: we had two back-ups before the three weeks follow-up visit. A patient with serum flow at the level of the scar and another with dry mouth and bloating. They both continued their treatment.

**Discussion & Conclusion** There were 7 pharmaceutical interventions i.e. 17,1% of prescriptions. The pharmacist intervened for the modification of 3 prescriptions for wrong dosage. Prescriptions were modified before first grip. On two occasions, there was a redundant prescription of enoxaparin with no consideration of the dabigatran prescription. But no double administration of enoxaparin occurred. Two patients were under dabigatran 75 mg without any explication despite our questioning. Dabigatran avoids an injection to the patient and seems to have a good profile of tolerance that still needs to be investigated. That is why dabigatran stays in controlled prescription in our establishment. A particular attention will be taken for new indications and the future diagnosis test that could reassure prescribers.

**Keywords** dabigatran etexilate, oral anticoagulant

## PTE-17

### Intravenous peripherally inserted central catheter for antibiotic therapy in patients with cystic fibrosis

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**Introduction** For patients with cystic fibrosis (CF), airways colonization with *Pseudomonas aeruginosa* is deleterious and requires numerous and prolonged intravenous antibiotics. However, high doses of antibiotics may destroy a patient's venous capital. For this reason, the use of peripherally inserted central catheters (PICCs) is gaining popularity in this population. PICCs are introduced from an upper extremity vein to the superior vena cava and remains there during the entire course of therapy. In this study, we evaluated 1/ the efficiency and 2/ the patients' and nurses' satisfaction with these catheters.

**Materials & Methods** For the first objective, we retrospectively studied success rate of PICCs introduction and incidence of adverse events in patients who had at least one PICC inserted between October 2006 and December 2009 in 2 CF centers, one pediatric and one adult, at the University hospital of Grenoble. Satisfaction was evaluated by addressing questionnaires prospectively to 12 CF adult patients for whom one PICC was inserted over a 3-months period (January to March 2010) and to their nurses (2 hospital, 7 liberal). This study was performed in the pneumology ward with the presence of a clinical pharmacist.

**Results** During the retrospective 38-months period, 47 CF patients (mean age = 23 yrs-old, range = 4–56) received a PICC. For these patients, we considered 125 procedures (average of 2.6 PICCs per patient; range = 1–9). The success rate of PICCs insertion was 93.6% (117/125). Regarding adverse events, one patient suffered from a *Candida albicans* septicemia and 4 thromboses were diagnosed, 2 in the same patient. The removal of 4 PICCs (3.2%) occurred for various other reasons. Overall, the success rate was 85.6% (107/125).

For the 12 patients prospectively interviewed, 5 had their therapy in hospital, 7 at home. According to them, the pain during the PICC insertion was rated as a 4.2/10 (on a visual analogic scale). During antibiotic therapy, mean satisfaction level was rated 9.25/10. 10 patients (83.3%) thought that PICC is “much more comfortable” than short peripheral cannulae, and 2 (16.7%) judged that it is “more comfortable”. Finally, patients concluded unanimously that they want PICCs used in all of their future antibiotic treatments. Regarding nurses, mean satisfaction level was 8.7/10 during patient's therapy and 100% of nurses also wanted to use PICCs in future antibiotic therapy of their CF patient.

**Discussion & Conclusion** While PICCs are successfully inserted in most cases, introduction can be painful. They are safe regarding infections and thrombosis. PICCs are appreciated by both patients and nurses as they are easy to use and increase the comfort and well-being of patients with CF during intravenous antibiotic therapy.

**Keywords** Clinical outcomes, Medical device use, Quality of Life

previous disease-modifying drugs, combination with methotrexate (MTX), adjunct treatments, efficiency and tolerance.

**Results** Over the study period (12/2007–05/2010), 31 patients received this drug. The sex ratio was 0.2 and the average age, 59.7±16.

- Indication. Rheumatoid arthritis (RA) in 97% of cases and ankylosing spondylitis in 3% (1 patient).
- Dosage. Amid the 31 patients, 1 (3%) did not receive the recommended dose: 750 vs 500 mg.
- Previous disease-modifying drugs. All patients received them before starting Oencia®. The average number was 4. The non-biological DMARDs accounted for 52% with, in order of decreasing frequency: MTX, leflunomide, sulfasalazine, cyclosporine, hydroxychloroquine and golden salts. The biotherapy represented 48% with etanercept, adalimumab, infliximab, rituximab and anakinra. Only 1 patient (3%) did not receive a TNF-blocker.
- Combination with MTX. 32% received it. Among the 21 patients without MTX, the cause of arrest was intolerance for 86%, ineffectiveness for 5% and unknown for 9%.
- Adjunct treatments. They concerned 18 patients (58%): corticoids for 78%, NSAIDs, 22%, and analgesics, 28%.
- Efficiency. The average duration of treatment was 14.7±8.2 months. Oencia® was found effective in 23 patients (74%) among whom 35% received MTX. It was considered as ineffective in 4 patients (13%). In these cases the inefficiency resulted in discontinuation of treatment, after 7 months on average. For the 4 last ones we missed elements to judge the efficiency.
- Tolerance. It was globally good for 42% (13 patients). 71% reported side effects. The most frequent ones were infections, 64%, and asthenia, 27%.

**Discussion & Conclusion** In this population, the female predominance in RA is also found. The prescriptions respected the marketing authorization indication, RA. With an average of 4 previous treatments (non-biological and biological DMARDs partly), Oencia® was not used in first intention. In almost all cases, TNF-blockers were part of these treatments, according to the marketing authorization. The administered dosage corresponded with what was recommended. Oencia® must be associated with the MTX, it was the case only for 1 patient on 3 but the intolerances justified it. The increases, which occurred in half of patients, were treated conventionally. With a mean of 15 months of use, the risk/benefit ratio is very favourable: 74% efficiency and no stop for intolerance. Besides, this efficiency was maintained in the absence of MTX.

*Thanks to fifth-year pharmacy students who contributed to this work.*

**Keywords** Efficiency of abatacept, Tolerance of abatacept, Abatacept in rheumatoid arthritis

## PTE-18

### Use of Abatacept in rheumatology department of Limoges teaching hospital

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**Introduction** Abatacept, Oencia® is a relatively recent biological DMARD. So it seemed important to take stock of its use in our hospital since its marketing in 2007.

**Materials & Methods** A retrospective study of medical records of patients. A questionnaire was developed to collect indication, dosage,

## PTE-19

### Optimization analysis of anticancer drugs prescriptions and pharmaceutical interventions

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**Introduction** The team pharmaceutical of the Preparation Unit of Cytotoxic Chemotherapy realizes a daily analysis of prescriptions using the software CHIMIO®. To optimize the relevance of our analysis, a validation process incorporating the systematic consultation of the software DXCARE® has been established and a paper tracing of these Pharmaceutical Interventions (PI) realised. This software allows the access to clinical datas of patients (biological assessments, medical letters, Multidisciplinary Concertation Meeting (MCM)...).

The objective of this work is to estimate quantitatively and qualitatively PI performed and to confirm the need to integrate additional data for securing prescription.

**Materials & Methods** During 6 months, a collection of PI was realized on the “Form of pharmaceutical intervention” developed in 2004 by the French Society of Clinical Pharmacy (FSCP). These interventions were then directly communicated by telephone to concerned oncologists.

**Results** On 4,750 prescriptions, 57 (1.16%) required a PI, concerning 46 patients of average age  $61 \pm 14$  years. Among the “problems” most frequently detected, we find an error of dose in 47.4% of cases: 24 PI allowed to avoid an overdose and three a sub-dosage. Respectively, 17.5% and 12.3% of PI targeted “a monitoring to follow” (no respect of intercourses or order of cures) and “a medicine not indicated” (confusion of two protocols, error of patient identification, continuing treatment by mistake). Similarly, a “no conformity with references/contraindication” is found for 12.3% of intervention: inadequate dosage for the treated location, reconstitution in bags of glucose for diabetics. Finally in 8.8% of cases, it is an “untreated indication” (forgotten prescription of an anticancer drug, diffuser, premedication), and for 1.7% “Way/Administration inappropriate” (prescription bags instead of a diffuser).

In 54.4% of these prescriptions, the intervention consisted of the addition (29.8%), arrest (15.8%) or substitution (8.8%) of treatment. Dose adjustment was performed in 38.6% of cases, optimization of procedures for administering, and monitoring therapeutic, respectively 5.3% and 1.7% of prescriptions.

All PI were accepted by prescribers. The consultation of DXCARE® has allowed the realization of 26.3% of these interventions.

**Discussion & Conclusion** Despite the computerization of the prescriptions of chemotherapies, the risks of errors remain. A more complete knowledge of the patient can increase the relevance of pharmaceutical interventions by extending the analysis to biological assessments, decisions in MCM and to the whole treatment of the patient. The work on PI confirms the interest of “technical” analysis by CHIMIO® coupled with a “clinical” approach via DXCARE® to securing the drug circuit.

A reflection on a form of pharmaceutical intervention more adapted of anticancer drugs prescriptions should better target the sources of errors.

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**Keywords** anticancer drugs, monitoring, pharmaceutical intervention, Prescription evaluation

## PTE-22

### Role of the pharmacist in clinical trials: satisfaction survey in the Timone Hospital

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**Introduction** The Huriot-Sérusclat law of December 20, 1988 defined the field of biomedical research and entrusted the management of clinical trials to the pharmacist, allowing him to become a key partner in their organization.

The implementation of the trial requiring compliance with Good Clinical Practice (GCP) and coordination between partners: pharmacist, physician, industrial sponsor.

Although a few bill cite the duties of hospital pharmacist in the clinical trial management, the pharmacist plays a central role conducting these studies, by its privileged relations with investigators and sponsors.

The tasks of the pharmacist, reaffirmed in the law of August 9, 2004, led us to test the opinions of the industrial sponsors on the role of hospital pharmacists in clinical trials.

**Materials & Methods** A questionnaire for industrial sponsors of clinical trials consisted of 33 questions was constructed and subjected to 83 Clinical Research Associates with at least one ongoing trial at the Timone Hospital over the 385 clinical trials conducted at site, during the period of June–September 2008. The questionnaire was divided into five sections, to cover all activities undertaken by the pharmacist as described in the legislation. 22 questions were divided in two items, “in general” and “at the Timone Hospital”, in order to situate ourselves compared to other Hospital pharmacies included in the same trials.

**Results** We have compiled answers to 68% of all CRA, 74% for laboratories promoters and 73% of monitors. 30% of CRA responding are in charge of a trial involving a sterile preparation of the experimental drug.

95% of the CRA think the pharmacist respects GCP and contributes to the good use of experimental drugs. About the section “home to the pharmacy”, the visits of the trial are deemed necessary (98%) and satisfactory. 68% of the CRA would prefer an initiation visit common with the medical team.

90% of the CRA think that the nominative dispensation of treatment by a pharmacist facilitates the conduct of the trial and almost 40% that our intervention has helped avoid an error.

For 18 questions / 22, the sponsor satisfaction was identical or higher for our site than for the mean for other sites. Concerning the management of drug stock by pharmacy, we note that the CRA found that our premises are not secure enough (14%), and 2% that experimental drugs are not stocked correctly. Moreover, 16% of the CRA in charge of a trial with sterile preparation think that our premises are not suitable.

**Discussion & Conclusion** The results allowed us to highlight a very positive perception of the service delivered by the pharmaceutical team in the clinical trial management, but also to identify negative aspects. Since this survey was conducted, we improved some of these negative aspects, especially on the premises for preparation and the experimental drugs storage.

We must improve ourselves continuously to ensure the sponsor a clinical trial participation among best.

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**Keywords** clinical trials, industrial sponsor, pharmacist, satisfaction survey

## PTE-24

### Asthma and histories of prisoner’s consumption of psychoactive substances: prospective study from April to August 2007

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**Introduction** With a prevalence of 5 to 7% in the general population, asthma remains a pathology often under-diagnosed, and poorly managed. The aim of this study was to identify psychoactive substances use, the prevalence and the triggering factors of asthma as well as to evaluate the management of asthmatic patients in the penitentiary facilities of Lyon.

**Materials & Methods** A prospective study was conducted between April and August 2007 on new arrivals to prison facilities. New prisoners above 18 years old were included if they were incarcerated for more than 7 days. The interview of the included prisoners (841) was based on a specific questionnaire.

**Results** Of the 841 questionnaires collected, 727 (86.4%) could be analysed. Among the 727 interviewed prisoners, 80.6% daily smoked, 15.4% daily used cannabis, 7.7% buprenorphine, 5.5% were daily users of heroin, 3.3% for methadone and 2.8% for cocaine (outside exposure).

78 of the 727 patients (10.8%) presented asthma, as diagnosed by a lung specialist. The prevalence of asthma was higher in the studied group than in the general population in France.

The proportion of asthmatic patients was higher among the prisoners consuming one or more drugs, regardless of the frequency of drug use: 4.3% of the non-consuming group is asthmatic versus 11.4% in the consuming group ( $p < 0.05$ ).

Precisely, the consumption of cocaine or methadone was significantly associated with asthma: 19.0% of the cocaine consumer's had asthma versus 9.9% in the non-consuming group ( $p = 0.026$ ); 21.9% of the methadone consumer's had asthma versus 10.2% in the non-consuming group ( $p = 0.037$ ). No link between asthma and use of cannabis, tobacco, buprenorphine and heroin was found.

**Discussion & Conclusion** According to the literature, the relationship between methadone use and asthma cannot be explained by the methadone's adverse drug effects, but the link between asthma and heroin or cocaine use is demonstrated. It would be possible that those methadone consumers had a previous exposure to heroin, which could be the cause of the asthma pathology.

With regards to treatments, 46 asthmatic patients (59%) declared receiving treatment outside of prison and 55 (71%) are followed by clinician and received treatment during their detention. 27 asthmatic patients (35%) received inadequate treatment during detention (asthma not under control).

In conclusion, the prevalence of asthma was higher for prisoners.

Additionally, this study showed the difficulties to assess the severity of the asthma pathology and to adapt treatments. As an outcome, good prescription practices were established and organized through improved collaboration between physicians and pharmacists. The updated knowledge of the medical staff by pneumologist contributed to the optimization of the follow up of asthmatic patients in detention.

**Keywords** asthma psychoactive substances prison

## PTE-25

### Developing a program of therapeutic education in HIV patients: choice of organization, educational tools and information for different participants

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**Introduction** According to WHO, the aim of therapeutic patient education (TPE) is to help patients acquire and maintain the knowledge necessary to manage life with a chronic disease. Antiretroviral treatments and prophylactic treatment against opportunistic infections have changed the management of HIV, which has now become a

chronic illness. To optimize the effectiveness of antiretroviral therapy and limit the emergence of resistances, a 95% adherence rate should be obtained (2). In this context, the hospital pharmacist, who plays an active role in TPE is a mediator between the doctor and the implementation of a complex therapy with numerous constraints.

**Materials & Methods** The infectious diseases specialist at our institution followed 40 HIV patients who were systematically proposed a TPE consultation. Semi-structured interviews were organised in a room for this purpose with a multidisciplinary team (pharmacists, residents, nurse), after the medical consultation. The help of a dietitian, a psychologist and social worker was occasionally required. The pharmacist who managed TPE had received level 1 TPE training including tools and illustrated workbooks to help him initiate a dialogue. The pharmacy team involved in drug dispensing also had training in therapeutic strategy and adherence.

**Results** After 5 months, 18 patients had participated in this new program. 30 forty-five minute interviews were performed. Essential educational tools were developed: individual therapeutic programs, practical information files on antiretroviral therapy to increase the relevance of advice provided during an exchange of information. A standardized patient file was also developed and validated. This was integrated into the computerized patient medical file and is only available to TPE staff to maintain confidentiality. This file contains all the information necessary for a group evaluation (prescribed treatment, global evaluation of therapeutic experience, evaluation of tolerance, management of side effects, self-medication, management of treatment under specific conditions, understanding of the disease and follow-up, prevention ...).

**Discussion & Conclusion** TPE is being developed in our institution simultaneously with routine hospital pharmacy practices. Although there are too few patients to assess the results of this activity patient feedback has been quite satisfactory. Our goal is to develop a proper TPE program in the near future with customized modules to respond to the needs of each patient. A specific program would be created and new tools would be developed. These modules would be offered on an as-needed basis according to targets identified during semi structured interviews.

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**Keywords** therapeutic patient education, organization, human immunodeficient virus

## PTE-26

### Transcatheter pulmonary valve replacement in patients with a dysfunctional right ventricular outflow tract conduit: report of the first cases in the University Hospitals of Lyon

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**Introduction** The estimated frequency of congenital heart malformations is 0.8 to 1% of living births. There is no effective long-term treatment for these malformations.

As an alternative to surgery, transcatheter-based approaches have emerged for pulmonary valve replacement. The percutaneous valve

Melody® (Medtronic®) was approved in this indication in 2006. Melody® is a covered stent with a valve and a metallic trellis which can be wrapped around a small balloon introduced by the femoral approach. The diffusion of this promising technique in France is limited due to its cost (20,000 euros per one).

**Materials & Methods** The start-up of the technique is described. The results on the first patients treated are given after a prospective observation based on the patient files with a preliminary follow-up of one month. This study was aimed at evaluating the main safety and efficacy data related to the use of this technique. Basic descriptive analysis was given.

**Results** In mild 2009, the cardio-pediatric ward for groupement Hospitalier Est obtained a grant of 60,000 euros from the drug and devices committee based on a budget devoted to innovative health technologies.

The three first patients from the University Hospitals of Lyon were implanted with a Melody transcatheter pulmonary valve between January and April 2010. All patients had congenital heart defects and had undergone three to four surgical interventions since birth including open heart surgery. They showed severe clinical signs of disease (NYHA class II) such as dyspnea, arrhythmia and thoracic pain which affected their quality of life.

Procedures were successful in all three patients after a mean duration of 90 min. Post-operative evaluation showed a decrease of the right ventricular outflow tract gradient 40–50% showing the efficacy of the prosthesis and an improvement of the NYHA score in all patients. The discharge was allowed 48 h after the procedure and the mean duration of stay was very short (3 days) as compared to conventional surgical treatment (usually 5 to 8 days with 24 to 48 h in intensive care). No complication related to a dysfunction of the valve was observed after one month.

**Discussion & Conclusion** Based on the preliminary results observed in three patients, the percutaneous pulmonary valve with Melody transcatheter is being confirmed as a very innovative and effective technique for the treatment of congenital heart defects. We intend to continue this observation in next patients and to include a long-term follow-up. Reimbursement of the prosthesis is now greatly awaited in France in order to improve the diffusion of this revolutionary technique.

