CSHP Summer Educational Sessions (SES) 2009: Poster Abstracts / Séances éducatives d'été (SÉÉ) 2009 de la SCPH : Résumés des affiches

Sunday, August 9, 2009 ·
Dimanche 9 août 2009
Viewing/Affichage : 1015–1045
Presentations/Présentations : 1230–1400

1. Switching Hemodialysis Patients from Epoetin Alfa in Multi-Dose Vials to Pre-Filled Syringes is Associated with Cost Savings
2. Sodium Thiosulfate-Based Treatment in Calcific Uremic Arteriolopathy: A Provincial Case Series
3. Process Flow for Erythropoiesis Stimulating Agents (ESA) Delivery to Hemodyalisis (HD) Patients at Toronto General Hospital — Process Optimization and Impact Analysis of Alternative Dosing Frequencies
4. Retrospective Observational Study of Regularly-Scheduled Sustained-Release Hydromorphone in Orthopedic Surgery
5. Clinical Benefits and Economic Impact of Surgical Pharmacists at Capital Health: Preliminary Results
6. Provision of an 8 hour Clinical and Distributional Pharmacy Service for a Neonatal Intensive Care Unit (NICU) at a Tertiary Care Facility
7. Intégration d'une base de données de produits de santé naturels à un progiciel pharmacie en établissement de santé
8. Daily Dalteparin for the Treatment of Pulmonary Embolism in a Hemodialysis Patient
9. Long Term Effect of a 30% Ethanol / 4% Sodium Citrate Locking Solution on the Mechanical Properties of Hemodialysis Catheters
10. A Retrospective Comparison of the Cockcroft-Gault and Modified Diet in Renal Disease Equations for Renal Dosing of Oseltamivir in Continuing Care Patients
11. Comparing Continuously-Infused Amphotericin-B with Liposomal Amphotericin: A Monte Carlo Analysis
12. The Utility of Acetaminophen Absorption Testing in the Critically Ill
13. Benefit of Achieving Higher AUC/MIC Targets with Ciprofloxacin when Treating Enterobacteriaceae Bloodstream Infections
14. Selecting the Best Empirical Therapy for Patients in Canadian Intensive Care Units
15. Therapeutic Monitoring of Doxycycline in Q Fever Endocarditis
16. Hospital-wide Multidisciplinary Intervention Improves Prescribing for Prophylaxis of the Most Common Preventable Cause of Hospital Deaths
17. Establishing an Interprofessional Medication Reconciliation Process for Elective Surgery Patients

Poster abstracts are published exactly as submitted by the authors and have not undergone any copyediting by the Canadian Journal of Hospital Pharmacy.

Le Journal canadien de la pharmacie hospitalière *n'a pas soumis les résumés des affiches à une révision linguistique et les publie ici tels que remis par les auteurs.*

CSHP Summer Educational Sessions (SES) 2009: Poster Abstracts / Séances éducatives d'été (SÉÉ) 2009 de la SCPH : Résumés des affiches

Monday, August 10, 2009 ·
Lundi 10 août 2009
Viewing/Affichage : 1010–1040
Presentations/Présentations : 1230–1400

1. Conversion from Darbepoetin Alfa to Epoetin Alfa for the Treatment of Anemia Associated with Chronic Kidney Disease in Dialysis Patients
2. New Brunswick (NB) Heart Centre Health Improvement Challenge
3. Development and Implementation of a Clinical Performance Assessment Tool
4. Development of a Regional Program for the Safe Handling of Hazardous Drugs by Hospital Pharmacies
5. Pharmaceutical Care in a Prehabilitation Clinic for Patients Undergoing Elective Total Joint Arthroplasty
6. A Regional Continuing Professional Development Program for Hospital Pharmacy Technicians
7. Adherence to Thromboprophylaxis in Post-Orthopedic Surgery Patients at a Community Hospital
8. Unusual Presentation of Heparin-Induced Thrombocytopenia Due to Dalteparin
9. Implementation and Evaluation of a Database for "Non-Formulary" Anticancer Drug Requests at CancerCare Manitoba
10. Concurrent Development of a Prescriber Order Entry System with a Bidirectional Pharmacy Interface
11. A Systematic Review of Voluven® vs. Pentaspan® for Volume Expansion in Surgery
12. Establishing a Process for Pharmacy Technician Initiated Medication Histories in the Emergency Department
13. Using a Web Based Community of Practice to Drive Change with Medication Reconciliation
14. Implementation of a First Dose Antibiotic Pharmacy Program to Ensure Timely Delivery of Antibiotics to Patient Care Areas
15. A Computerized Pharmacy Generated Medication Reconciliation Process for Transfer from the Intensive Care Unit Reduces Discrepancies and Order Writing Time
16. Medication Reconciliation: Towards a "Best Practice Medication Discharge Plan" in a Pediatric Hospital
17. Impact of the Medical Home on the Safety and Quality of Health care in Canada
18. Identifying, Understanding, and Overcoming Barriers to Medication Error Reporting in Hospitals in Nova Scotia, Canada
19. Latent Opportunities for Errors in Medication Orders in Four Health Authorities