**Keywords** congenital heart malformations, Melody transcatheter, pulmonary valve

## PTE-28

### Medication use in elderly with chronic kidney failure: inventory in a geriatric unit

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**Introduction** Elderly with renal failure have an increased sensibility to side effects. These side effects often result of an inappropriate posology of medicines eliminated essentially by renal route. So, posology of these medicines must be adapted to kidney glomerular filtration rate (GFR).

**Materials & Methods** Our study was realised in a geriatric unit in which prescription was recently computerized. Creatininemia and weight of each patient were collected to determine creatinine clearance (Creat Cl) according to Cockcroft-Gault equation (CG). When this value was lower than 60 ml/min, the prescription was analyzed and posology was compared with informations contained in drug's monography.

**Results** On 131 analyzed patients, 75 patients have Creat Cl < 60 ml/min. Ninety-six percent of these patients have Creat Cl between 30 and 60 ml/min and only 4% have Creat Cl between 15 and 30 ml/min.

Ten analyzed prescriptions (13.3%) contain unadapted medications. Four of them have a contraindication, 3 of them have a problem of dosage adaptation and 3 others a non-recommendation.

**Discussion & Conclusion** Most of studied patients present only a moderate chronic renal failure. However, most of drugs require a dosage adaptation in case of severe renal insufficiency. No common equation to estimate GFR and to adapt medicines' posology is totally satisfying. CG equation overestimates renal insufficiency. Digoxine, Allopurinol and Sotalol represent medicines with unadapted dosage; Metformine and Fenofibrate LP 160 mg are contraindicated medicines.

We have to calculate Creat Cl to determine if the patient has a chronic renal failure. Before checking posology, we must wonder if therapeutic is adapted to elderly and if a drug does not correct a side effect of an other prescribed medicine. Finally, a guide for medicines requiring a dosage adaptation according to the degree of renal insufficiency could allow to avoid errors of posology during the validation pharmaceutical. However, this list is not exhaustive and requires regular update.

**Keywords** renal failure, chronic, elderly, posology, chemotherapy

## PTE-29

### Tolerance of 2% cyclosporine eye drops preparation assessed by patients

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**Introduction** The Pharmacy Department of Hôtel-Dieu Hospital produces a cyclosporine A (CsA) eye drops preparation (concentrations of 20 or 5 mg/mL). CsA administration is very effective in the case of immunological diseases of the cornea, conjunctive or uvea and is widely used in the prevention of high-risk rejection corneal transplantation.

The hydrophobic nature of CsA is the main difficulty in developing this topical form. CsA eye drops are prepared following a particular formulation including one part commercially available cyclosporine oral solution (Sandimmun®) diluted in four parts of sterile castor oil to improve CsA solubilization.

Sandimmun® oral solution contains ethanol which can cause local toxicity. Ethanol concentration in our preparation is lower compared with other available CsA eye drops. The objective of this work is to assess the 2% CsA eye drops local tolerance felt by patients.

**Materials & Methods** 625 questionnaires were sent to Hôtel-Dieu Hospital patients in August 2007. We only included patients treated by 2% CsA eye drops. Various items allow the gathering of information on indications, side effects and benefits felt by patients.

**Results** On 625 contacted patients, 388 answered the study (57%). Indications reported are prevention of the rejection of cornea transplantation (66%), keratoconjunctivitis (12%), dry eye syndrome (9%) and others (pemphigus, ulcer, steroid addiction, rosacea, allergy, etc.) 37% of patients reported side effects (SE). The main SE described were burning (78%), itching (20%) and pain (18%).

There is no statistically significant difference in SE according to the pathology (Chi-square;  $p < 0.05\%$ .)

In 54% of the cases, SE persisted after the instillation (average 1 hour, median 15 min). SE remain present several months after treatment initiation (58%). However, 83% patients felt an improvement of their visual comfort following treatment institution (24% of major improvement).

**Discussion & Conclusion** The CsA eye drop prescription has increased for three years (+50% in 2009 compared to 2007). Indications reported by patient need chronic treatment. To avoid the risk of



non-adherence, it is useful to warn patients, not only at the initiation of treatment but regularly afterwards. Patients have to be informed that SE will disappear with time in half of cases. For patients who have persistent SE, they last no more than 15 min in half of the cases. To improve patient's knowledge and adherence, several actions are possible regarding the quality of information given.

First, assess the knowledge of pharmacy staff and inform them about the latest news on CsA.

Then put in place structured patient-centered information at each dispensation: patient's needs, motivation, and willingness have to be taken into account.

Finally, deliver exhaustive, understandable and adapted booklets for adults and children in order to give information about proper use, safety and tolerance.

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Cyclosporine 2% eye drops preparation F. Chast, F. Lemare, J.-M. Legeais, R. Batista, C. Bardin, G. Renard.

**Keywords** cyclosporine eye drops, side effects evaluation

## PTE-30

### Audit support for appropriate use of bare-metal stents

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**Introduction** Bare metal stents (BMS) are medical devices commonly used, not included in French diagnosis related group (DRG) system. Therefore, their reimbursement to hospitals is possible if their use is based on official labelling (OL) and published scientific data. The aim of this audit is to describe the use of BMS or Drug Eluting Stents (DES) between 2006 and 2009 and to compare BMS medical practices for the treatment of coronary artery disease (CAD) to OL.

**Materials & Methods** This audit is a retrospective study performed in collaboration with the cardiology unit. Every patients treated by coronary stent implantation from 2006 to 2009 in our institution were included. For the audit, we selected only patients treated by BMS. The analysis of use was performed by angioplasty as conformity to the OL:

Short lesion length ( $L < 20\text{mm}$ ),  
Severe stenosis ( $> 70\%$  by visual assessment),  
Coronary dissection or occlusion.

The reimbursement terms include the number of BMS used (1 BMS by lesion or 2 per artery, and 3 BMS in cases of dissection). Data were collected through the base of the Cardiology Unit. We studied patient's characteristics: age, sex, CAD risk factors and characteristics of angioplasty (type of lesion, indication).

**Results** Between 2006 and 2009, 3 372 patients underwent coronary angioplasty with 4 798 stents implanted. The mean age was  $65 \pm 13$  years [52–78] and sex ratio M/F = 3. Most common risks factors were hypercholesterolemia (58%), smoking history (46%), hypertension (44%) and family history of CAD (66%).

In 2009, 57% of stents implanted were BMS and 66% in 2008. In the other cases, 1 or more DES were implanted. Between BMS and DES, some risk factors differ significantly as dyslipidemia, diabetes, obesity ( $p < 10^{-4}$ ). Between 2006 and 2009, 15 BMS-restenosis were observed and lead to a second angioplasty with DES implantation  $9.7 \pm 6.5$  months [1–29] later.

The BMS audit included 856 coronary angioplasties with 671 BMS. The overall rate of conformity to OL was 95.1%. 25 implantations (4.9%) were outside the OL: 1 patient with a restenosis of BMS, 2 patients with a higher number of stents (3 stents in the same lesion) and 22 patients with inadequate size of lesions ( $L > 20\text{mm}$ , diameter  $< 3\text{mm}$ ).

**Discussion & Conclusion** The epidemiological characteristics are similar to those found nationally [1]. A large majority of the indications belongs to the OL (95.1%). This analysis shows an appropriate and controlled use of BMS in angioplasty. The indications outside the official labelling may be some indications to drug-eluting stents. This audit is the first part of a professional practices evaluation completed by a presentation of results to cardiologists. A similar audit is underway with the implantation of drug-eluting stents compared to a National guidelines of the HAS (Haute Autorité de Santé) published in February 2009 [1].

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**Keywords** angioplasty, stents, audit

## PTE-31

### Tocilizumab in support of adult Still's disease steroid-dependent

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**Introduction** The adult Still disease is a rare inflammatory arthritis. It's characterized by fever above  $39^{\circ}\text{C}$ , skin rash, pharynx or muscle pain, leukocytosis and elevated liver enzymes level. Although the pathogenesis is unknown, many proinflammatory cytokines have been implicated, such as tumor necrosis factor, interleukins 1, 6 and 8. The evolution of the disease is unpredictable. A 52-years-old woman with Still disease was admitted in January 2010 with fever associated with chills and arthritis. Symptoms disappeared with prednisone 50 mg/d and recurred with dose decrease (30 mg/d).

**Materials & Methods** Bibliographic research: Pubmed, Haute Autorité de Santé and regional center of pharmacovigilance

**Results** Corticosteroids were decreased and anakinra, a recombinant form of IL-1 receptor antagonist, was introduced in March 2010, leading to a dramatic clinical improvement. Two weeks later, marked inflammatory lesions at the injection sites led to discontinuation of anakinra therapy. Biopsies were concordant with anakinra toxicity as described elsewhere and HHV6 and 7 PCR remains negative. Lesions spontaneously improve within a few days. Tocilizumab, an anti-IL6, was proposed as 3rd line treatment. The first infusion of tocilizumab at a dose of 480 mg after premedication by dexchlorpheniramine shows no immediate adverse event. After 4 weeks, blood counts and inflammatory parameters were within normal range. Tolerance of tocilizumab was excellent without flu-like symptoms, fever, cough, nor infection. The patient is currently under 20 mg of steroids with a decrease of 10 mg every 15 days and her physical status completely improves.

**Discussion & Conclusion** this case report shows the difficulty of the management of steroid-dependant Still disease and the lack of EMEA-approved label alternative despite convincing evidence of targeted therapy efficiency. Clinical pharmacists act in concert with physicians for the best patient management and safety.

**Keywords** Drug use, Still disease

## PTE-32

**An assessment of intermittent intravenous cyclophosphamide (CYP IV) in systemic autoimmune disease**S. Perrin<sup>1</sup>, A. Reberga<sup>1</sup>, C. Tesmoingt<sup>1,\*</sup>, P. Arnaud<sup>1</sup><sup>1</sup>Pharmacy Unit, Bichat-Claude Bernard Hospital, AP-HP, Paris, France

**Introduction** Systemic autoimmune disease management could be different between two medicals departments and sometimes in the same department. The CYP IV's fabrication is made at the centralized unit for cytotoxic drug preparations of the pharmacy. The pharmaceutical validation is difficult because of a lack of uniform prescription between the clinical units. The aim of this study is to assess the CYP IV use in autoimmune disease in nephrology department at the first time.

**Materials & Methods** A literature review and a 3 years retrospective study were made in medicals and pharmacy departments. Datas from prescription and patients files were collected. Then, population characteristics, indications, and prescriptions adherence to recommended therapeutic strategies were evaluated.

**Results** Thirty one patients (23 females / 8 males) received intermittent CYP IV: 19 patients (62%) with systemic lupus erythematosus (SLE), 6 patients (19%) with Wegener's granuloma (WG) and 6 patients (19%) with other vasculitis.

Fifteen patients with SLE (79%) received intermittent CYP pulse therapy of 500 mg every two weeks during 3 months, 1 (5%) received 1000 mg once a month during 6 months, and 3 (15%) had different managements from 500 mg to 1100 mg during 15 to 80 days. These 3 patients were treated in rheumatology unit.

All the patients with WG and the other vasculitis were treated as the same way with 750 mg/m<sup>2</sup> CYP at D1, D15 and D30 and every 3 weeks during 6 months.

**Discussion & Conclusion** The protocols are globally uniform in the nephrology's department, but variations exist between different medical units.

This retrospective study shows that the principal treatment schedule for SLE is based on the EuroLupus protocol[i] (6 pulses of 500 mg every 2 weeks) keeping the cumulative dose as low as possible. Sometimes, the NIH protocol is used (750 mg/m<sup>2</sup> monthly for 6 months), but with a maximal dose of 1000 mg per pulse in order to limit the cumulative dose and the sides effects. For the Wegener disease and the other vasculitis, the protocol used comes from the Wegent study [ii] (750 mg/m<sup>2</sup>, 3 pulses every 15 days and then every 3 weeks during 6 months) with a maximal dose of 1000 mg per pulses too. However, doses reductions are possible because of the patient's side specificity (renal insufficiency, old age...). A multidisciplinary writing protocol has been made in this department in the first time, validated both by doctors and pharmacists. An other retrospective study is going to be continued in the other departments to compare and try to uniformized the practices in the hospital.

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**Keywords** intravenous cyclophosphamide, protocols, systemic autoimmune disease

## PTE-33

**Optimal management of febrile neutropenia: one-year prospective study in a French Hospital**C. Vignand<sup>1,\*</sup>, V. Martinez<sup>2</sup>, C. Guillet-Caruba<sup>3</sup>, F. Doucet-Populaire<sup>3</sup>, A. Rieutord<sup>1</sup>, M. C. Lott<sup>1</sup>, I. Kansau<sup>2</sup><sup>1</sup>Pharmacy, <sup>2</sup>Internal Medicine, <sup>3</sup>Microbiology, AP-HP, Clamart, France

**Introduction** Febrile neutropenia (FN) is linked with a high mortality rate, which makes essential the prompt establishment of an appropriate antibiotic treatment. The aim of the study was to assess the clinical management and outcomes of neutropenic patients.

**Materials & Methods** A one-year prospective study was performed between May 2009 and 2010 in our department of Internal Medicine. Inclusion criteria are neutrophils count <0.5G/L and fever >38.5°C. Clinical data and antimicrobial therapy were collected. The following antibiotic associations are recommended by hospital internal rules: piperacilline/tazobactam (PTZ) aminoglycoside (AMG), PTZ-ciprofloxacin (CP) or PTZ-AMG-CP and PTZ-AMG-vancomycin (VM) in case of suspected central catheter infection. Results were compared to internal rules and ECIL guidelines.

**Results** Twenty-four FN episodes after chemotherapy were collected in 15 patients (mean age: 65.9 years, sex ratio F/M = 2, hemopathy (n = 10; n = 3 HIV), solid tumor (n = 5)). Fourteen patients had favourable outcome and one patient died (no-related with FN). Two (8.3%) patients received *Pneumocystis* spp. prophylaxis with cotrimoxazole. Empiric antibiotics (100%) were consistent with our internal guidelines (indication, drug choice and dosage). Median length of treatment was 9.1 days. Patients were treated by PTZ-AMG (11), PTZ-CP (7) for those with *P. aeruginosa* prior history, AMG-VM (3), PTZ-AMG-CP (1), PTZ-AMG-VM (1) and caspofungin for candida infection (1). Infections were microbiologically documented in 16 episodes (67%): 9 Gram negative bacilli, 5 *Staphylococcus* spp. (4 *S. epidermidis* and 1 *S. haemolyticus*), 4 *P. aeruginosa*, 1 *C. albicans* were isolated. Half of treatments were improved thanks to microbiological results. Central catheter was removed in 5 patients.

**Discussion & Conclusion** Higher rate (67%) of bacteria isolation was reported compared to literature (>30%) Prescriptions were accorded to ECIL guidelines and lead to favourable outcome in FN.

**Keywords** Antibiotic management, Febrile neutropenia, Prospective study

## PTE-34

**Treatment of rheumatoid arthritis: biotherapy versus TNF alpha antagonist?**C. Lu<sup>1,\*</sup>, M. Vasseur<sup>1</sup>, A. Leroy<sup>1</sup>, R.-M. Flipo<sup>2</sup><sup>1</sup>Pharmacy, <sup>2</sup>Rheumatology, CHRU DE LILLE, LILLE Cedex, France

**Introduction** Rheumatoid arthritis is a chronic inflammatory disease that can affect many different tissues and organs but mainly joints. It can ultimately lead to cartilage destruction. A wide variety of disease modifying antirheumatic drugs is available to treat RA, which include biotherapy and TNF alpha antagonists. It is hard for physicians to clearly define the basis for choosing the most appropriate treatment for a given patient.

This study aims at determining a therapeutic strategy for patient affected by RA by comparing biotherapy and TNF alpha antagonists.

**Materials & Methods** The medical prescriptions of patients treated for RA with intravenous drugs were studied. Intravenous drugs include biotherapy rituximab, abatacept, and TNF alpha antagonist infliximab.

A computer program recorded dispensations and provided, for each year and each molecule, patient treated.

A table summarizing the number of patients receiving each drug in 2008 and 2009 was created.

**Results** In 2008, 200 patients received treatment for RA, 29% patients were on TNF alpha antagonist whereas 71% were treated with biotherapy: 43% with rituximab and 28% with abatacept. In 2009, among the 189 patients that were treated for RA, 28% of them were on infliximab while 73% received biotherapy: 41% and 32% of patients were treated with rituximab and abatacept respectively.

In 2009, prescriptions of patients with no prior treatment were analysed: there were 20 patients that received rituximab for the first time; there were 8 new orencea patients, and 5 new infliximab patients.

Modifications of treatments occurred during the two years studied: 5 patients switch from rituximab to abatacept whereas 2 of them went from abatacept to rituximab. Concerning infliximab patients, 5 of them switch to abatacept and 1 to rituximab.

**Discussion & Conclusion** From 2008 to 2009, outcomes are quite static: the number of patient treated for RA in total and the number of patients treated with TNF alpha antagonists and biotherapies have not changed much. Concerning the therapeutic strategy for RA, the first line strategy remains TNF alpha antagonists, in case of failure with one of them, another one is used.

This study does not include subcutaneous alpha antagonist: etanercept and adalimumab. Patients' prescriptions weren't available because in France, most of them are treated at home.

For the second-line treatment, biotherapy is used, rituximab first, and if there is no response, then abatacept will be used.

However, for patients with no prior treatment in 2009, it can't be sure that they weren't treated with adalimumab or etanercept before; it is only certain that they did not received any intravenous treatment.

**Keywords** biotherapy, rheumatoid arthritis, TNF alpha antagonist

## PTE-35

### Audit on the reevaluation of antibiotics at 24–72 hours

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**Introduction** In France, certification v2010, national contract on rational use of antibiotics (RUAB) and calculation of ICATB Index require the evaluation of the RUAB. As a fundamental concept of RUAB, reevaluation after 24–72h of antibiotic prescription was chosen as a basis of an audit made on hospitalized patients treated with antibiotics (AB) for more than 4 days. The appropriateness of AB was not evaluated.

**Materials & Methods** Investigation was held in October 2009 and all hospitalized patients on AB were included. For those treated for more than four days, reevaluation was considered null (< 3 criteria), partial (3–5 criteria) or complete (>5 criteria) on the presence or not of several criteria in the patient file: searching for or documentation of microbes, identification of the origin of infection, clinical diagnosis, justification of AB modifications on side effects, resistance, economic, practical or local AB policy data or opinion of the Infectious diseases specialists. The nature of the modification and its traceability in the patient file were recorded.

**Results** Out of 943 hospitalized patients on AB screened in 55 departments, 83 (8.8%) were treated for more than 4 days and were analysed with a standardized questionnaire. Reevaluation was considered null in 9 (11%), partial in 47 (56%) and complete in 27 (33%). In case of complete reevaluation, antibiotherapy modifications were present in 75% and treatment was maintained in 60% in case of partial or null reevaluation. Out of 40 changes, 1/3 involved antibiotic substitution, in 28% addition or withdrawal of an antibiotic and in 24% a change in the mode of administration. Dosage was modified in 14%, dose in 10%, interval of administration in 4%. Reevaluation was explained and recorded in the patient file in 80% of cases.

**Discussion & Conclusion** In antibiotherapy, the concept of reevaluation is important as it gives to the clinician a “second chance” to improve his prescription and the global medical management of the patient. After completion of this audit, several actions are planned: forwarding the results back to the units (prescribers and nurses), explanation of the concept of reevaluation and guidelines to stimulate and improve systematic reevaluation of antibiotic prescription, creating a formulary named “therapeutic reevaluation and traceability” to include it in the computerized patient file. This audit will be renewed in the next year to assess the impact of these corrective actions.

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**Keywords** antibiotherapy, audit, reevaluation at 24–72 h

## PTE-36

### Survey of peripheral intravenous infusion practices

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**Introduction** The aim of the survey is to analyze the peripheral intravenous infusion current practices and to assess the impact of the actions conducted by the multidisciplinary workgroup after the first evaluation survey conducted in 2007. Some of the investigated items are part of the 2010 national survey of the national prevention program of health care associated infections.

**Materials & Methods** The survey was conducted by binomials hygienist/pharmacist on 3 consecutive days in all hospitalization departments which consisted in direct clinical observations of inpatients and in the analysis of their nursing records. An assessment grid worked out from the one proposed by the evaluation group in hospital hygiene practices was used to collect the observations according to various items: type, nature of the infusion and medical devices used; traceability of the insertion and daily clinical monitoring of the peripheral venous catheter.

**Results** 14 hospitalization departments were investigated. 253 observations were collected of which 82 observations of inpatients with infusions (32.4%).

Most injectable preparations were infused from bags (87.8%) and guidelines for good infusion practices were respected. Infusion rate was regulated by gravity administration sets in 64.6% of infusions and by infusion pumps in 23.2% of cases. 67.1% of the infusions were related to the administration of medications and 19.5% of keep vein open (KVO) infusions were reported. 58.5% of the patients had no

bidirectional positive pressure valve on their infusion line. 9.8% of the patients had a peripheral KVO, without infusion, closed by a valve.

The institutional traceability support for the daily clinical monitoring of peripheral venous catheters was present in 71.4% of the nursing records and was filled in in 64.6% of cases. The insertion date of the catheter was found for 89% of patients but was written on the dressing of the catheter in only 7.3% of cases.

**Discussion & Conclusion** In 2007, decisions and training actions permitted to replace infusion bottles by infusion bags (in order to avoid air embolism) and to withdraw flow control devices (according to the 2007 AP-HP guidelines) without generating an overuse of infusion pumps. The good use of bidirectional valves, in particular for the lock of peripheral KVO without infusion, was part of the training plan set up for the nursing staff.

At present, the remaining irrelevant indication of KVO infusion, the underuse of bidirectional valves and the necessary improvement of the clinical monitoring traceability of catheters raise the fact that the training plan must be reactivated to provide practice guidelines for infusion therapy to the nursing staff.

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Good use of medical devices for infusion. AP-HP Guidelines, April 2007.

**Keywords** Health care quality, Infusion, Medical device use, Practice guidelines

### PTE-37

#### Analysis of drug treatment changes during hospitalization in a medical post emergency unit

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**Introduction** The main risk factor for occurrence of side effect (SE) is the number of drugs taken. Assess regularly drugs indication and dosage is one way to prevent these SE. The aim of our study is to analyze the drug treatment changes during a hospitalization in a medical post emergency unit.

**Materials & Methods** It is a prospective study between Pharmacy and Medical post-emergency Departments. In collaboration between medical and pharmaceutical staff, a data gathering sheet has been established, including International Nonproprietary Name (INN), dosages, Anatomical Therapeutic Chemical (ATC) classification of drugs taken before and after the hospitalization. The casebook was made by students in hospital pharmacy for 15 weeks from July to October 2009. All patients admitted in the unit during this period were included. Analysis was realized jointly between physicians and pharmacists. For each patient, we analyzed the total number of drugs taken before and after hospitalization, pharmacological classes of drugs concerned by adding, stopping or dosage changes, the reasons for these changes and the acute or chronic treatment.

**Results** We included 189 patients: average age 70 years, sex ratio (M/W) 2/3, average length of stay 6 days. On average, the patient comes in with 5.1 drugs and left with 6. Per patient, 2.7 medicines were introduced and 1.7 were stopped. 62% of patients were concerned by a discontinuation of treatment, 97% by an introduction and 26.5% by a dosage adjustment. The principal therapeutic families concerned were: for discontinuation (338), diuretics (8.6%), analgesics (6.5%), hypolipidemics (6.5%) and metabolic supplementation (6.2%); for

dosage adjustment (67), anxiolytics and diuretics (16.4% each); for introduction (518), antibiotics (20.3%) and analgesics (18.5%). Introduced treatments were temporary for 72% whereas stopped treatment were chronic for 72%. The main reasons for stopping treatment were non-indication (40.6%) and side effects (22.4%).

**Discussion & Conclusion** Although the total number of medicines at the end of the hospitalization is higher than that at the admission, it is primarily due to introduction of acute treatments (antibiotics and analgesics). In contrast, most stopped treatments are chronic treatments. This joint intervention between pharmacists and physicians can improve drugs' prescription by its clarification: benefit/risk discussion about stopping or adding treatment, taking into account the patients' pathophysiological state during hospitalization. This study shows that a medical post emergency unit can be the place of a comprehensive analysis of drug treatment in its entirety particularly thanks to adverse drug reaction prevention.

**Keywords** evaluation, iatrogeny

### PTE-38

#### Evaluation of patients' observance in a post-emergency unit

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**Introduction** The majority of patients come to hospital with an ambulatory treatment prescribed by a physician. It is important to know if and how the patient takes this treatment, because bad observance can lead to a hospitalization. The aim of our study is to evaluate patients' observance at home and eventually to adapt their treatment when they leave hospital.

**Materials & Methods** It is a prospective study between Pharmacy and Medical Post-Emergency Departments. In collaboration with physicians, the pharmaceutical staff selected a questionnaire composed of 6 "yes/no" questions. Each of them gives 0 or 1 point and the global score allows to class patients in 3 categories: good (score = 0), medium (score from 1 to 2) or bad observance (score  $\geq 3$ ). The pharmacy students and intern questioned patients in the ward over a period of 2 months. We excluded patients without ambulatory treatment, unable to communicate and those who were institutionalized. For each of them we also noted the number of drugs taken, way of life and the person who usually prepares and gives the treatment.

**Results** We questioned 56 patients on the 120 admitted in the ward: average age 75 years, sex ratio M/W = 24/32, treated on average with 7 different drugs. The test shows a variable observance: good 28% (16/56), medium 50% (28/56) and bad 22% (12/56). Average observance score was 1.5 for the 56 patients. We noticed that 50% (23/56) of the patients think they have too many pills to take (average observance score of 2.53). This group of patients takes 8 different drugs each day whereas the other patients take 6.2 different drugs without significant difference. Moreover, 35% of the patients often forget a dose, or don't take it at the scheduled time. Seven patients were hospitalized for a drug side effect. Their average score test was 2.5. We did not observe a relation between observance and sex, way of life, number of drugs taken.

**Discussion & Conclusion** We noted that 72% of patients have problems with observance, with a bad observance rate of 22%. Moreover the test is based on patients' self declaration; a minority of them probably denies bad observance. It is interesting to note that patients who declare having too many pills to take are not those who have the more medicines prescribed. Besides it appears that there is no correlation between observance and the number of drugs the



patients take. This test is a first approach to the patients' vision of their treatment. It allows to adapt treatment according to the predicted observance on patient discharge. The next step should be a feedback on behalf of the general practitioner who can judge the long term clinical interest of this change, particularly when staff considers the observance is very bad and can endanger the patient's health.

**Keywords** Evaluation, Inpatients, Observance

## PTE-39

### Effect of addition of montelukast to the asthma maintenance treatment on the clinical and humanistic outcomes

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**Introduction** Asthma is a disease that can result in restrictions in the physical, emotional and social aspects of a patient's life. Therefore, new treatment modalities are needed to be assessed for both clinical and humanistic outcomes. The aim of this study is to assess the impact of addition of montelukast to the ongoing asthma treatment in terms of improvement in forced expiratory volume in 1 second (FEV1) percentage, symptom control and quality of life (QOL).

**Materials & Methods** The patients (n = 50) consisted of asthma patients aged between 18–65 years, who were not receiving a leukotriene receptor antagonist and who accepted to participate in the study on admittance to the study outpatient asthma clinic. These patients were followed-up for one-month receiving their maintenance therapies (inhaled corticosteroid [ICS] w/wo long-acting beta2-adrenoceptor agonist [LABA] + rapid onset bronchodilator as needed). After one-month the baseline clinical, medication-related and QOL data were recorded and montelukast was added to their therapies. The patients were followed-up for three months and the clinical data as reflected by FEV1%, disease severity, symptom control and the QOL data were recorded again and analyzed for any improvement through the 3-months. Disease severity was graded according to the Global Initiative for Asthma (GINA) guidelines. "Asthma Control Questionnaire (ACQ)" and "Asthma Control Test (ACT)" were used in order to assess the symptom control. Asthma Quality of Life Questionnaire (AQLQ) was used to assess the asthma-related QOL of the patients.

**Results** Mean (SEM) age of the patients was 38.6 (1.7) and 80% was female. The medications used for maintenance asthma treatment other than montelukast were high-dose ICS w/LABA (26%), moderate-dose ICS w/wo LABA (40%/8%) and low-dose ICS w/wo LABA (16%/10%). Addition of montelukast resulted in improvement in disease severity (rate of uncontrolled patients decreased from 86% to 50%;  $p < 0.05$ ); improved symptom control (median [min-max] ACT score increased from 13 [5–25] to 19.5 [10–25] ( $p < 0.001$ ); median [min-max] ACQ score decreased from 18 [5–37] to 8 [0–25] ( $p < 0.001$ )); improved QOL (median [min-max] AQLQ score increased from 104.5 [45–213] to 156.5 [74–224] ( $p < 0.001$ ); similar improvements were observed for all domains of the AQLQ. The mean (SEM) FEV1 which was initially 73.08% (2.1%) increased to 87.15% (1.6%) at the end of three-months ( $p < 0.001$ ).

**Discussion & Conclusion** Addition of montelukast to the ongoing asthma treatment yielded favorable results in terms of improved disease severity, symptom control and QOL.

**Keywords** Asthma, Clinical outcomes, montelukast, Quality of Life

## PTE-42

### Use of bevacizumab in ophtalmic neovascularization

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**Introduction** Ophtalmic neovascularization is one of the leading causes of vision loss in Western societies. In the Groupe Hospitalier Pitié-Salpêtrière (GHPS) the ophtalmic diseases with neovascularisation (except the neovascular age-related macular degeneration (AMD) which has a treatment with an european medicines agency autorisation (EMA): ranibizumab) an intravitreal injection (IVT) of bevacizumab (5 mg/0.2 mL) prepared from the commercial solution for 25 mg/mL is administered. This preparation is realized in an isolator at the centralized unit of injectable preparations.

In France, the use of Avastin® (bevacizumab) in ophthalmology is not recognized. The French Agency of Sanitary Safety of the Products of Health (AFSSAPS) indicated that the data of safety of use of Avastin® in ophthalmology were limited. In order to allow verifying the legitimacy of the prescriptions a retrospective review of all patients treated with intravitreal bevacizumab over the year 2009 at the ophtalmologic department of GHPS was performed.

**Materials & Methods** A data base was created by a workgroup combining ophtalmologists and pharmacists. All the medical files were reviewed by pharmacists. The following information, indication, rhythm of administration, tolerance (infection, pain, intraocular pressure), efficiency data (visual acuteness, optical coherence tomography, slit lamp) as well as the evaluation of the medical supervision after the injection were collected. The data of 7 IVT by patient could be documented. The meditative data were validated by an ophtalmologist.

**Results** Twelve main indications justified by publications or works of learned societies were brought out: neovascular glaucoma, macular edema, polypoidal choroidal vasculopathy, choroidal neovascularization (CNV), retinal neovascularization, pseudoxanthoma elasticum, retinal hemangioblastoma in von Hippel-Lindau disease, macular oedema associated with central retinal vein occlusion, proliferative diabetic retinopathy, exudative AMD, uveitis associated with CNV, ischemia-induced retinal neovascularization. In 2009 104 patients received one or several intravitreal injections of bevacizumab on the GHPS, corresponding to 181 IVT. The data processing of efficiency and tolerance via the realized questionnaire is in progress. The preliminary results (50 analyzed files) have shown that 6 patients presented intolerance to the IVT (headaches, vision swindles). We noticed a lack of homogeneity in the present data in files. The study of the medical files continues and all the results will be presented on the meeting.

**Discussion & Conclusion** The final results of this study might allow justifying the use except EMA in a not exceptional way by proving efficiency and the safety of use for the patient. The conditions of aseptis and stability recommended by the AFSSAPS are organized by the pharmacy. A document to fill in every IVT would allow improving the quality of the follow-up of the patient.

**Keywords** bevacizumab, intravitreal injection, ophtalmic neovascularization

## PTE-45

### Antimicrobial susceptibility pattern of *Staphylococcus aureus* strains isolated from hospitalized patients in Tehran, Iran

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**Introduction** *S.aureus* is a major bacterial pathogen that causes different community- and hospital-acquired infections. Over time, strains of *S.aureus* have become resistant to different antibiotics including penicillinase-resistant penicillins. Having data on the local antimicrobial susceptibility pattern of this pathogen is necessary for selection of appropriate antibiotics for empirical treatment of infections due to it. To determine the antimicrobial susceptibility pattern of *Staphylococcus aureus* strains isolated from hospitalized patients in Tehran, Iran

**Materials & Methods** This is a prospective cross-sectional study performed at Imam Khomeini Hospital. Samples were collected from hospitalized patients and cultured. All positive cultures which yielded *S.aureus* underwent antimicrobial susceptibility testing using the Kirby-Bauer disk diffusion method on Mueller-Hinton agar. The results were interpreted after 24 h of incubation at 37°C.

**Results** A total of 160 clinical isolates of *S.aureus* were collected. Most isolates were obtained from blood (29%). The overall susceptibility of isolated *S.aureus* strains to antimicrobial agents was 100% for vancomycin, 49.4% for amikacin, 43.8% for gentamicin, 36.8% for co-trimoxazole and tetracycline, 36.3% for cefazolin, 30.6% for cephalexin, 24.4% for oxacillin, 23.8% for erythromycin, and 3.1% for penicillin.

**Discussion & Conclusion** According to this study, other than vancomycin, none of tested antibiotics are appropriate for empirical treatment of serious *S.aureus* infections in our area. Also, these data shows that antimicrobial resistance is increasing among *S.aureus* strains in our country. This increase along with the emergence of VRSA highlights the value of prudent prescribing of antibiotics (including vancomycin) and avoiding their irrational use. It is necessary to establish an antimicrobial susceptibility surveillance system and to improve current infection control programs in our hospitals to prevent the spread of resistant microorganisms including MRSA and VRSA.

**Keywords** Antibiotic Resistance

## PTE-46

### Intravenous iron therapy on dialysis patients: any impact on liver functions?

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**Introduction** Intravenous (IV) iron is required by almost all haemodialysis patients to optimize erythropoiesis-stimulating agents (ESA) therapy. The recent DRIVE study, designed to evaluate the efficacy of IV ferric gluconate in such patients, showed an increase of haemoglobin levels (Hb) when patients received IV iron therapy. In our haemodialysis centre, two different protocols were examined. First, from July 2008 to January 2009, iron dose was adjusted according to the ferritin level. Then, from February 2009 to December 2009, iron dose was adapted to reach a target value for transferrin

saturation (TSAT  $\geq 20\%$ ), whatever the ferritin level was. Impacts of this protocol modification on the iron test and hepatic functions were then analysed.

**Materials & Methods** 182 eligible patients were involved in our monocentric study: entry criteria were haemodialysis for at least one year and no more than 3 months of absence after inclusion in the study. Median age was 67 (range, 30–95). Biologic parameters included a monthly iron test (TSAT, ferritin level, C reactive protein, Hb) and a hepatic function test every six months (Alanine Amino Transferase ALT, total bilirubin, Gamma Glutamyl Transferase GGT, Alkaline Phosphatase ALP).

**Results** Patients received an average dose of 284 mg of IV iron in July 2008. It reached 710 mg in March 2009 and then decreased to 412 mg in December 2009. On the first period, the average TSAT level reached 27.3% [25.2 to 29.4%], ferritin 602  $\mu\text{mol/L}$  [555 to 681  $\mu\text{mol/L}$ ] and Hb 114 g/L [113 to 116 g/L]. Then, for the second period, we respectively obtained 33.2% [23.9 to 38.1%], 961  $\mu\text{mol/L}$  [683 to 1154  $\mu\text{mol/L}$ ] and 117 g/L [113 to 119 g/L]. Regarding hepatic functions, the average ALT level increased from 19.9 (July 2008) to 20.3 UI/L (December 2009), with a maximum of 23.1 UI/L in January 2009. PAL increased from 82.5 to 93.7 UI/L, GGT from 46.2 to 63.9 UI/L, and total bilirubin from 10.6 to 13.3  $\mu\text{mol/L}$ .

**Discussion & Conclusion** These results indicate a significant increase of iron plasmatic level during the period of study. It consequently leads to major ferric impregnation (increase of TSAT and ferritin levels), but with a low impact on haemoglobin rates. Despite high ferritin levels (until an average of 1154  $\mu\text{mol/L}$ ), no major disorder on hepatic functions was demonstrated between the two protocols. Indeed, except for slightly higher GGT levels, all measured hepatic parameters remained in the normal range. As a conclusion, although no toxic effect on hepatic functions were proved (but with consequences of iron overload still to be evaluated on the long-term), the results of this study suggest a limited interest in anaemia treatment.

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**Keywords** Anaemia, Haemodialysis patients, Hepatic functions, Intravenous iron therapy

## PTE-48

### Inquiry about the appropriate use of antibiotics in three services

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**Introduction** Within the sub committee's work on antibiotics, a survey was conducted to assess the proper use of some antibiotics in three target services: reanimation, hémodialysis and septic traumatology orthopaedic. The survey covered the most prescribed antibiotic families in the establishment: glycopeptide (vancomycin), aminoglycosides (gentamycin, amikacin), fluoroquinolones (ofloxacin). A two months prospective investigation.

**Materials & Methods** The investigation was carried out using 8 charts of valuation regarding the professional practice of the HAS in April 2008. The comparaison of the first two charts has required a research in patient records. The antibiotics referent of the hospital was consulted on several occasions and so was the laboratory of microbiology.