Poster abstracts are published exactly as submitted by the authors and have not undergone any copyediting by the Canadian Journal of Hospital Pharmacy.

Le Journal canadien de la pharmacie hospitalière *n'a pas soumis les résumés des affiches à une révision linguistique et les publie ici tels que remis par les auteurs.*

Switching Hemodialysis Patients from Epoetin Alfa in Multi-Dose Vials to Pre-Filled Syringes is Associated with Cost Savings

Lori D Wazny, Colette B Raymond, Michelle K Do, Dan E Skwarchuk, CGA

Winnipeg Regional Health Authority / Manitoba Renal Program, Department of Pharmaceutical Services, Health Sciences Centre, Winnipeg, MB

Objective: In April 2008, the Manitoba Renal Program (MRP) converted all hemodialysis (HD) patients receiving epoetin alfa (EPO) from multi-dose vials (MDV) to pre-filled syringes (PFS) because of safety needle legislation, convenience, and a potential to reduce wastage. The purpose of this study was to evaluate EPO drug costs in patients receiving HD after a province-wide switch from MDV to PFS.

Methods: A retrospective study of EPO drug costs during a six-month MDV usage period (July – December of 2007) versus a six-month PFS usage period (July – December of 2008). Study patients were all individuals on HD receiving EPO in the MRP. Data were collected from quarterly counts of the number of patients receiving EPO and monthly inventory billing records.

Results: The average dose and cost per patient per week for EPO MDV were compared to those of EPO PFS. In 2007, an average of 756 patients received EPO MDV and was compared to 799 patients receiving EPO PFS in 2008. The average dose per patient per week was 13,282 units with MDV, versus 11,689 units with PFS. The average cost per patient per week was $195.71 with MDV, and $183.23 with PFS. This translated to an estimated $12.48 per patient per week in savings ($518,519 annual savings across the MRP)

Conclusion: The switch from epoetin alfa MDV to PFS saved money likely as a result of reduced drug wastage. Renal programs across Canada should consider cost savings when evaluating a switch to PFS.

Sodium Thiosulfate-Based Treatment in Calcific Uremic Arteriolopathy: A Provincial Case Series

Amy Sood, Lori Wazny, Colette Raymond, Kelvin Leung, Paul Komenda, Martina Reslerova, Mauro Verrelli, Claudio Rigatto, Manish Sood

University of Manitoba; Manitoba Renal Program, Winnipeg, MB

Calcific uremic arteriolopathy (CUA) is associated with high mortality rates of 45-55%. Case reports have suggested marked improvement in CUA with sodium thiosulfate (STS). We describe our experience with STS in 6 consecutive patients with CUA, the largest cases series to date.

Patients diagnosed with CUA who received STS in Manitoba between Oct 2006 and July 2008 were included. Demographic, clinical and laboratory data were abstracted by chart review. We measured mortality, radiographic or wound size regression and changes in pain as estimated by type and dose of analgesic required. Response was defined as improvement in at least 1 of 3 parameters: pain, wound size or radiographic findings.

Six patients with CUA diagnosis confirmed by biopsy (2/6) and/or bone scan (5/6) received STS. All patients were receiving chronic dialysis (4 peritoneal), and five were female with a mean age of 50 years. Treatment with STS 25g iv thrice weekly was initiated within 8 weeks of diagnosis in 5 patients with an average duration of 12.5 weeks. Patients also received pamidronate (5/6), wound care (5/6) and conversion to hemodialysis (3/4). Four patients showed improvement, 2 patients showed no response. Overall mortality was 50%, and all deaths occurred within 6 months. Among the 4 responders, mortality remained at 50%. In the two patients responding to all 3 parameters, radiographic regression occurred early (1 month) and reduction in pain and wound size was evident by 3 months. Adverse events included nausea, vomiting and anion gap metabolic acidosis. Estimated mean cost of the drug was $35,500 per patient.