**Results** 90 antibiotics prescriptions were analysed. Results charts of the HAS: antibiotics prescriptions in conformity with good practices (92%), curative antibiotherapy in conformity with good practice (73%), the place of the anti-infectious commission (85.7%), the place of the referent and local correspondent of antibiotherapy (75%), part of the laboratory of microbiology (85%), the part of the pharmacy for the internal use (55.5%), directing the hospital actors towards the proper use of antibiotics (33%), information - training (25%). 93% of the antibiotherapies were prescribed in association and that, at least, for the first three days. For 40% of the antibiotherapies, three wasn't any reevaluation registered in the patient record. 9% of the antibiotherapies exceeded one week without any justification. 27% of the antibiotherapie were not in conformity with either the protocol of the service or the recommendations of the speciality, and they were not taking either into account the microbiological results. In 79% of the cases, during the reevaluation from 48 to 72 h, the foreseen length of time hasn't been specified. A climbing down has been carried out concerning 66% of the antibiotherapies and as for 33% of the non-climbing down antibiotherapies the decision was justified.

**Discussion & Conclusion** As a result the investigation has released a general view of these antibiotics prescriptions in the establishment and has also allowed to verify operating and handling to each service. The referent ought to be consulted more often for the application concerning some treatments and so should be the laboratory of microbiology. Some of the ameliorations aimed at by the HAS, such as the part of the pharmacy for internal use, the organization of the hospital actors regarding the best use of antibiotics and information and training remain so far to be improved. The results of the study were presented to the sub committee on antibiotics, the decision was taken to update the advising documentation regarding the support of infectious pathologies. Furthermore the antibiotic referent group of the hospital, which meets daily between 2 and 2.30 pm, now puts this schedule at all doctors disposal in the hospital whenever they wish to discuss an antibiotherapy.

**Keywords** appropriate use of antibiotics

## PTE-49

### Analysis of effectiveness of off-label use of Bevacizumab in recurrent breast and ovarian cancer

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**Introduction** Therapeutic possibilities are limited for intensively treated patients with advanced breast or ovarian tumour. The objective was to analyze the effectiveness of the off-label use of bevacizumab (BVZ) as 2nd or subsequent line of treatment.

**Materials & Methods** Retrospective observational study. Treatment regimen was 10 mg/Kg BVZ q2w or BVZ 15 mg/Kg q3w in monotherapy or combined with metronomic oral cyclophosphamide or oral capecitabine or paclitaxel. Response was assessed by measurable disease (RECIST criteria) in both cancers and by serum levels of cancer antigen (CA) 125 and 15.3 in ovarian and breast cancer patients, respectively. Assessments are presented as a function of: type of previous chemotherapy, treatment line, stage, BVZ combination, and baseline tumour marker (CA 125 or 15.3) level. Effectiveness parameters were: response rate (RR), response duration (RD), time to progression (TTP) and overall survival (OS).

**Results** The study included: 9 ovarian cancer patients previously treated with platinum and taxane; and 10 breast cancer patients, 80%

previously treated with anthracycline and taxane. Median number of previous regimens was 6 for ovarian and 5.5 for breast cancer patients. All were in stages III or IV. BVZ was combined with metronomic cyclophosphamide in 88.8% of ovary patients and with paclitaxel in 50% of breast patients. Pre-treatment, ovarian patients had median CA 125 of 569.75 U/mL (range, 48.8–2034 U/mL) and breast patients median CA 15.3 of 264.05 U/mL (range, 29.1–2396 U/mL). In ovarian patients, RR was 55% (2 complete responses [CRs]); DR was 23 weeks (range 6–31); and 2 patients had TTP >6 months. Among breast cancer patients, there were 2 partial responses (median DR of 28 weeks, range 16–40) and 1 CR (currently under treatment); 4 patients showed progression from treatment onset; and only 1 patient had TTP >6 months. Median OS was 5.13 months for ovarian and 5.5 months for breast cancer patients.

**Discussion & Conclusion** The combination of BVZ with oral cyclophosphamide demonstrated response rate activity in intensively pre-treated patients with recurrent ovarian cancer. Less favourable outcomes were obtained in patients with refractory metastatic breast cancer.

**Keywords** advanced breast cancer, advanced ovarian cancer, Bevacizumab, highly treated

## PTE-50

### Audit of prescriptions framework of lenalidomide

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**Introduction** In June 2007, lenalidomide received marketing authorization in the treatment of relapsed multiple myeloma (RMM) 25 mg daily for 21 days (28 days cycle) in combination with dexamethasone (DXM). The DXM schedule is 40 mg 4 days repeated 3 times during the first four cycles and then 40 mg on days 1–4 following cycles. However, a recent study reported better overall survival and less toxicity when combined with lower doses (40 mg once a week) (1). Lenalidomide prescription is reserved to onco-hematologists. A plan of care requires the signature of an agreement of care by the patient and the presentation of a notebook for each delivery.

**Materials & Methods** In order to evaluate the conditions of prescriptions of lenalidomide, we retrospectively analyzed all prescriptions over 2 months. We first examined the respect of reglementary requirements: prescriber speciality and checking of the notebook containing agreement signed care. Using the patient's medical folder, the followed items were then evaluated: indication, dosage, combination with DXM and its dose.

**Results** The prescriptions of 54 ambulatory patients were analyzed. They were all signed by hematologists. The notebook was duly completed and presented for each dispensation according to reglementation.

The indication for lenalidomide treatment concerned the RMM for 39 patients (72%). Seven (13%) had a myelodysplastic syndrome with 5q deletion (5q-MS). For 6 patients (11%), different hematological malignancies were reported: myelofibrosis, myeloid splenomegaly and Non-Hodgkin Lymphoma.

Focusing the indication of RMM, the daily approved dose of 25 mg during 21 days concerned 13 of 39 patients (33%). For 24 patients (61.5%), a lower dose was prescribed, during 21 days per cycle for 13 of them and during 14 days per cycle for 11 of them (including 9 with a dose of 15 mg per day). These lower doses concerned transplant patients or patients with renal failure or who poorly tolerated prior treatments or in case of combination with other treatments (bortezomib, melphalan). Continuous treatment called maintenance treatment concerned 2 patients (5%).

DXM was associated in 67% of cases with a schedule of once a week in 96% of cases.

**Discussion & Conclusion** Although RMM is clearly the major indication of lenalidomide, other hematological malignancies are reported. Its prescription in 5q-MS, authorized in the United States, represent a significant rate. For RMM, we note a variety of schedules and doses prescribed, revealing a treatment adapted to each patient's tolerance. The dose of DXM once a week is mostly used according to the results of a recent study showing a lower risk of thrombosis in association with DXM low dose (1).

In conclusion, we find a respect of the reglementary requirements maintained 2 years after approval. For the DXM dose and maintenance schedule, we clearly demonstrate that early published clinical data are integrated in practical clinic (1, 2).

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**Keywords** Drug dispensing

### PTE-51

#### Unconformities in medical devices clinical trials. Review of 47 clinical trials set up in hospital environment

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**Introduction** Clinical trials (CT) are set up to ensure the quality, safety and efficacy of innovating health products. Pharmaceutical rigorous procedures enforce the quality management of ongoing CT. CT of medical devices (CTMD) face specific constraints in their design that may endanger the CT validity and expose included patients to risks if not correctly managed. Since the 2007/47/CE directive, CTMD have become of major importance for their evaluation regarding to medicine advances. In this work, our aim is to highlight the main unconformities to document the specificities of CTMD and to improve CTMD management which included as well CT promoters, investigators and pharmacists.

**Materials & Methods** Our pharmacy department has a specialised unit dedicated to sterile medical devices (SMD). Since 2006, CTMD are isolated from drugs CT to distinguish and respect their own specific procedures. 47 CT were reviewed. Characteristics, organization and unconformities were registered and analysed. Drugs CT including a MD were excluded.

**Results** 98% MD included were sterile, 73% implantable, 81% had EC mark and 25% were already known and used in the testing clinical department. All trials were prospective, 77% multicentric, 86% open and 55% not randomized. 89% of CTMD involved inpatients: 46% from surgery and 39% from medical departments. 37% of CT studied were comparative studies and 63% efficacy and/or tolerance studies. 81% of the CT evaluated the MD itself and 19% the medical technique. 4% included an economical section and 25% had a pharmaceutical remuneration agreement (ok?). 3 dispensation modes exist: Pharmacy prescription (28%), consignment (35%) or global dispensation (13%). 6 major CTMD specific anomaly patterns were noted: accountability (n = 8), shortage (n = 1), financing (n = 1), peremption (n = 1), unconform labelling (n = 2) and CT break (n = 5).

**Discussion & Conclusion** The number of CTMD is constantly increasing, especially for implantable MD. Consignment seemed to be the main practical issue to CTMD management. Uncorrect MD tracability generates issues that can be avoided by rigorous procedures as it exists for drugs CT. In contrast with drugs CT, CTMD design is not as standardized. Hospital pharmacists should be involved in the supply chain and the follow up of CTMD to insure and secure appropriate use of MD. A qualified MD and CT specific acknowledgments are required to manage CTMD. MD prescription must be as rigorous as for drugs CT, firstly, to guarantee patients security, secondly, to fit to the CT criterias. Quality management and pharmaceutical controls are essential to assume those responsibilities.

**Keywords** clinical trial, management, medical device, unconformity

### PTE-52

#### Etravirine use evaluation in the management of HIV treatment-experienced patients

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**Introduction** Etravirine (a non-nucleoside reverse transcriptase inhibitor), in combination with a boosted protease inhibitor and other antiretroviral medicinal products, is indicated for the treatment of human immunodeficiency virus type 1 (HIV-1) infection in antiretroviral treatment-experienced adult patients. The objective of this study is to analyse the effectiveness and safety of etravirine in this patients.

**Materials & Methods** Retrospective observational study during 24 months. Sample: 100% patients. Inclusion criteria: adults, antiretroviral treatment failure. Exclusion criteria: treatment adhesion < 100%, length of treatment < 6 months. HIV viral load testing and CD4+ T-cell count at week 24 as effectiveness variable. Treatment withdrawal (main) and haematological and biochemical side effects, based on NCI Criteria for Adverse Events 2006 (secondary), as safety variables. Genotypic antiretroviral resistance testing to reverse transcriptase is considered (V90I, A98G, L100I, K101E/P, V106I, V179D/F, Y181C/I/V y G190A/S). Per protocol analysis at month 0 and 6.

**Results** 20 patients began etravirine treatment. 9/20 met inclusion and exclusion criteria (6 men; mean age = 45 years), all with antiretroviral treatment history for more than 10 years. Only 2 patients present 1 genotypic mutation to reverse transcriptase (G190A; L100I). All of them incorporate at least 1 new drug to its antiretroviral regimen (6 raltegravir, 2 darunavir, 1 enfuvirtide). 8/9 patients have re-established the maximal virologic suppression (HIV RNA <50 copies/mL) (95%CI: 51,75–99,72) and 1/9 has a reduction of 1 log10 copies/mL RNA-VIH. 8/9 patients have an increase in CD4 count in the range of 50–150 cells/mm<sup>3</sup> (mean = 227 cells/mm<sup>3</sup>). No patient had required treatment withdrawal due to adverse effects to etravirine. No patient had haematological laboratory abnormalities. Only 1 patient had transient grade III AST/ALT toxicity

**Discussion & Conclusion** Etravirine, associated to at least 1 pharmacologically active antiretroviral drug, shows a high safety and effectiveness in the management of treatment-experienced patients, even if only 1 reverse transcriptase mutation is present.

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**Keywords** Clinical outcomes, Etravirine, HIV

## PTE-53

### A one year pharmaceutical interventions'assessment at the Strasbourg prison consultation and ambulatory care unit

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**Introduction** Drugs prescribed at Strasbourg detention center (6 km far away from the hospital) are dispensed by the Hospital Pharmacy. Medication prescriptions are validated by pharmacists and pharmacy technicians prepare for each patient, individual unit-dose medication. Within this special distribution process, the pharmaceutical intervention area includes drugs interactions, contraindications, drug monitoring and adjustment or respect of guidelines. Each intervention is archived in the pharmacy with the prescriptions and notified in patient's file.

This study aims to identify the main contents of these interventions and to evaluate its acceptance by physicians for one year (between November 1st 2008 and October 31th 2009).

**Materials & Methods** In order to assess the clinical pharmacy activity, these pharmaceutical interventions were recorded on the web site "Act Ip" of the French Society of Clinical Pharmacy and analyzed. Around forty news prescriptions were analysed by pharmacists on a daily basis.

**Results** Over the study period, 2,638 prescriptions were analysed and 87 pharmaceutical interventions were recorded. The acceptance rate was high (80%). Among all prescriptions, 47% were non conformant according to the hospital formulary, 21% had high posology, 8% were not completed with correct medical wording, 4.6% were non conformant according to the consensus conference and 3.5% had light posology. The main pharmaceutical interventions proposal were drug substitutions from the hospital formulary (46%), dosage adaptations (33.5%), treatment stop (8%), added drug (4.6%) and 2.5% concerned administration conditions changes.

**Discussion & Conclusion** Main therapeutic class concerned by pharmaceutical interventions were cardiovascular drug (mainly anti-hypertensive drugs) and digestive system drugs (mainly proton pump inhibitors). Consolidation and analysis of interventions, with the help of the tools of SFPC, achieved a first assessment of this activity and enhanced pharmacists' role in the therapeutic management of patients. This activity is well estimated by physician at the prison and permitted a positive pharmaceutical environment.

**Keywords** pharmaceutical intervention, tools of SFPC

## PTE-54

### Retrospective use of the antibacterial agent linezolid in a french university hospital

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**Introduction** Since the beginning of the year 2009, the consumption of the antibacterial agent linezolid has greatly (x 2) increased in the intensive care unit of our hospital. Given its high cost, linezolid is given according to local guidelines that include contraindication to other active agents (ie, glycopeptides). The major aim of our work

was to review the clinical use of linezolid in this unit and to compare to the official labelling and to the local guidelines.

**Materials & Methods** A retrospective study of linezolid prescriptions was made between june 1<sup>st</sup> and august 31<sup>th</sup> 2009. Patient characteristics, infection localisation, isolated pathogens, duration of therapy and drug-drug interactions according to the french drug agency were analyzed.

**Results** Over the study period, thirty patients (13 women, 17 men; mean age: 67 years; range: 34-88) were treated by linezolid. Only 10 (33,4%) prescriptions were in accordance with the French official labelling in terms of indications (pneumonia, n = 5; skin and soft tissue infections, n = 5). The other indications included septic and febrile syndrome (26,7%), catheter infections (13,3%), intra-abdominal infections (6,7%), fever in neutropenic patients (10%), bone and joint infections (3,3%), urinary infection (3,3%), food and community toxi-infection (3,3%). Regarding local recommendations, only 10 (33,3%) patients had received glycopeptides before linezolid. The main justification for using linezolid instead of glycopeptides was the alteration of renal function. Twenty three (76,7%) patients had documented gram-positive infection. Isolated pathogens primarily include Staphylococcus. Seven patients received linezolid as empiric treatment. The mean duration of linezolid treatment was 8 days (range: 1-24). Four patients (13,3%) were treated more than the recommended 14 days. Three potential drug-drug interactions without apparent clinical consequence were recorded: two associations with paroxetine (risk of serotonin syndrome) and one association with rifampicin (risk of decreased activity of linezolid). Co-administration with adrenergic agents was frequently encountered but was clinically judged irrelevant because patients are closely monitored (risk of enhancement of pressor response due to the monoamine oxidase inhibitory activity of linezolid).

**Discussion & Conclusion** Appropriate use of linezolid was found in a minority of patients of intensive care unit. Adherence to both official labelling and local guidelines were poorly followed in our hospital. The use linezolid instead glycopeptides in patients with altered renal function is debatable and could necessitate the reevaluation of local guidelines.

**Keywords** Drug use, Drug-drug interaction, Linezolid

## PTE-55

### Compliance with osteoporosis medications among Iranian patients

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**Introduction** Despite the need for long-term therapy, generally adherence to osteoporosis medications is not optimal yet. This problem can affect the medical attempts to prevent fractures. The primary aim of this study was to assess the compliance of Iranian postmenopausal women with osteoporosis treatments.

**Materials & Methods** During a cross sectional study in endocrine and metabolic research center, affiliated to Tehran university of medical sciences, among women who had been on osteoporosis medication for at least one year prior to the study, 400 patients were randomly selected and patient compliance was assessed using 2 different compliance assessment tools: Morisky-Green test, and the

Compliance Questionnaire. Factors that might contribute to compliance were also assessed. patients were interviewed by telephone.

**Results** Patients had mean age of 59.4(SD = 11.2), 94% of patients were women and 90% of them were postmenopausal. Fifty five percent of patients had osteoporosis at their first visit according to their bone mineral density (BMD). Almost two third of patients were taking their medications for more than two years. The most common prescribed medicine was Alendronate (95%). Of all patients, 4.8% had good compliance, while 91% had intermediate and 4.2% had poor compliance to their medications. Most of the patients (88%) were taking calcium and vitamin D daily. Patients with higher level of education had significantly better compliance. No significant correlations were found between occupational or insurance status and patient compliance. About 12% experienced at least one adverse effect. The most common adverse effects which were experienced by the patients were gastritis, musculoskeletal pain and nausea respectively.

**Discussion & Conclusion** Since more than half of the patients had osteoporosis diagnosis at their first visit, it shows that osteoporosis is very common in post menopausal Iranian population. Taking calcium and vitamin D regularly by most of the patients reveals that our physicians offer good recommendations regarding osteoporosis supplements. The high rate of suboptimal adherence to osteoporosis medications could have unwanted consequences for patients and the society. It seems that patient education regarding importance of taking medications properly is essential and expert pharmacists can play a pivotal role in this area.

**Keywords** compliance, osteoporosis

## PTE-56

### Effects of Methimazole versus Propylthiouracil on soluble Fas level

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**Introduction** Fas antigen (Fas), a transmembrane glycoprotein, mediates apoptosis through forming complexes with Fas ligand (FasL). Soluble Fas (sFas) molecule, which lacks the transmembrane domain, inhibits Fas mediated apoptosis of cells. Increased levels of sFas in patients with graves disease and its correlation with free thyroxine levels has been reported. Since methimazole (MMI) and propylthiouracil (PTU) are the main antithyroid drugs used for graves disease, the propose of this study was to compare their effect on sFas levels during the study.

**Materials & Methods** In this prospective open lable randomized clinical trial 31 newly diagnosed graves disease patients were included. The patients were randomly assigned to receive either MMI 30 mg daily or PTU 300 mg daily in three divided doses for 4 weeks and then doses were reduced by half and continued for 4 more weeks. At baseline and after 8 weeks of treatment, serum levels of sFas, thyroid stimulating hormone (TSH), free thyroxine (fT4), free triiodothyronine (fT3), thyroid peroxidase antibody (TPO), thyroglobulin (Tg) and anti-TSH receptor antibody (TRAb) were measured.

**Results** There were 14 patients in MMI group and 17 patients in PTU group. Mean age of the patients were 36.6±17.1 and 39.8± 14.7 years respectively. At baseline groups had no significant difference in TSH, fT4 and fT3 levels. sFas levels changed significantly during the study (3.5± 1.2 ng/mL vs 1.1 ± 1.5;  $p = 0.031$ ) in patients receiving MMI but the changes were not significant in PTU group. There were no

other differences between two groups regarding the changes of other parameters.

**Discussion & Conclusion** Some studies have addressed the role of sFas in pathogenesis of graves disease. It seems that it is produced by thyrocytes and regulated by cytokines. Some studies have revealed that elevation of sFas level depends on the extend of hyperthyroidism and it reduces when patients become euthyroid after treatment with antithyroid drugs. Since in the current study there were no significant differences in TSH, fT4 and fT3 at baseline between two groups, MMI might have decreased sFas levels by other mechanisms

**Keywords** methimazole, propylthiouracil, sFas

## PTE-58

### Monocytes in thrombotic disorders. New targets for antithrombotic therapy: potential interest of Rivaroxaban

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**Introduction** Although monocytes are implicated in immunity, these cells play a key role in both venous and arterial thrombosis development. The contributions of activated monocytes in venous thrombosis and macrophages in arterial thrombosis are supported by numerous clinical data.

Indeed, activated monocytes constitute a major source of blood tissue factor (TF), the first coagulation cascade key element. In addition, monocytes/macrophages link inflammation and procoagulant state noted in a prothrombotic environments.

Therefore, we suggest that the best antithrombotic agent should be able to inhibit the clotting activity associated to activated monocytes/macrophages and also reduce the inflammatory cytokines secretion.

**Materials & Methods** We have compared the action of two specific anti-Xa agents: Rivaroxaban, a direct anti-Xa agent and Fondaparinux, an indirect anti-Xa acting in a complex with antithrombin. We also tested the action of these 2 agents on (1) the procoagulant activity supported by LPS-activated monocytes/macrophages and (2) the secretion of inflammatory cytokines.

**Results** 1- *The procoagulant activity of monocytes and macrophages was reduced by Rivaroxaban but much less by Fondaparinux.*

Although the expression of TF is not changed when activated cells were incubated with Rivaroxaban or Fondaparinux, prothrombinase activity of activated monocytes was greatly reduced by Rivaroxaban. This decrease in monocytes prothrombinase activity, expressed as the % of control, was 30±3, 16±4 and 12±2% respectively for 150, 250, 350 ng/mL of Rivaroxaban, and 43±2, 24±3, 15±1% for THP-1 cells. In contrast, Fondaparinux did not modify the prothrombinase activity (105 ± 12%).

2- *Both Rivaroxaban and Fondaparinux decreased the secretion of some inflammatory chemokines which are involved in the atherosclerotic plaque progression.* The inhibition of thrombin generation by both Rivaroxaban and Fondaparinux inhibits PAR-1 and subsequently cytokine secretion. Furthermore, Rivaroxaban induce a much more marked reduction than Fondaparinux of EGF secretion. This decrease could contribute to a decrease in plaque progression. This could be linked to the lack of activation of PAR-2, as factor Xa bound to monocytes was mostly inhibited by Rivaroxaban.

**Discussion & Conclusion** The decrease in cytokines production by Fondaparinux may explain the anti-inflammatory effect induced by heparin and its derivatives and supports that Rivaroxaban could also exert anti-inflammatory action. However, only Rivaroxaban inhibits the prothrombinase activity generated within the membranes of

activated monocytes. This could explain the greater efficacy of Rivaroxaban compared to low molecular weight heparin on the prevention of venous thrombosis in orthopedic surgery.

**Keywords** Antithrombotic therapy, Direct factor Xa inhibitor, Indirect factor Xa inhibitor

## PTE-59

### Depression and quality of life in adults with stroke

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**Introduction** Depression is a common condition among individuals with stroke and believed to influence post-stroke mortality. Depression following a stroke, also referred to as post-stroke depression (PSD), has long been recognized as one of the most common complications of stroke. Early recognition of PSD symptoms and introduction of pharmacological treatment is of great importance in the reduction of stroke complications and stroke mortality as well as for improving quality of life. The aim of this work is to investigate the prevalence of depression in stroke survivors and assess the treatment as well as the impact on their quality of life.

**Materials & Methods** A prospective study was used. Patients under antihypertensive therapy visiting community pharmacies all over Portugal were recruited. Depressive and anxiety disorder and Quality of life were assessed using self-report scales.

**Results** One hundred and fifty five stroke patients participated. Average patients' age was  $66.92 \pm 10.23$  years. The youngest patient had 41 years, and the oldest 87 years. There were 73 males and 82 females. One-third of participants were found to have mild depression (58/155; 34%), and 25% have moderate to severe depression. Only 13% patients were under antidepressant treatment, although 63% take benzodiazepines. Gender did not influence the severity of depression in patients with stroke ( $p_{\chi^2} = 0.087$ ). Anxiety was statistically more frequent among stroke patients ( $p_{\chi^2} = 0.003$ ). Stroke patients had worse results in daily living domain of life quality.

**Discussion & Conclusion** Post-stroke depression is the most frequent psychiatric complication of stroke. Untreated depression after stroke can lead to a reduced quality of life, poorer prognosis, and increased mortality. Early effective treatment of depression may have a positive effect not only on depressive symptoms but also on the rehabilitation outcome of stroke patients.

**Keywords** Community pharmacy, Quality of Life, stroke

## PTE-60

### Profile and predictor of health-related quality of life among hypertensive patients in Portugal

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**Introduction** The health-related quality of life (HRQOL) of hypertensives may be influenced by blood pressure, adverse effects of drugs used to treat hypertension, or other factors, such as beliefs and attitudes about illness and treatment. This study describes the HRQOL and its determinants among patients diagnosed and treated for Hypertension by comparing people with Hypertension under control or not.

**Materials & Methods** The study was prospective in design that involved hypertensive patients receiving antihypertensive treatment. They were all hypertensive patients that presented at the community pharmacies during the period of the study who meet the inclusion criteria and consented to participate in the study. Demographic data, disease characteristics such as symptoms and recent drug history were obtained from the patients. The HYPER questionnaire was administered once by interview to the participants to measure their HRQOL. Descriptive statistics was used in summarizing the demographic data and hypertension related histories of the participants.

**Results** There were 2444 participants. Average patients' age was  $59.18 \pm 11.71$  years in the group of controlled BP and  $62.58 \pm 11.80$  years was the average age of the uncontrolled BP. This difference was significant ( $p < 0.001$ ). Daily living ( $p = 0.007$ ) domain mean score for patients with controlled BP was significantly higher than patients with uncontrolled BP. However, the overall HRQOL was not significantly better in the group of hypertensives with controlled blood pressure ( $p = 0.994$ ). Nervous disease ( $p < 0.001$ ), the presence of myocardium infarct ( $p = 0.043$ ) and pectoris angina ( $p = 0.049$ ) were significant negative predictors of the overall HRQOL.

**Discussion & Conclusion** This study provides evidence for a model that links patients' status with regard to biology (blood pressure), symptoms, and functionality (HRQOL) and may prove useful in guiding follow-up of patients who receive treatment for hypertension. Identification of patient's symptoms, blood pressure, complication/comorbidity and changes in functioning may help pharmacists increase their effectiveness in helping patients maintain adherent behaviour with drug and non drug interventions in chronic diseases such as hypertension.

**Keywords** Community pharmacy, hypertension, Quality of Life

## PTE-62

### Implementation and clinical audit of guideline for prevention of venous thromboembolism in orthopedic surgery

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**Introduction** Generally, the guidelines consider all the activities of a hospital pharmacy that may lead to a more economical and safer use of drugs: clinical pharmacy, pharmacoeconomics, pharmacoinformatics, quality assurance, internal and external audits and the implementation of these activities in everyday practice. The guideline for Prevention of Venous Thromboembolism in Orthopedic Surgery was written on the basis of actual European and American guidelines and it was developed in autumn 2009 in Emergency Center. Before implementation of guideline there were disagreements among physicians about the optimal medication, dose and duration of anticoagulant therapy, so the aim of clinical audit was to check prescription habits after implementation of guideline.

**Materials & Methods** In the beginning of 2010, pharmacists were involved in implementation of guideline. They counseled orthopedic surgeons about the dose of anticoagulants for patients with fractures or trauma. The team of hospital pharmacists was reviewing all therapeutic and discharged lists from orthopedic ward in the period January– March 2010 and analysing the number of patients with fractures, doses of anticoagulants and duration of therapy after hospital discharge.

**Results** In the period of monitoring there were 104 patients (28 with hip fracture, 18 with knee fracture, 36 with femur fracture, 14 with

tibia fracture and 8 with polytrauma); 101 of them received recommended therapy and dose during hospital treatment (26 with hip fracture, 18 with knee fracture, 36 with femur fracture, 13 with tibia fracture and 8 with polytrauma). Appropriate therapy and duration of therapy after hospital discharge was recommended for 88 of them (22 with hip fracture, 17 with knee fracture, 33 with femur fracture, 10 with tibia fracture and 6 with polytrauma). Calculated as a percentage, approximately 97% of all patients received recommended therapy and dose during hospital treatment, and for 85% of them was recommended appropriate therapy and duration of therapy after hospital discharge.

**Discussion & Conclusion** Implementing of guideline has brought to the decrease of differences in therapeutic approach between physicians. They accepted co-operation with pharmacists with pleasure. Patients were receiving appropriate antitrombotic prophylaxis during hospitalization and it was recommended them to continue with it after discharge. And, finally, implementing of guideline made possible for management more accurate insight into consumption and better planning of medicines acquisition.

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**Keywords** Audit, Hospital pharmacy, Implementation, Protocols

### PTE-63

#### Observational study of patients infected by the human immunodeficiency virus (HIV) who started an antiretroviral therapy

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**Introduction** Infection by HIV is a chronic disease. The treatments (HAART) are very effective. However a significant number of patients are in a severe treatment failure because of a lack of compliance. The aim of this retrospective and observational study is to understand the reasons of drug discontinuation and to know the impact of therapeutic educational program (TEP) on adherence.

**Materials & Methods** We analysed the initiation of antiretroviral therapy (except for pregnant women) between 2006 and 2008. For each patient, are implemented the initiation treatment, the number of daily intakes, tolerance and if the patients has been involved in TEP. As a matter of fact, TEP is proposed only to patients with difficulties to understand the French language. The undetectable plasma viral load (VL) is used as an indicator of compliance.

**Results** During this period, 77 patients started an antiretroviral therapy. 82% of them are foreigners, 61% coming from sub-Saharan Africa. The treatment associates a nucleoside inhibitor (Nuc) with a protease inhibitor (IP) in 61% of the cases, or a non-nucleoside inhibitor (NNuc) for 39% of them. The treatments are taken once a day for 57% of the patients. Treatments are changed for 24 patients (31%) at least once during the first 12 months. The changes are mainly due to tolerance problems with IP (digestive disorders) or NNuc (dizziness) but also due to a simplification of the treatment. At the initiation of treatments, only 24 patients out of the 77 previous patients have been involved in a TEP during that period. At 3 and 6 months, the VL becomes undetectable in 68% (n = 19) and 94% (n = 18) TEP patients versus 66% (n = 44) and 86% (n = 50) for the patients who don't get the TEP. On 2010, 24 to 48 months after

the initiation of the treatment, these 77 patients are still been followed up in the department. In the TEP group, VL is undetectable in 96% of the patients (n = 24) versus 85% in non-TEP group (n = 53, 8 VL are detectable with 6<300 copies/ml).

**Discussion & Conclusion** The treatment is chosen in relation with the clinical status of the patient, his genotype, but also takes into account his way of life and the acceptability of side effects of the drugs. The TEP is developed to strengthen the medical explanations and motivate the patient. There is no significant difference between the groups with or without TEP (low number of patients). However, the results are hopeful for TEP. Nevertheless, it is important to be aware of drug intake because compliance is a dynamic parameter and can easily drop down.

**Keywords** compliance, HIV

### PTE-65

#### Analysis of psychotropic prescription in geriatric sector for senior with Alzheimer's disease or related

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**Introduction** The High Authority for Health (HAS) has published recommendations for good practice concerning the management of disruptive behavior disorders in patients with Alzheimer's disease or related.

The main objective of this work is to analyse psychotropic prescriptions for patients. The secondary objective is a more detailed study of neuroleptics by the rules of proper use.

**Materials & Methods** This is a retrospective study in Unit Long-Term Care (ULTC) and a Geriatric Care and Rehabilitation Unit (CRU), performed during three months for patients with dementia. Data were collected from patient records in a table which includes Mini Mental State Examen (MMSE) and the indication of psychotropic concerned (informed or not in the medical record).

**Results** Among the 209 patients ULTC and CRU, 106 patients with Alzheimer's or related parties are included in the study (82 in ULTC and 24 in CRU). The psychotic patients aged (8 in ULTC) for which antipsychotics have a former psychiatric indications are excluded. The average age is 83 years [66–101] with a majority of women (sex ratio 2.5). In ULTC, 17% of demented patients are receiving neuroleptics (93% of indications in the medical record), 52% other psychotropics and 25% co-prescription. In CRU, 42% of patients with a diagnosis of dementia are receiving antipsychotics (indicated in 73% of cases in the patient record), 65% other psychotics and 25% co-prescription of these. The difference in prescription of neuroleptics between two services can be explained by the fact that patients are coming in CRU advantage of behavioral problems by their long-term hospital and often neuroleptics upon arrival in CRU. These results are consistent with data from the literature that the prescription of antipsychotics is an average of 32% in this population (ranging from 17–42% according to studies). [1]

**Discussion & Conclusion** The fact that 77.4% of demented patients in this study may not have limitation of neuroleptic, shows that the management of disruptive behavior disorders in this population is possible in most cases without neuroleptics, while preserving the use of other classes of psychotropic acting on mood disorders, insomnia and the anxiety and the non-pharmacological management (workshops, events, individual psychotherapy ...) as recommended by the HAS.

No conflict of interest.



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**Keywords** behavioral disorders, dementia, geriatrics, Neuroleptics

## PTE-67

### Prospective Randomized Study of Transarterial Chemoembolization with or without amiodarone in the Treatment of Unresectable Hepatocellular Carcinoma: Results of the Lipiothep Study

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**Introduction** Hepatocellular carcinoma (HCC) is the third most common cause of cancer-related death worldwide. Transarterial chemoembolization (TACE) is the standard treatment for patients with intermediate-stage HCC. However, there is no consensus about the best chemotherapeutic agent or optimal treatment regimen. The phase II Lipiothep trial was designed to compare the efficacy and the toxicity of TACE with or without amiodarone, a multidrug resistance inhibitor, in the palliative treatment of HCC.

**Materials & Methods** The protocol was approved by the Agence Française de Sécurité Sanitaire des Produits de Santé and by the Comité de Protection des Personnes Est I. From 2006 to 2008, 27 patients were randomized (1:1) to receive four courses of TACE every six weeks. The treatment consisted in an injection of pirarubicin 50 mg and lipiodol 20 ml with amiodarone 150 mg (arm 1) or without amiodarone (arm 2). The treatment response was evaluated two months after the last course according to Response Evaluation Criteria In Solid Tumors (RECIST) criteria and then every four months. Patients were monitored for adverse events by using the National Cancer Institute Common Terminology Criteria for Adverse Events (NCI-CTCAE) version 2.0. Analyses were done by intention to treat. Survival curves were estimated using Kaplan Meier method and compared by the log-rank test.

**Results** Baseline characteristics of the patients were similar in both arms: Child Pugh class A: 92%, alcoholic cirrhosis: 42%, Performance Status 0: 78%, mean tumor size: 95 mm. Overall response (complete and partial) was 62% in patients treated with amiodarone vs 50% in patients treated without amiodarone ( $p = 0.55$ ). The median overall survival was 22.7 months in patients treated with amiodarone vs 18.5 months in patients treated without amiodarone ( $p = 0.41$ ). The median progression-free survival was 12.0 months in patients treated with amiodarone vs 9 months in patients treated without amiodarone ( $p = 0.10$ ). The overall frequency of grade 3 or 4 treatment-related adverse events was 7 per 69 TACE procedures (4 in the amiodarone arm, 3 in the arm without amiodarone). The overall frequency of all grade adverse events was similar in both arms, in particular in cardiac events.

**Discussion & Conclusion** TACE with an emulsion composed of anthracycline, lipiodol and amiodarone is safe. The absence of significance in term of survival benefit we observed in patients treated with amiodarone may be explained by a lack of power in the study. However, this encouraging result incited us to design a new phase II trial of TACE with amiodarone in the treatment of advanced HCC.

**Keywords** amiodarone, clinical trial, hepatocellular carcinoma, transarterial chemoembolization

## PTE-68

### Study of the use of midazolam in the palliative care unit of a french hospital

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**Introduction** The midazolam is frequently prescribed in palliative care. Its use for sedation remains controversial and requires due caution and good clinical practice. Guidelines concerning sedation have been issued by the Société Française d'Accompagnement et de soins Palliatifs and the European Association for Palliative Care. The overall aim of this study is to describe the current practices concerning the midazolam in the palliative care unit of the hospital of Port Louis-Riantec and to analyse them in relation to guidelines.

**Materials & Methods** A systematic retrospective analysis of the medical records of all patients who received midazolam in the palliative care unit between January 2008 and April 2010 was performed. Data regarding indication, administration route, dosage, adverse events and drugs mixed with midazolam in the syringe were collected. For the patients whose clinical status required sedation, additional data were gathered: indication of the sedation, dosage, continuous or discontinuous nature of the infusion, sedation duration, and informations about the decision-making process (patient consent).

**Results** 172 patients were hospitalized during this period and midazolam was prescribed to 70 of these patients.

The indications for the use of midazolam were mainly anxiety (60%), restlessness (20%), insomnia (7%) and convulsions (7%). The midazolam was well tolerated but a decreased respiratory rate was reported for 8 patients who had a co-prescription of morphinics. Sedation was required for 13 patients. The indications for sedation were terminal restlessness, (39%), existential distress (31%), refractory pain (10%), convulsions (10%) and severe terminal dyspnoea (10%). In all cases, the indications complied with guidelines. The wide dose range of midazolam emphasizes the need for careful titration of dose for each patient. The dose required for the titration was reported in 7 medical records. The level of alertness was regularly assessed and recorded in the medical charts but the Rudkin score recommended in french guidelines was rarely used. Consent was obtained from 6 patients and reported in their medical records. In all cases, general measures as ensuring a peaceful environment, pursuing mouth care or discontinuing non essential treatments were done, as recommended in guidelines.