Our case series describing a STS-based treatment for CUA had similar mortality rates to those reported in the literature without use of STS. The positive findings in previous reports of STS use may represent publication bias. Further evaluation is needed of this high cost treatment.

Encore Presentation

Process Flow for Erythropoiesis Stimulating Agents (ESA) Delivery to Hemodyalisis (HD) Patients at Toronto General Hospital – Process Optimization and Impact Analysis of Alternative Dosing Frequencies

E. Fung[1], E. Musing[1], A. Tanghe[2], K. Butaye[2]

[1]University Health Network, Toronto, ON; [2]Health Information Communication Technology (hict), Bruges, Belgium

Rationale: Delivering ESA therapy to HD patients is complex and requires a significant amount of operational resources. To the best of knowledge, there has not been any systematic investigation of ESA delivery in hospitals in Canada, including an impact assessment for Alternative Dosing Frequencies (ADF).

Description: The study assessed the entire process of ESA delivery to HD patients at Toronto General Hospital (TGH), including defining process improvements. Additionally, the benefits of ADF for ESAs were identified and quantified.

Steps: A conceptual model was developed to characterize the base processes related to delivering ESAs in a pharmacy, dialysis unit, waste unit and back-office. Observation of the entire flow of an ESA-syringe throughout TGH and structured interviews with staff were used to develop a comprehensive list of processes and activities. Consumed resources were measured and resource costs were derived from the accounting records. A calculation model captured resource changes when switching from three-times-a-week to once-a-week dosing of ESAs. Inventories, procedures, layouts, etc. were also analyzed.

Evaluation: Optimization suggestions were formulated for all departments. For Pharmacy this involved improvements on dispensing methods and frequency, ESA inventory and the order process (i.e. how orders are initiated and placed). Suggestions were formulated to improve the layout of the HD units, patient files, waiting times, etc. Optimization of the ESA reimbursement application also resulted out of the study. Switching from three-times-a-week to current once-a-week dosing of ESAs resulted in an 83% labour and material cost reduction in the departments.

Importance: The study demonstrated that using a systematic assessment can result in process-related efficiency gains. As a follow-up on this study, the Pharmacy implemented several recommendations, e.g. streamlining the supply of ESAs to HD units in order to reduce holding costs and improve efficiency. Finally, the study demonstrated that ADF may provide significant cost savings for TGH.

Retrospective Observational Study of Regularly-Scheduled Sustained-Release Hydromorphone in Orthopedic Surgery

C. Huber and N. Bisson

Concordia Hospital, Winnipeg, MB

Rationale: A sustained-release hydromorphone (SRHM) protocol was developed for pain management in orthopedics. No published studies to date describe use of SRHM in this setting.

Patients receive SRHM on post-operative days (POD) 1 and 2 with a dose reduction on POD 3. Patients also receive pre-operative analgesia, peri-articular injections and post-operative immediate-release hydromorphone (IRHM), patient controlled analgesia (PCA) and/or non-narcotic analgesics.

Objectives: To review the safety and efficacy of a SRHM protocol in primary knee and hip arthroplasty.

Methods: A retrospective chart audit of a random convenience sample of patients prescribed the SRHM protocol (January to June 2008) was completed. Endpoints included: pain and sedation scores (POD 1 and 2), nausea, perioperative prescribing patterns and PCA duration.

Results: Forty-six charts were reviewed, 20 charts were excluded for missing medication administration records. We included 26 patients (58% female, mean age 64.8 years); 53.8% underwent total hip arthroplasty. Mean daily narcotic dose prior to admission was 1.7 mg ± 6.5 mg hydromorphone equivalents. The majority received pre-operative analgesia (88.5% SRHM, 50% celecoxib, 96.2% gabapentin, 96.2% acetaminophen) and 100% received peri-articular nerve blocks. PCA duration was short (mean 18.8 hrs). SRHM accounted for 40% of the daily narcotic dose on POD 1 and 2 with increasing IRHM from POD 3 onward. Mean daily doses of SRHM were 9.6 mg, 8.4 mg and 4 mg while mean daily doses of IRHM were 12.5 mg, 11 mg and 7 mg on POD 1, 2 and 3, respectively.