**Discussion & Conclusion** These results are consistent with previous studies showing that midazolam is commonly used in palliative care units but seldom for sedation. The clinical practices concerning sedation comply with guidelines but some items could be improved like the use of the Rudkin score or the report in the medical chart of the dose of midazolam required for the titration. Moreover, informations concerning the decision-making process should be reported systematically in the medical record. These results were recently reported to the medical staff of the palliative care unit.

**Keywords** midazolam, palliative care, sedation

## PTE-69

### Renal transplantation and innovative therapeutics: focus on the current practices

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**Introduction** Renal transplantation (RT) is considered the treatment (Tx) of choice for patients suffering from end-stage renal disease, and finding a perfectly compatible transplant is not always possible, the demand outpacing the supply. Hence, drugs can be used either to reduce the anti-HLA (human leukocyte antigen) antibodies before transplantation (desensitisation), or to manage transplant rejection. In our institution, the spendings of the last innovative therapeutic drugs in those indications, which are particularly expensive, noticeably increased last year. Among these drugs, some are more and more prescribed off label for adults: a detailed analysis of these prescriptions was performed and is presented here.

**Materials & Methods** Expensive drugs consumptions for year 2009 were obtained from the 6 hospitals of the Assistance Publique–Hôpitaux de Paris institution performing adult renal transplantations. The first analysis consisted of studying the indication of the Tx, which allowed a selection of drugs prescribed either for one these indications: desensitisation before RT (D), prophylactic Tx of renal transplant rejection (PTx), curative Tx of renal transplant rejection (CTx). Then, some pertinent elements were calculated, using Access® and Excel® softwares: effective costs, drug doses, number of cycles of Tx, number of treated patients, per hospital and per indication. A bibliographical research was also performed in order to evaluate these practices.

**Results** The first analysis performed revealed that 4 innovative drugs were prescribed for one of the selected indications: intravenous immunoglobulins (IVIG), rituximab (R), bortezomib (B) and eculizumab (E). Among these drugs, IVIG were the most prescribed: 307 patients were treated (D: 8,5%; PTx: 63,2%; CTx: 43,3%), for a total cost of more than 3 millions €, and 44 patients for 2 indications. The mean dose used was 79,3 grams per cycle [2–270], and a patient received 3,5 cycles of Tx [1–16]. Ninety-one patients were treated with an association of 2 drugs, and 6 patients received a tritherapy (32 000 €/patient). Alemtuzumab and recombinant human C1-inhibitor were not prescribed in our study.

**Discussion & Conclusion** The therapeutic use of IVIG, R, B and E, alone or in association, for the management of RT, is made off label and has fallen into the practice although the published data have not reach a sufficient level of evidence: questions about efficient dose, duration of Tx, sequence of administration of drugs, adverse events and, mainly, survival of the transplanted patients, remained with partial answers. There is a huge need to promote well designed clinical trials and to include the patients whenever possible. This study reveals the need of a register and of an internal evaluation: a working group will be created in our institution in order to analyse further the practices and to protocolise the treatments. Cost-effectiveness of these therapeutics used in RT must be estimated.

**Keywords** bortezomib, innovative drugs, intravenous immunoglobulins, renal transplantation, rituximab

## PTE-70

### Monitoring clinical good use of six anticancer drugs in the Aquitaine region and perspectives

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**Introduction** Within the framework of its fourth annual progress report on the Contract on clinical good use of medicinal products and medical devices, the Observatory of Drugs, Medical Devices and Therapeutic Innovations (OMEDIT) for the Aquitaine region

established, for the third consecutive year, the monitoring of the clinical good use of 6 innovative, tracers defined nationally. This study falls within the regulatory measures on medical spending.

**Materials & Methods** One month collection (June 2009) of the distribution of the following situations: marketing authorization, temporary therapeutic protocol (PTT) and off label indications, for six anticancer drugs (cetuximab, docetaxel, paclitaxel, panitumumab, rituximab and trastuzumab, prescribed in all healthcare establishments in the Aquitaine region.

**Results** 1,705 patients in 34 healthcare establishments were enrolled in this study. 16 establishments transmitted situations falling outside of marketing authorization. For those six drugs, prescriptions were in accordance with the Marketing authorization or PTT indications for an average 90.7% of cases (cetuximab: 93.8%, docetaxel: 91.0%, paclitaxel: 86.8% panitumumab: 87.5%, rituximab: 85.5% and trastuzumab: 97.2 %). Depending on the establishments and innovating drugs, the percentage of off label indications ranged from 0 to 25%.

The main off label indications transmitted by the establishments are:

- Paclitaxel or docetaxel in combination with bevacizumab beyond the first line in metastatic breast cancer.
- Panitumumab in combination in colorectal cancer and TCF protocol in the stomach beyond the first line.
- Rituximab in chronic lymphocytic leukemia beyond the first line (Marketing authorization in July 2009).
- Docetaxel or paclitaxel in combination in lung cancer and malignant pleural mesothelioma.
- Combination of paclitaxel and carboplatin in ovarian cancer and endometrial cancer.

**Discussion & Conclusion** The justification of the off label situations provides a good basis for a multidisciplinary exchange between regional experts (oncologists, clinical pharmacists and institutions), to enhance the appropriate and optimal clinical use of anticancer drugs and improve the overall care of patients suffering from cancer.

**Keywords** anticancer drugs, clinical good use, evaluation

## PTE-71

### Practice guidelines: drug-eluting stents

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**Introduction** In addition to secondary prevention, the available therapies for the management of coronary artery disease consist of drugs and surgical techniques for myocardial revascularisation or interventional techniques (angioplasty). In France, drug-eluting stents (DES) are reimbursable over and above the cost of a hospital stay for the treatment of coronary insufficiency. This may be attributed to *de novo* lesions of native coronary arteries in patients with high risk of restenosis (lesions >15 mm, diameter of affected vessel <3 mm or in diabetic patients); restenosis within bare-metal-stent (BMS), and chronic total coronary occlusion.

In accordance with the provisions of the decree 2005 August 24th, the objective of this study is to assess the compliance of professional practice in the implantation of DES in the Grenoble University Hospital, France with the recommendations of the French Society of Cardiology and approval of the French medical devices assessment commission (CEPP) for reimbursement

**Materials & Methods** This is a retrospective, descriptive study of coronary angioplasty procedures using DES implanted in September 2009. This assessment covers DES used at Grenoble University Hospital: the CYPHER® sirolimus-eluting stent, the TAXUS®

paclitaxel-eluting stent, the ENDEAVOR® zotarolimus-eluting stent, the XIENCE V® everolimus-eluting stents. For each medical device, the following items were noted: presence of diabetes; length, diameter and type of affected vessel; stenosis of the proximal left anterior descending artery; restenosis within BMS; some *de novo* multi-vessel lesions of native coronary arteries; unprotected left main stenosis; left ventricular ejection fraction; the number of stents used.

**Results** The study concerned 42 DES implanted in 30 patients. There were 3 women and 27 men with an average age of 67 years. 37% of patients were diabetics ( $n = 11$ ). Overall there were 20 patients with one stent implanted, 8 patients with two stents, and 2 patients with three stents. Specifically, 19 XIENCE V®, 12 TAXUS®, 7 CYPHER®, and 4 ENDEAVOR® were implanted. 29 interventions (69%) were classified as group 1- official indications recognized for reimbursement; 5 interventions (12%) as group 2- non official indications recognized for reimbursement based on clinical evidence.

However, deviations relative to the medico-administrative conditions for reimbursement were observed in 19% of the implanted stents (mainly concerning the length or diameter of the lesions, and the restenosis within BMS).

**Discussion & Conclusion** This study allows practitioners to reassess their clinical practices. A decisional flow-diagram, which overviews the criteria for use of different types of stents, is now provided to the unit. A new information source that emphasizes the indications for different DES would support the correct choice of stent and therefore be beneficial to physicians.

**Keywords** drug-eluting stents; angioplasty; medical audit; practice guidelines.

## PTE-73

### Gemcitabine combined with oxaliplatin in the treatment of relapsed or refractory Hodgkin lymphoma

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**Introduction Background and Objective:** Most patients with Hodgkin lymphoma are curable by chemotherapy. Patients with relapsed or refractory disease may be offered high dose chemotherapy with autologous stem cell transplantation or various salvage treatments that still need to be optimized. Gemcitabine alone or in combination has been tested in pretreated patients with Hodgkin lymphoma. The major aim of our work was to evaluate the off-label use of gemcitabine combined with oxaliplatin in patients pretreated for a Hodgkin lymphoma.

**Materials & Methods Design:** Retrospective study of gemcitabine oxaliplatin prescriptions between January 2005 and august 2009.

**Setting:** Pharmacy, Strasbourg University Hospital, France  
Oncology-Hematology department, Strasbourg University Hospital, France

**Main Outcome Measures:** patient characteristics, oxaliplatin and gemcitabine use, efficacy, tolerance.

**Results** Over the study period, ten patients with Hodgkin lymphoma (mean age at the time of diagnosis: 31 years; range: 16-57) were treated by gemcitabine and oxaliplatin. Most of the patients ( $n = 6$ ) had nodular sclerosis Hodgkin lymphoma. At the time of initial diagnosis, five patients had stage II disease, two patients had stage III disease and three patients has stage IV disease. The combination was used in highly pretreated (median number of prior chemotherapies: 5; range 2-7). Seven patients had received high dose chemotherapy with autologous stem cell transplantation. Gemcitabine ( $1\text{g}/\text{m}^2$ ) and

oxaliplatin ( $100\text{ mg}/\text{m}^2$ ) were given every other week. Two patients also received rituximab with the association. All patients were evaluable for response. One patient achieved a complete response and one achieved a partial response after 2 and 3 cycles, respectively. Patients with progressive disease ( $n = 8$ ) were treated by other agents and 3 of them achieved a complete response. Currently, six patients are alive. The patient with complete response died a month later of infectious complication. The patient with partial response died of tumour evolution. Among evaluable patients for tolerance ( $n = 7$ ), five patients developed grade 3-4 hematologic toxicity. One patient experienced neurologic disorders and one patient had a bronchitis.

**Discussion & Conclusion** Gemcitabine and oxaliplatin were used off-label in patients highly pretreated for a Hodgkin lymphoma. In line with the literature, the association showed limited activity in heavily pretreated patients.

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**Keywords** gemcitabine, oxaliplatin, Protocols, refractory hodgkin lymphoma, relapse hodgkin lymphoma

## PTE-74

### Use of botulinum toxin in neurogenic bladder and assessment of its effectiveness

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**Introduction** Anticholinergic drugs represent the first line treatment for bladder overactivity. This therapy is usually effective but often produces troublesome side effects which may prompt patients to stop taking their medication. Refractory patients to conventional anticholinergic treatment are proposed to take botulinum toxin. The aim of this study is to evaluate the effectiveness and safety of botulinum toxin in neurogenic bladder (off-label use).

**Materials & Methods** Observational and descriptive study of botulinum toxin use (10 IU/mL, 10 mL vial) in neurogenic bladder for 5 years. The effectiveness assessment was performed based on clinical criteria (urinary leakage) and need for concomitant medications (oxybutynin, baclofen, chloride trospium and tolterodine). Safety assessment based on the need for intermittent catheterization. Statistical analysis protocol nonparametric tests (Fisher's test and Mann-Whitney test).

**Results** 28 Patients. Mean age was 40 years (SD 14.54). Basal disease: spinal cord injury (53.6%), multiple sclerosis (17.9%), myelopathy (14.3%) and others (14.2%). Dose: 85.7% used 300 IU (range 200–300 IU) in 30 injection sites (77.8%; 10 UI/site). 22 patients received a single administration, 4 are waiting for the second dose and 2 received two doses. 50% of patients who required a second dose needed it until six months. 23 patients (82.1%) required concomitant drug therapy before 6 months. The average duration of effectiveness in the total patients was 10 months (SD 8.62). The side effects consist primarily of urine retention, leading patients performed intermittent catheterization every 6–8 h (53.6%).

**Discussion & Conclusion** Botulinum toxin, although is not approved in the treatment of neurogenic bladder, is a safe drug to correct this problem, but its effect is limited in time, requiring in most cases the administration of additional medication or to repeat a new dose of botulinum toxin.

**Keywords** Bladder overactivity, Botulinum toxin, Neurogenic bladder

## PTE-75

### Optimization of diabetic foot's management: pharmacist's role in a multidisciplinary health team

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**Introduction** Since 1987, pharmacists have undertaken to promote chronic wounds care, initially in the bed sore and since 2009 also for the diabetic foot care. Diabetic foot cares require a multidisciplinary team. Drugs' and dressings' management emanate from the appropriate role of hospital pharmacists. Pharmacists evaluate prescriptions to detect and prevent potential errors before dispensation and administration. The aim of this study is to identify the accordance of prescriptions with the internal guideline: antibiotics' guideline and dressings' guideline.

**Materials & Methods** Six patients carrier of a diabetic foot's wound have been chosen at random between January 1st, 2009 and May 31st, 2010. Dressings and antibiotics' prescriptions have been analysed and compared with the internal guideline.

**Results** Our results have shown 12 hospitalisations and 17 wounds (sometimes on both feet) for 6 patients. All patients have received double antibiotic combination therapies using in case of deep wounds. There were 3 hospitalisations without antibiotics, in 89% of hospitalisations (8/9), patients have treated by ofloxacin and/or rifampicin, and other antibiotics were ceftriaxone, pristinamycin and clindamycin. Fifty nine percents (10/17 wounds) have received a dressing with alginate of calcium pure suitable for exudates fibrinoid wounds. Twenty three percents (4/17 wounds) have received a dressing with tulle associated with hydrogels to treat dry and necrotic fibrinoid wounds. One patient arrived with his dressing that contains gel with a growth factor. No pharmacist interventions have been reported. The pharmaceutical analysis of these nominative prescriptions of drugs and dressings was in compliance with the guideline of our establishment and thus with the consensual therapeutic strategy.

**Discussion & Conclusion** The description of these series of cases in comparison with internal guidelines confirms beneficial effect of multidisciplinary setting. It has been demonstrated that the most effective method of treating foot ulcer problems is within the multidisciplinary setting. The pharmacist as the other health professionals participates to security care to promote diabetic foot management.

**Keywords** Diabetic foot care, Drug use, Multidisciplinary team

## PTE-76

### Evaluating the principle of optimization in nuclear medicine: comparing the activities injected to the patients to the diagnostic reference levels

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**Introduction** The patients exposure to radioactivity should be kept as low as reasonably achievable. To assess the respect of the

radioprotection principle of optimisation we led an evaluation of the radiopharmaceutical drug activities injected to the patients.

**Materials & Methods** A survey on the activities injected to the patients was performed during year 2009 for two scintigraphy exams: bone scintigraphy (724 exams) and myocardial scintigraphy using thallium chloride (1,843 exams).

For each exam we calculated the average injected activity and compared it to the diagnostic reference levels (DRL), to the SFMN (French Society for Nuclear Medicine) and IRSN (National Institute for Radioprotection and Nuclear Safety) recommendations.

We also studied how higher or lower were the injected activities compared to those recommended.

**Results** The average injected activity for bone scintigraphy exams is  $640.8 \pm 61.9$  Mbq (range from 433 to 812 Mbq).

For this exam the DRL is between 300 and 700 Mbq, the SFMN recommendation is 10 Mbq/kg and the IRSN recommendation is 700 MBq maximum.

Regarding myocardial exercise scintigraphy the average injected activity is  $120 \pm 10$  Mbq (range between 100 and 153 Mbq).

Concerning this exam the DRL is 110 Mbq, the SFMN recommends not using more than 1.5 Mbq/kg and the IRSN recommended dose is 1.67 Mbq/kg with a maximum of 110MBq.

**Discussion & Conclusion** The average dose injected to the patients for bone scintigraphies is within the DRL's range and the majority of the patients received less than 700 MBq.

In our study 20 percent of the patients undergoing this medical exam received a higher dose than recommended, either by the DRL or the SFMN / IRSN.

Regarding the myocardial scintigraphies the average injected dose is above the DRL upper limit and more than 80 percent of the patients received more than 110 MBq of <sup>201</sup>Tl.

It is because some patients can receive up to 140 MBq if the situation requires it, after technical and medical justification.

Still, up to 5 percent of the patients received more than 140 MBq during their exam which is definitely too high (main reason: weight over 100 kg)

Diagnostic Reference Levels are useful tools for auto-evaluation, allowing corrective measures to be taken if necessary.

In our situation the average injected doses should be lowered, especially for myocardial exercise scintigraphies, since injected doses higher than 110 MBq are to be exceptional.

As a consequence we will, together with the nuclear doctors, reconsider the doses that should be injected to the patients especially for myocardial exam.

Such a study should be frequently repeated, once or twice a year, to improve our practice and limit the patients exposure to nuclear radiations.

**Keywords** Activity, DRL, Optimization, Radiopharmaceutical drugs, Radioprotection

## PTE-81

### A national survey of the current use of adult parenteral nutrition in pediatric population

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**Introduction** Some industrial total parenteral nutrition (TPN) admixtures are authorized for 2 years old children and older, although their composition has been done according to adults needs. They contain three kinds of nutrients: dextrose, lipids, amino acids and also electrolytes. But do physicians really prescribe these TPN for children? Some serious metabolic disorders have been mentioned as a result of their use in the especially vulnerable pediatric population.



Indeed, these products do not seem to be adapted to children in terms of electrolytic and lipid concentrations (1), and calorie/nitrogen ratio. This is the reason why we decided to launch a study examining the real practices in pediatric wards.

**Materials & Methods** First we consulted our own databases in order to identify the main French hospitals concerned by pediatric parenteral nutrition prescriptions. Then we drew up a list of TPN products that had obtained Marketing Authorization for 2 years old children and older. In May, 2010 we sent it (by mail or fax) to the chief pharmacists of the selected hospitals. The enclosed questions were: “Are these total parenteral nutrition admixtures used in your pediatric departments, and in which proportion?”

**Results** We have already received 25 answers from 52 hospitals (i.e. 48%). This data has been analyzed and presented according to the ages of treated children (newborns, infants, children or teenagers). Only 4 hospitals prescribe the solutions to newborns (0 to 30 days) and infants (1 to 23 months); these prescriptions are rare; they are considered “off-label” prescriptions. 5 hospitals prescribe them to children (2 to 11 years) and 13 hospitals to teenagers (over 12 years). In all hospitals, the solutions are rarely prescribed except in one hospital where they are systematically given.