Eighty-six percent and 71% had pain scores < 3/10 on POD 0 and 1, respectively. On POD 0 and 1, mean sedation score was 1.2 (0= alert, 4 = responds only to painful stimuli) with 27% and 31% experiencing nausea requiring anti-emetics. No naloxone doses were administered.

Conclusions: This review of a SRHM protocol for primary knee and hip arthroplasty suggests efficacy and safety similar to what is reported in the literature for other settings.

Key Words: Hydromorphone sustained-release, Hydromorphone Contin, Knee and Hip Arthroplasty

Clinical Benefits and Economic Impact of Surgical Pharmacists at Capital Health: Preliminary Results

Heather Lummis[1], Bernadette Chevalier[1], Lisa Nodwell[1], Brent Hawrylak[1], Sophie Poirier[1], Chris Daley[1], Amanda Jacques[2], Claudia Harding[1], Tammy MacDonald[3], Sandra Westhaver[3], Anne Hiltz[1], Neil MacKinnon[2], Kathy Slayter[1,2]

[1]Pharmacy Department, Capital Health; [2]College of Pharmacy, Dalhousie University; [3]Department of Surgery, Capital Health; Halifax, NS

Rationale: Clinical pharmacists can improve the quality of patient care by reducing adverse drug events (ADE), length of stay, and mortality. This impact has been inadequately evaluated in specialty areas such as surgery. Two fulltime clinical pharmacist positions were added to a general surgery service in September 2009.

Objectives: To evaluate the impact of surgical pharmacists on processes of care and on clinical and economic outcomes.

Study Design and Methods: This is a prospective, 6 month observational study of a 50 bed general surgery/gastroenterology service on 9A and 9B, Victoria General site. All clinical activities including patient interventions and resolution of drug related problems are documented. Interventions are rated for severity, value and probability of preventing an ADE. Cost savings (direct costs) and cost avoidance (indirect costs) are estimated. Cost avoidance is calculated using two methods from the literature, either by avoiding 4.6 days of additional hospital stay ($3593/ADE) or additional hospital costs ($8187/ADE). Two investigators independently categorize the interventions and disagreements are resolved by consensus. Data analysis is descriptive.

Results: In the first 4 months, there were 790 interventions (mean 5.1 interventions/day) of which 64% were of moderate to high significance. It was estimated that 54% of interventions had a 40-60% probability of preventing an ADE. Pharmacists also performed 232 medication reconciliations, made 252 telephone calls to community pharmacies, counseled 207 patients on 847 medications, and attended 133 patient care rounds. Cost savings were calculated to be $15,425 (mean $3856/month). The mean cost avoidance per intervention ranged from $654 – 1490 (depending on the method used).

Conclusion: These preliminary results indicate that pharmacists have made a substantial clinical impact on a surgical service in the first four months. The majority of patient interventions have resulted in improved patient care, drug cost savings and cost avoidance.

Provision of an 8 hour Clinical and Distributional Pharmacy Service for a Neonatal Intensive Care Unit (NICU) at a Tertiary Care Facility

Sheri Dyck

St. Boniface General Hospital, Winnipeg, MB

Rationale: Current funding and human resources do not lend themselves to 24 hour pharmacy services. This vulnerable and specialized patient population at St. Boniface General Hospital had historically been serviced using a traditional dispensing model from a combined adult/child central pharmacy and part time clinical services. Using a modified approach, an integrated clinical and unit dose distribution service was implemented requiring no capital monies and funding for 1 FTE pharmacist and 2 FTE technicians.

Concept: A pharmacy satellite located in close proximity to the NICU would have been ideal. Since funding and space were lacking a modified approach was taken. A clinical pharmacist is assigned to NICU 7 days a week from 07:30-16:00. In that same time frame, 1-2 pharmacy technicians work from the Central Pharmacy to prepare oral and IV unit dose medications.

Project Development: An implementation team was struck comprising of Pharmacy staff, nurse managers and a physician. Decisions were based on pharmacy service survey results that had been obtained from NICU nurses and physicians one year prior. A phase in approach was outlined beginning with full time clinical pharmacy services, followed by oral medications and then completed with IV admixtures. The phase in period occurred over 3 months.

Evaluation: A 6-month post implementation survey of the NICU staff has been completed (April 2009). Thirty nurses, 3 physicians and 2 Allied Health completed the survey which was a 44% response rate. Even with limited resources and time 86% of respondents agreed that pharmacists significantly contribute to the team, 91% agreed that the pharmacists contribute to overall patient and medication safety, and 80% of nurses agreed that the distribution service met their needs.