**Discussion & Conclusion** The purpose of this study was to assess if TPN for adults are used in young populations over 2 years of age, as their marketing authorization allows it. Several specialist groups, even the HAS (Haute Autorité de Santé - or French National Authority for Health), agree that treatment with adult TPN in paediatrics could trigger serious metabolic disorders (2). Our investigation reveals that these products are rarely used in children, especially under the age of 11. Pediatricians usually choose not to prescribe them to their patients, but in a large majority prefer to prescribe individualized parenteral nutrition admixtures. These findings may interest the health authorities in their review of the use of parenteral nutrition admixtures and confirm that specific pediatric parenteral nutrition admixtures are still needed.

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**Keywords** parenteral nutrition, pediatric

#### PTE-82

##### Compliance of biliary stenting indications with the national guidelines in a French University Hospital

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**Introduction** In France, expensive medical devices, such as biliary metal stents, are reimbursed apart by national health insurance in addition to the price per pathology. This specific reimbursement imposes to follow the dedicated guidelines concerning the respective place of plastic prostheses and metal prostheses for biliary drainage. In this context, we evaluated the conformity of biliary stenting usage to the French Digestive Endoscopy Society (SFED) guideline (version of march 2000) in our hospital.

**Materials & Methods** Design: prospective observational study led during 2 months. Setting: All consecutive patients who were referred

to the endoscopy unit for the treatment of a biliary stenosis by an endoprosthesis, plastic or metal. **Main outcome measure:** percentage of indications in accordance with the SFED guideline for each type of medical device.

**Results** 51 patients (19 females/32 males) were included in our study (mean age = 64 years [25; 89 years]). Endoprostheses were inserted by one of the 8 different operators of the medical team. Operators filled indication on a case report form immediately following drainage (tick boxes). Nineteen patients (37%) had 1 metal biliary stent (coated or not coated) and 32 patients (63%) had 1 or 2 plastic prostheses. Metal stents were inserted because of malignant stenosis in 18 cases (95%) and for a benign stenosis in one case (5%). Whereas plastic prostheses were used for malignant stenosis in 19 cases (59%) and for benign stenosis in 11 patients (34%).

All indications of metal stenting and 94% (30/32) of the indications of plastic stenting complied with the SFED guideline. Two patients had a plastic stent implantation for an indication not mentioned in the SFED guideline: one case of autoimmune cholangitis, a rare and recently described pathology, and one case of fistula, a rare circumstance.

**Discussion & Conclusion** SFED guideline for biliary stenting is adequately applied in our hospital, despite its relative complexity and despite it has been published 10 years ago. The only 2 cases of non compliance with the guideline cannot be considered strictly as a misuse of the prostheses as they were related to rare or recently individualized pathologies. Scientific data have to be collected to slightly update the guideline.

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**Keywords** biliary endoprosthesis, guideline, medical practice evaluation, stenosis, use

#### TDM-1

##### Therapeutic drug monitoring of mycophenolic acid in lupus patients

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**Introduction** Systemic lupus erythematosus (SLE) is an autoimmune disease that may require long-term treatment with immunosuppressive agents. Mycophenolic acid (MPA), the active form of mycophenolate mofetil (MMF) and enteric-coated mycophenolate sodium (EC-MPS), is an immunosuppressant being used increasingly for remission maintenance after induction therapy in SLE patients. In kidney transplantees, MPA plasma concentrations monitoring after MMF administration improved patient outcomes over currently recommended fixed-dose strategy. Conversely, no recommendations for MPA therapeutic optimization are available in a non-transplant setting, and very few data on its pharmacokinetics (PK) have been published in SLE. Our objective was examine MMF and EC-MPS pharmacokinetics to devise guidance for therapeutic drug monitoring (TDM) for SLE patients with normal renal function.

**Materials & Methods** This observational study included 21 patients receiving MMF (1000 mg twice daily) and 14 taking EC-MPS (720 mg twice daily). Total and free MPA area under the plasma concentration–time curve between 0 and 12 h (AUC<sub>0–12h</sub>), maximum concentrations (C<sub>max</sub>), times to maximum concentration (T<sub>max</sub>), 12-hour trough concentrations (C<sub>12h</sub>), MPA apparent oral clearance

(CL/F), and MPA free fraction were determined and compared between the two formulations. Correlations between MPA exposure and single concentrations were assessed for both formulations using Pearson's test.

**Results** Means of dose-normalized MMF- or EC-MPS-MPA  $C_{\max}$  were 64.6  $\pm$  25 and 61.4  $\pm$  27.1 h mg/l, respectively. MPA  $T_{\max}$  for EC-MPS was longer and more variable than for MMF. MMF-MPA  $AUC_{0-12h}$  and ( $C_{12h}$ ) were correlated ( $r = 0.78$ ,  $p = 0.0001$ ), but EC-MPS-MPA  $AUC_{0-12h}$  and single concentrations were weakly correlated. A limited-sampling strategy (LSS) combining  $C_{\max}$  and  $C_{12h}$  gave satisfactory predictive performance to estimate MPA  $AUC_{0-12h}$  after EC-MPS administration.

**Discussion & Conclusion** For TDM in SLE patients with GFR > 60 ml/min/1.73 m<sup>2</sup>,  $C_{12h}$  after MMF ingestion could predict MPA  $AUC_{0-12h}$ , while an LSS around  $T_{\max}$  should be used for patients on EC-MPS.

**Keywords** enteric-coated mycophenolate sodium, mycophenolate mofetil, therapeutic drug monitoring

## TDM-4

### Pharmacokinetics of Daptomycin during continuous Venovenous hemofiltration in septic patients

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**Introduction** Most septic unstable patients in intensive care units (ICU) suffer from acute kidney injury (AKI). They need renal replacement therapy (RRT) such as continuous venovenous hemofiltration (CVVH). We know that CVVH can modify the pharmacokinetic of anti-infective agents and change their plasma concentrations. Daptomycin is bactericidal against a board range of gram-positive strains, including methicilin-resistant staphylococcus aureus (MRSA) during CVVH.

**Materials & Methods** In 2009, a pharmacokinetic study was conducted on 6 patients (average age 69 years) randomized in two groups (standard rate of CVVH at 35 ml/kg/h or high rate at 70 ml/kg/h). They received daptomycin 6 mg/kg/day doses. Patients had 3 sample phases, on Day 1 (start of hemofiltration), Day 3 and Day 5, at 6 different times, from 1 to 24 h after infusion of daptomycin. On D5, the patients in each group became "standard rate". Four samples were taken for each sample time: 1 from the arterial line before the filter, 1 from the venous line after the filter, 1 from the effluent bag, 1 from the patient's arterial catheter. Daptomycin was extracted from plasma by solid phase technique with Phenomenex Strata-X<sup>®</sup> cartridges and then assayed by liquid chromatography mass spectrometry (LC-MS) on an Agilent G1956 system. Lower limit of quantification was 0.5  $\mu$ g/ml. The method was validated following FDA guidance's for validation.

**Results** The median pharmacokinetic parameters measured on D1, D3, D5 of study period, were for "standard rate" and "high rate", maximal concentration ( $\sim$ 54.9, 55.3  $\mu$ g/ml), area under the concentration from 0 to 24 h ( $\sim$ 510, 477 mg.h/ml), half-life ( $\sim$ 11h, 7h), volume of distribution ( $\sim$ 0.095, 0.131 liters/kg), systemic clearance ( $\sim$ 14, 22.4 ml/h/kg), respectively. There was no significant difference between two groups of "standard" and "high" rate (Mann & Whitney test,  $P > 0.05$ ) but the patients on CVVH were underexposed in 6 mg/kg/day doses compared to values of volunteers patients (1).

**Discussion & Conclusion** Doses of daptomycin higher than 6 mg/kg/day once daily during CVVH may be considered in further studies to

evaluate the efficacy and safety by achieving plasma target concentrations. This analysis suggests that modified dosing regimens are indicated for patients with CVVH.

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**Keywords** continuous venovenous hemofiltration, daptomycin, intensive care unit

## TDM-5

### Therapeutic drug monitoring of raltegravir in HIV-infected patients

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**Introduction** Raltegravir (RAL), first drug of a new class of anti-retrovirals (ARV), the integrase inhibitors, has been available for 3 years. RAL is mainly metabolized in the liver by the UGT1A1 and is neither substrate nor inducer/inhibitor of CYP3A4. However, a wide interindividual pharmacokinetic variability was reported during clinical trials. At the standard dose of 400 mg bid, the RAL mean trough concentration (C<sub>trough</sub>) reported is 63 ng/ml (range: 29–118 ng/ml). We evaluated RAL C<sub>trough</sub> in a context of real life and the interindividual variability according to the drug coadministered.

**Materials & Methods** Retrospective study on 54 patients (24 women and 30 men) with a median age of 46 receiving RAL as part of their ARV regimen. RAL C<sub>trough</sub> was determined using a liquid chromatography–tandem mass spectrometry (LC-MS/MS) method (limit of quantification of 5 ng/ml), at steady-state, at least one month after initiation of the regimen.

**Results** Data were collected during 14 months. RAL dose was 400 mg bid (n = 53) and 800 mg bid (n = 1). During the follow-up, 2 patients were switched to 800 mg bid following the introduction of rifampicine. Patients received RAL in association with an optimized background therapy (OBT) as follows: 2NRTIs (A, reference group, n = 35), DRV/r $\pm$ NRTIs (group B, n = 8), ETR $\pm$ NRTIs (group C, n = 5), ATV/r $\pm$ NRTIs (group D, n = 4) and TPV/r $\pm$ NRTIs (group E, n = 2). Overall 100 RAL C<sub>trough</sub> were determined at  $12 \pm 3$  h after the last drug intake. The median (IQR, CV %) of RAL C<sub>trough</sub> for all groups was 113 ng/mL (45–320; 182). Median C<sub>trough</sub> values were (A): 152 ng/ml (66–353; 122), (B): 45 ng/ml (24–107; 177), (C): 155 ng/ml (121–402; 121), (D): 60 ng/ml (37–69; 90) and (E): 56 ng/ml (41–59; 68), respectively. RAL C<sub>trough</sub> was always close or above the mean C<sub>trough</sub> reported of 63 ng/ml. A significantly higher RAL C<sub>trough</sub> was observed when RAL was only associated with 2 NRTIs compared with group 2 ( $p = 0.001$ ), group 4 ( $p = 0.04$ ), group 5 ( $p = 0.02$ ). We did not find a higher RAL C<sub>trough</sub> with the coadministration of ATV/r, probably due to the small number of patients. No decrease in the RAL C<sub>trough</sub> was observed when ETR was associated.

**Discussion & Conclusion** Our results confirmed a large interindividual variability in the RAL C<sub>trough</sub> and confirmed no significant drug-drug interactions. Therefore, RAL may be safely coadministered with other antiretroviral agents. RAL variability increases with food and coadministration of drugs like proton pump inhibitors

suggesting an important variability at the absorption level. Therefore, the therapeutic drug monitoring of RAL may be of interest if pharmacodynamic/pharmacokinetic relationships were demonstrated.

**Keywords** Cthrough, HIV, raltegravir

## TDM-6

### Gentamicin and vancomycin therapeutic drug monitoring in newborns: evaluation of practices

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**Introduction** Gentamicin and vancomycin therapy warrants therapeutic drug monitoring (TDM) for both efficacy and toxicity reasons. For gentamicin two dosing regimens are described: multiple daily (MDD) and once-daily dosing (ODD). Measuring of peak (for gentamicin MDD only) and through concentration is recommended. In newborns, blood sampling should be minimal to prevent pain and risk of anaemia.

In the absence of strict recommendations at our institution, it was hypothesized that dosing and TDM of gentamicin and vancomycin were heterogenic and blood sampling too frequent.

**Materials & Methods** Retrospective chart study over 12 months of all newborns receiving either gentamicin or vancomycin.

**Setting** Neonatology at a university hospital.

Chart analysis criteria: % of MDD vs ODD gentamicin regimens, mean number of blood sampling, % of treatments with peak or through level monitoring, % of concentrations outside recommended therapeutic ranges followed by treatment adaptation (gentamicin: through level <2 mg/L, peak level 5–10 mg/L; vancomycin: through level 5–10 mg/L).

**Results** *Gentamicin*: 102 newborns were included (mean gestational age: 34.0±5.1 weeks).

Treatments (n = 119) had a mean length of 3.1±3.1 days; MDD was used in 48 (40%), ODD in 67 (57%) and a mixed dosing scheme in 4 (3%), respectively.

Through levels were measured in 87% of all treatments and were more frequently >2 mg/L with MDD than with ODD (19.2 vs 7.4%). Through levels >1.5 mg/L led to treatment stop in 22% of the cases; in 73% of the cases levels were repeatedly measured, followed by dosing adaptation.

Peak levels were measured in 50% of MDD and in 12% of ODD courses. Therefore more blood was sampled with MDD than with ODD (mean number of sampling/course: 2.7±1.6 vs 1.3±1.1, *p*<0.01). 25% of all peak levels were <5 mg/L, all observed with MDD. Dosing was adapted in only 33% of these cases.

*Vancomycin*: 37 newborns were included (mean gestational age: 30.8±3.9 weeks).

Mean treatment length was 6.5±5.2 days. Mean number of blood sampling was 2.5±2.1.

Through levels were measured in 85% of all treatments (n = 41) and peak levels in 51%. 31% of through levels were >10 mg/L and led to dosing adaptation in 89% of all cases. Levels <5 mg/L were observed in 11% of the cases, but dosing was adapted in only 16%.

**Discussion & Conclusion** Dosing pattern of gentamicin and TDM of gentamicin and vancomycin in newborns were very heterogenic at our institution. TDM was performed in order to avoid toxic levels, but less frequently to ensure pharmacologic efficacy.

Strict guidelines have now been developed and implemented to standardize dosing practices, to reduce unnecessary blood sampling,

and to improve management of subtherapeutic levels. Their impact will be evaluated.

**Keywords** gentamicin, newborn, therapeutic drug monitoring, vancomycin

## TDM-7

### Antiemetic therapy for chemotherapy, role of pharmacists

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**Introduction** Patients' quality of life during and after chemotherapy emerged as an important outcome parameter alongside the tumor response. Supportive therapy became an integral part of anticancer therapy to limit therapy-associated toxicity. Chemotherapy-induced nausea and vomiting (CINV) is often regarded as the most distressing adverse effect experienced by patient receiving cytotoxic drugs. However, significant developments have been made in supportive care for the management of chemotherapy-induced CINV. In this study, pharmacists play an important role in counselling physician on appropriate antiemetic therapy, selecting suitable antiemetics together with convenient dosing regimens.

**Materials & Methods** A six month preliminary survey was conducted in patients with single day chemotherapy (minimum of 6 days between two administrations). 50 patients were included in the survey. On the day of chemotherapy, patients' demographics, risk factors and history of nausea and vomiting were assessed via patient interview by pharmacists. Patients were also asked whether they were anxious by character. A standard diary was used to collate clinical events, including number of nausea and vomiting agents after chemotherapy. Use of breakthrough antimitotics and unscheduled visits to the physician, clinics, or hospitals due to nausea and vomiting were documented.

A three-drug combination of 5-hydroxytryptamine (5-HT<sub>3</sub>) serotonin receptor antagonist, corticosteroids and aprepitant was used before chemotherapy of high emetic risk. A two-drug combination (5-HT<sub>3</sub>/corticosteroids) was used before chemotherapy of moderate emetic risk. For delayed emesis corticosteroids were used with or without aprepitant.

**Results** No patient was lost to follow up and no patient was excluded from data analysis due to incomplete information. Neither acute nor delayed vomiting was reported by a majority of patients, acute vomiting was experienced by 12% of patients and delayed vomiting by only 6%. Acute and delayed nausea was reported by 34% of patients. The highest incidence of nausea was generally reported on day 2 of chemotherapy and gradually reduced over the next days. 12% of patients received benzodiazepines before administration of the chemotherapy to reduce anxiety.

**Discussion & Conclusion** Specific variables such as risk factors for CINV, together with patients' ability to adhere to medication regimens, must be considered in the selection of antiemetics to optimize the goal of eliminating CINV and improving treatment outcome. The implementation of pharmaceutical care might also improve communication between health care professionals and support the idea of a multidisciplinary team approach.

**Keywords** pharmacist, chemotherapy, antiemetics

## TDM-8

### Simultaneous determination of four free carbapenem antibiotics in plasma by HPLC-UV

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**Introduction** The pharmacokinetics of carbapenem antibiotics, imipenem, doripenem, ertapenem and meropenem, is characterized by a large inter- and intra-individual variability depending on the site of infection, the bacteria and many drug interactions. Individualized dose adjustment is therefore crucial in order to optimize treatment efficiency and to prevent adverse reactions, especially in critical care patients. Currently there is no method for the simultaneous determination of these four antibiotics.

A simple, precise and accurate high-performance liquid chromatography (HPLC) method using ultraviolet (UV) detection has been developed for simultaneous determination of the free active form of these antibiotics in human plasma.

**Materials & Methods** Samples were spiked with flucloxacillin as internal standard and phosphate buffer 40 mM (pH 4). The major advantage of this assay was sample preparation by a 20 min centrifugation with Amicon® Ultra (Millipore) for the free form extraction of each antibiotic. Separation was achieved on a C18 column 4.6 mm x 150 mm with a mobile phase composed of phosphate buffer 10 mM (pH 7) with concentrated orthophosphoric acid and acetonitrile in gradient elution mode. Detection was performed at 300 nm for carbapenems and 230 nm for flucloxacillin. The analytical validation was conducted according to recommendations of the Food and Drug Administration [1].

**Results** The analysis time was less than 15 min. Retention times were as follows: 2.7, 6.6, 7.5, 8.5 and 13 min respectively for imipenem, doripenem, ertapenem, meropenem and flucloxacillin. The assay was specific and linear for each compound over the concentration range of 1 to 50 µg/mL, with correlation coefficients over 0.991. Intra- and inter-day validation studies showed accuracy between 84.88–113.76% and 89.56–105.88% respectively, precision below 10.58% and 8.02% respectively. Mean recoveries were 100, 90.47, 85.47 and 98.21% for imipenem, doripenem, ertapenem and meropenem. For imipenem and meropenem, LOD and LOQ determined in plasma were respectively 0.08 and 0.26 µg/mL and for doripenem and ertapenem, LOD and LOQ were respectively 0.13 and 0.42 µg/mL. No endogenous substance did interfere in blank plasma. Stock solutions of carbapenems (1 mg/mL) were stable 6 month at -80°C and plasma samples were stable 3 month at -80°C excepted for ertapenem (15 days at -80°C).

**Discussion & Conclusion** This method is simple, specific, sensitive, rapid and can currently be used to assess pharmacokinetic parameters and optimization of these four carbapenems in patients. The step of ultrafiltration and the same analytical conditions for all carbapenems helps to save valuable time and will be applicable to bronchoalveolar lavage.

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**Keywords** carbapenem, free form, HPLC-UV, plasma, quantification

## TDM-9

### Effect of a regular clinical pharmacist intervention on the anti-infective agents based on procalcitonine kinetic survey in critically ill patients

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**Introduction** Procalcitonine (PCT) is an early, precise (sensitive) and moreover, specific marker of severe bacterial infection as well as a fungal or parasitic infection. Literature mentioned PCT serum level kinetic as a tool to decrease the antibiotics treatment duration and further a tool to decrease the anti-infective agents consumption without threatening (affecting) success of treatment and mortality. During the year 2008, at our hospital setting a clinical pharmacist has been affected in the medical reanimation unit which is one of the main anti-infective agents users and used to applying streamlining antibiotic treatments. Evaluate the role of a clinical pharmacist on the anti-infective agents consumption in the medical reanimation unit (2008) by means of PCT level kinetic follow-up, besides the use of the other usually infections markers (WBC, CRP...).

**Materials & Methods** PCT serum level was measured first, before antibiotic initiation, and then every 48 h up to the end of the anti infective treatment. The clinical pharmacist workload included: 1) discussion with the physician of the PCT measurement relevancy before an antibiotic initiation, and its follow-up, 2) daily checking of different labs data (WBC, CPR, ...) and PCT, 3) correlate the PCT level evolution and the clinical outcomes (fever, WBC, CPR) and discuss these data with the physicians, 4) to move a discontinuation of the antibiotic treatment to the physicians as soon as the PCT serum level is less than 0.5 ng/L or became 10% about initial concentration.

**Results** The global anti-infective agents consumption expressed as Daily Defined Doses per 1 000 inhabitants (DDD/1000 per inhabitants) decrease about 15%. All the different categories of antibiotics decrease except the fluoroquinolones (FQ) which increase (+6%). Consecutively the annual anti-infective agents expenditures in this unit drop down from 18% to 13%

**Discussion & Conclusion** The work of a clinical pharmacist involved with the physicians of the medical reanimation unit in the antibiotics management based on the PCT follow-up provides an helpful tool to decide the duration of antibiotics treatments, upon condition of interpreting it in the clinical context including underlying diseases. So we can appropriately determine an adequate duration of antibiotic therapy in a way which both preserve the microbial resistance and limits the pharmaceuticals costs.

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**Keywords** antibiotic management, clinical pharmacy, Procalcitonin

## TDM-11

### High-dose methotrexate in the treatment of osteosarcoma: therapeutic measures against acute intoxication

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**Introduction** High-dose methotrexate (MTX) is indicated in chemotherapy for numerous cancers, and the monitoring of plasma MTX concentrations is routine practice. The objectives of this study were to analyze the effectiveness of measures against intoxication due to high doses of MTX and to evaluate the need for renal function assessment in patients receiving high-dose MTX in order to identify patients at risk of a delay in its elimination.



**Materials & Methods** Plasma MTX concentrations were monitored in a 56-yr-old patient weighing 75 Kg with diagnosis of knee osteosarcoma and at high risk of serum creatinine levels at the limits of normality. He received 8 g/m<sup>2</sup> MTX (13 g) in a 4-h IV infusion. Following the Oncology Department protocol, plasma concentrations were determined at 24 h post-infusion and then daily until levels were < 0.05×10<sup>-6</sup> M, and rescue with 15 mg of folinic acid was administered after extracting the first sample followed by 11 supplementary doses, every 6 h, modifiable as a function of MTX concentration. Fluorescence polarization immunoassays (FPIA, TDX) were performed.

**Results** Plasma concentration at 24 h post-infusion revealed intoxication ( $C = 22.71 \times 10^{-6} \text{ M}$  and  $t_{1/2} = 19 \text{ h}$ ). It was recommended to increase rescue with folinic acid to 100 mg/m<sup>2</sup>/3h and start vigorous hyperhydration and urinary alkalinisation with sodium bicarbonate to enhance renal elimination. A rigorous follow-up was maintained of urinary PH, administering activated carbon and filicol to inhibit the enterohepatic cycle and, given the persistence of elevated concentrations, performing haemodialysis, which reduced the concentration to <0.05×10<sup>-6</sup> M at 9 days post-infusion.

**Discussion & Conclusion** Increased folinic acid dose, activated carbon and filicol, hydration, urinary alkalinisation and haemodialysis are effective in the approach to intoxication due to high-dose MTX. Renal function should be evaluated to identify patients at risk of a delay in MTX elimination.

**Keywords** intoxication, Methotrexate

## TDM-12

### The significant effect of influenza vaccination on Vitamin-K antagonist treatment

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**Introduction** Millions of patients are vaccinated yearly against influenza in France with old and cardiac patients as a priority. Patients are frequently treated with VKA (vitamin-K antagonist). Due to high inter-patient and intra-patient variability, the therapeutic dose of VKA must be individually monitored using international normalized ratio (INR) values. Many studies have evaluated the influence of influenza vaccination on INR variations, however with controversial results. The aims of this study were: 1) evaluate INR variation after vaccination 2) assess hemorrhagic linked events.

**Materials & Methods** Patients monitored at the “Follow-up anticoagulant treatment advice center” (CSCTA) were contacted by telephone to know their vaccination status against seasonal or H1N1 influenza. The study enrolled 308 patients with 239 vaccinated. Type of treatment and INR values were recorded in CSCTA database.

**Results** At follow-up patients, 76.3% were vaccinated (25% for H1N1 influenza alone). Average vaccination age was 74.5 years (54% male and 46% female), 84.4% of patients were treated with fluidione (most common type of VKA in France) and only 10.6% with warfarin. After vaccination, 60% of patients had stable INR values, 26% increased and 14% decreased (outside target).

Regarding INR increase values population (n = 43), one patient had intestinal hemorrhagic event and 5 major variation *i.e.* more than 3 point variation which required to stop VKA immediately and to administer vitamin K.

No statistical correlation was found between sex (60% male and 43% female), age (average 72 years in stable group versus 74.5 in variation group), type of anticoagulant treatment, co-treatment, INR

target level (2–3 versus 3–4.5) and INR variations (Mann Whitney and Student-t-test)

Before vaccination 81.7% were within the target (83% INR stable group and 79% INR variation group, NS). Therefore, a correlation no longer existed between the Rosendaal index (time within the target) and a potential INR variation after vaccination.

**Discussion & Conclusion** In conclusion, our study results show that vaccination could have a significant effect on VKA treatment stability. Therefore, it is imperative to follow-up all VKA treated patients after vaccination. Routine INR measurements can avoid thrombotic and hemorrhagic events.

**Keywords** hemorrhagic events, influenza vaccination, INR monitoring, Vitamin K antagonist

## TDM-13

### Agarose gels: model of artificial brain in neurosurgery

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**Introduction** The term artificial brain usually brings to mind a computer model that mimics neuronal activity. International teams have already worked on a model of agarose gel to explore the cerebral perfusion of drugs (1). Our work had 2 goals:

To create a biomechanical brain surrogate used for the development of an invasive neurosurgical robot, devised for future medical applications such as tumor removal and insertion of implant.

To determine the physical and mechanical parameters of the gels that will be used for experimental tests (development of robot).

**Materials & Methods** Four stages in our work: development of concentrations agarose gels, sensory and texture analysis, homogeneity.

The literature directed us towards manufacturing of gels at 0.8, 0.9, 1, 1.1 and 1.2% (1).

The formulation of gels was a mixture of water, agar-agar and phosphate buffer (K<sub>2</sub>HPO<sub>4</sub> NaHPO<sub>4</sub> 0.01 M pH 7.1).

Gels, from 0.8 to 1.2 (w/v), offered physical characteristics that imitates the human brain. Nine neurosurgeons, blind of concentrations, gave subjective appreciation of gels according to mechanical criteria (palpation, puncture Cushing trocar, dissection); subsequently, objective geometric criteria and surface were noted for each gel. The production homogeneity was obtained by measuring density and Hounsfield density with a dual energy scanner (General Electric), compared to water, the major constituent of brain and a witness oily industrial manufacturing.

A physical quantification was performed by texturometric analysis versus control with a TA NEXYGEN 300 (flat pad). Texturometry determined hardness, elasticity and adhesion on gels tested versus control. The repeatability was tested.

**Results** Selected gels: 0.9, 1, 1.1% mimicking at best the human brain (hardness, compactibility, humidity).

Hounsfield density average:  $D_{0.9\%} = 3.9$ ,  $D_{1\%} = 3.2$ ,  $D_{1.1\%} = 5.3$  variation coefficient (CV) < 5.9  $D_{\text{Witness}} = -105$  and  $D_{\text{water}} = 0$ .

The average density  $\mu$  (mg/cm<sup>3</sup>):  $\mu_{0.9\%} = 1002$   $\mu_{1\%} = 1004$ ,  $\mu_{1.1\%} = 1007$  (CV < 12.9).

Texturometric average parameters for the 0.9% gel: hardness = 0.6 to 1 kgf (CV = 7), elasticity = 3.6 mm (CV = 5.7), adhesion = 2.6 N (CV = 21).

**Discussion & Conclusion** Three gel concentrations were selected using sensory subjective analysis. Gels were homogeneous

irrespectively of concentrations. Hounsfield densities of gels were close to water, except for the witness because of its composition (paraffin). The measure of texturometry used the same criteria as in sensory analysis (2). The repeatability of texturometry was satisfactory for all parameters.

This work has allowed us to produce homogeneous gels with general biomechanical characteristics that are close to human brain. Further tests are mandatory to specify the optimal gel concentration.

Inclusions of physical objects simulating different tissues within gels are to be considered in order to provide experimental conditions enabling the simulation of three-dimensional trajectories.

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**Keywords** Neurosurgery, validation model, artificial brain

## TDM-14

### Impact of pharmacist interventions in a unit dose distribution system

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**Introduction** Unit dose system is standard in Spanish Hospitals because error rates in hospitals that use it are significantly lower than in those using multiple-dose systems of drug distribution. Medication for every inpatient is prepared on daily bases individually, and medical prescription is reviewed by pharmacists every time there is any change. This system allows pharmacist to make interventions to ensure the rational use of drugs. Since 2005 all pharmacist interventions are registered electronically in the Hospital Unit dose Program. Our aim was to evaluate the impact of pharmacist interventions (PI) during validation of medical orders during a 5 years period in a Unit dose system.

**Materials & Methods** The interventions were recorded on the own electronic program (Sinfhos, version 3.1) that is used for inpatients medication distribution on a daily bases. Interventions were made by all staff pharmacist. Physicians were informed by the pharmacist about drug-related problems (DRP), and the PI was recorded into the electronic pharmacotherapeutic history. PI were classified according Spanish Society of Hospital Pharmacy. On a weekly basis DRP were reviewed by a pharmacist focus on their classification by type of DRP, the acceptance of the PI by the physicians and the probability of harm.

**Results** Since January 2005 to May 2010, 4714 PI were documented. It meant about 2.4 PI per day. The most frequent pharmacist intervention were those oriented towards modification of the dose (45.9%), followed by those regarding administration drug schedule (25.3%), duplicated drugs (10.1%) and replacement of a drug (10.0%). The rest were: addition of a drug (9.5%), detection of drug interactions (7.3%), ineffective treatments and adverse effects (2.4% and 2.3% respectively). The degree of acceptance of the intervention was 72.8%. We could not assess 9.1% of the PI because drug was stopped before 72 h post intervention. 48.7% of the PI required prescription modification and 0.2% caused increasing hospital stay.

Since 2005 to 2009 number of documented PI have increased by 93.2% (323 PI in 2005 and 1530 PI in 2009).

**Discussion & Conclusion** Pharmacy validation through a Unit Dose System is a good tool to identify possible DRP. Acceptance of PI is high so we can consider that have been useful to improve patient care and have helped to educate physicians on the quality of pharmacotherapy. Our increasing number of PI indicates the influence of the development of clinical pharmacy at our hospital.

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**Keywords** Drug-related problems, Pharmaceutical Care Issues, Prescribing

## TDM-15

### Mycophenolate mofetil pharmacokinetics enable prediction of lupus clinical flares

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**Introduction** Systemic lupus erythematosus (SLE) is an autoimmune disease that may require long-term treatment with immunosuppressive agents. Mycophenolate mofetil (MMF), the pro-drug of mycophenolic acid (MPA), is an immunosuppressant being used increasingly for remission maintenance after induction therapy in SLE patients. In kidney transplantees, MPA plasma concentrations monitoring after MMF administration improved patient outcomes over currently recommended fixed-dose strategy. Conversely, no recommendations for MMF therapeutic optimization are available in a non-transplant setting, and very few data on its pharmacokinetics (PK) have been published in SLE. Our objective was to determine whether MPA PK under combined MMF and prednisone maintenance therapy can predict SLE clinical flares.

**Materials & Methods** Baseline steady-state PK parameters of MPA, and its main glucuronide metabolite (MPAG) were determined for 25 stable SLE patients without renal manifestations. Disease activity was assessed during 6 months of follow-up. Potential relationships between those baseline MMF PK variables and clinical outcome were analyzed (univariate analysis). A receiver operating characteristics (ROC) curve analysis was conducted to determine which parameters could best discriminate a clinical flare.

**Results** MMF controlled disease activity in 17 patients (successes) and failed to do so for 8 others (failures). For failures and successes, respectively, baseline MPA areas under the time–concentration curve between 0 and 12 h ( $AUC_{0-12h}$ ) (medians: 37.7 vs 73.1 mg  $\times$  h/L,  $P = 0.003$ ) and MPA 12-hour trough concentrations ( $C_{12h}$ ) (medians: 1.5 vs 3.7 mg/L,  $P = 0.008$ ) were significantly lower, and baseline MPAG/MPA  $C_{12h}$  ratios (medians: 18.7 vs 10.2,  $P = 0.02$ ) were significantly higher. According to our ROC curve analysis, the MPA  $C_{12h}$  concentration was best able to discriminate a flare during follow-up (93% sensitivity, 85% specificity). A 3-mg/L cut-off had 92% negative-predictive value for developing a flare during follow-up.

**Discussion & Conclusion** For our SLE patients without renal manifestations, clinical flares developing under maintenance therapy were associated with a baseline MPA  $C_{12h} < 3$  mg/L. Further studies on

larger populations are needed to confirm the ability of MPA-PK parameters to predict clinical outcomes of lupus patients.

**Keywords** Clinical outcomes, lupus, mycophenolic acid, pharmacokinetics

## TDM-16

### Quantification of Raltegravir in human biological matrices by HPLC-MS

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**Introduction** Raltegravir belongs to a new class of antiretrovirals acting for a human immunodeficiency virus (HIV)-1 integrase inhibition. Clinical trials have demonstrated its potent antiviral activity in both therapy naive and experienced patients. Thus, raltegravir has become an important component of combination treatment regimens for treatment of patients with multidrug-resistant HIV-1. The quantification of raltegravir in human plasma and peripheral blood mononuclear cells (PBMCs) is important to support clinical studies and determine pharmacokinetics parameters of raltegravir in HIV-1 infected patients. For the quantification of the HIV-integrase inhibitor raltegravir in human plasma and PBMC lysate, an assay was developed and validated, using solid phase extraction (SPE) and high performance liquid chromatography-mass spectrometry (HPLC-MS). **Materials & Methods** PBMC are isolated by density gradient centrifugation using Vacutainer<sup>TM</sup> CPT tubes. Raltegravir was extracted from plasma and PBMCs by solid phase extraction with OASIS MAX cartridges. Chromatographic separation was performed on a reversed phase C18 column (150mm × 4.6mm, particle size 5 µm) with a quick stepwise gradient using 0.1% formic acid/acetonitrile, at flow rate of 0.8 mL/min. The analytical run time was 27 min. The simple quadrupole mass spectrometer was operated in the positive ion-mode and single ion monitoring was used for drug quantification.

**Results** The method was validated over a range of 50–5000 ng/mL in plasma and a range of 2.5–500 ng/mL in PBMCs lysate following FDA guidance for bioanalytical validation [1]. Quinoxaline was used as the internal standard. The SPE method was optimized to be selective and highly efficient. The lower limit of quantification was 2.5 ng/mL in plasma and PBMCs. The method was proven to be specific, precise, with mean inter-day CV% within 4.94–8.22% for plasma and 4.39–12.39% for PBMCs, and accurate (range of inter-day deviation from nominal values –2.63 to –1.79% for plasma and –4.75 to +3.06% for PBMCs). Mean extraction recoveries ranged 84.6–91.4% for plasma and 67.4–83.4% for PBMCs.

**Discussion & Conclusion** This method is simple, specific, sensitive, automatable, and can be successfully applied to therapeutic drug monitoring of raltegravir in HIV-infected patients.

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**Keywords** HPLC-MS, PBMC, Plasma, Raltegravir, Solid phase extraction

## TDM-18

### Population pharmacokinetics of digoxin: prediction of blood concentration in patients with congestive heart failure at Al-Amiri hospital Kuwait

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**Introduction** Digoxin is a cardiac glycoside widely used for the treatment of Congestive heart Failure. It has a very narrow therapeutic index (0.5–2.0 ng/ml) and displays large inter- and intra-patient pharmacokinetics variability. Several population methods (Paulson, Williams, Bauer, Hori and hyperbolic) have been developed for determining the digoxin dose. The aim of this study was to: (a) compare different methods for predicting digoxin level; (b) examine the effect of creatinine clearance (Clcr) and spironolacton on the disposition of digoxin.

**Materials & Methods** 169 inpatients were identified for whom a measured concentration (MC) was available. Clcr was calculated using Jellif, Cockcroft, Hull, Mawer, and Salazar equations. Based on Clcr, each method was used to predict digoxin Concentration (PC), which was compared with MC. Degree of agreement between PC and MC was assessed by the mean of difference between the PC and MC (mean prediction error, ME) and the mean of absolute deviation between the PC and MC (mean absolute prediction error, MAE). The MC/daily dose (D) ratio was determined, and the effect of Clcr and spironolacton on MC/D was examined.

**Results** The MC/D ratios of the patients with Clcr<50 ml/min were significantly higher than those of the patients with Clcr > 50 ml/min. In contrast, there were no significant differences in the MC/D ratios between the spironolacton-treated patients and the non-treated patients. The ME (measures of bias) and the MAE (measures of precision) for the methods ranged from –0.923 to 0.002 and 0.187 to 1.486 ng/ml respectively. Using Jelliffe Clcr, the hyperbolic method gave the smallest values of ME and MAE which were 0.002 and 0.228 ng/ml respectively.

**Discussion & Conclusion** Hyperbolic equation was the most reliable of those evaluated and could be applied initially in Kuwaiti hospital. However, a large number of patients PC were well above the MC, therefore, individualization of digoxin dose based on MC is of great need.

**Keywords** Digoxin, Pharmacokinetics, Prediction error