Usefulness to Practise: This has demonstrated that with limited resources and space, an effective and valued clinical and distributional pharmacy service can be established.

Intégration d'une base de données de produits de santé naturels à un progiciel pharmacie en établissement de santé

Denis Lebel, Guillaume Faubert, Jean-François Bussières

CHU Sainte-Justine, Montréal, QC

Mise en contexte : Il existe peu de données sur l'utilisation de base de données de produits de santé naturels en établissements de santé.

Concept : Il s'agit d'une étude descriptive avec démonstration de faisabilité menée au sein du CHU Sainte-Justine, Montréal, QC, Canada. Le concept repose sur la génération d'un rapport web de produits de santé naturels ayant un potentiel d'interaction avec les ordonnances actives de médicaments de chaque patient hospitalisé. Deux bases de données ont été comparées (Natural Standard® et Natural Medicines Comprehensive Database®).

Évaluation du projet : À partir d'une revue documentaire et d'une évaluation des deux bases données en ligne, nous avons retenu la base Natural Standard®. Nous avons développé un rapport en asp.net intégré à l'intranet pharmacie permettant l'affichage d'une liste de patients provenant du dossier pharmacologique informatisé (GesphaRx®, Québec QC) pour les pharmaciens à l'étage. Cette liste peut être imprimée à partir d'un accès réservé aux utilisateurs de la pharmacie pour l'affichage en temps réel par unité de soins de la liste des interventions cliniques actives, de la liste des dénominations communes de médicaments pour les ordonnances actives et de la liste des dénominations communes de médicaments incluant tous les paires d'interactions potentielles médicaments actifs-produits de santé naturels. Un total de 53 895 paires d'interactions et de 1512 dénominations communes de médicaments ont été importés de Natural Standard®. Un total de 1765 paires de dénominations communes de Natural Standard® et de GesphaRx® ont été liées manuellement.

Importance du concept : Il existe peu de données en ce qui concerne l'intégration de bases de données de produits de santé naturels à des dossiers pharmacologiques informatisés. Cette étude de faisabilité décrit le concept permettant l'intégration de près de 60 000 paires d'interactions médicaments-PSN dans un affichage web en temps réel en établissement de santé.

Daily Dalteparin for the Treatment of Pulmonary Embolism in a Hemodialysis Patient

Cory Lang and Rob Ariano

St. Boniface General Hospital, Winnipeg, MB

Low molecular weight heparins (LMWH) are cautioned in patients with severe renal impairment (creatinine clearance < 30ml/min/1.73m^2) as 70% of the drug is excreted unchanged in the urine. Administration of LMWH's to patients with renal impairment has been shown to result in prolongation of anti-Xa activity. The half life of dalteparin in normal renal function is 2 hours and is extended to 5.7 hours in hemodialysis patients. This pharmacokinetic profile would suggest the potential for drug accumulation and an increased risk of bleeding in those with end stage renal disease (ESRD).

We describe a case of a 53 year old, 80 kg female who had been on hemodialysis for 19 months when she was diagnosed with multiple subacute pulmonary emboli (PE). Subcutaneous dalteparin 10,000 IU daily (125 IU/kg) was initiated and continued for 26 days without bleeding complications. Two anti-Xa concentrations were performed on days 6 and 21, and were 0.78 IU/mL and 0.77 IU/mL, respectively (desired 0.5 to 1.5 IU/mL). This empiric dosage reduction from the standard 200 IU/kg resulted in a therapeutic, non-accumulating peak concentration. The associated pharmacokinetically modeled t ½ (half-life) was 7.8 hours, while Vd/F (volume of distribution) was 0.12 L/kg.

Dalteparin has been used in prophylactic dosages at 2500 IU thrice weekly, prior to hemodialysis to prevent catheter occlusion, with no evidence of accumulation. This is the first case report examining the actual pharmacokinetics of dalteparin after multiple treatment doses in a hemodialysis patient.

With no evidence supporting the safe use of LMWH in patients with ESRD, hemodialysis patients often require hospital admission for full heparin anticoagulation. Therapeutic drug monitoring with reduced-dose dalteparin, however may offer an attractive alternative for therapy in those with ESRD.

Long Term Effect of a 30% Ethanol / 4% Sodium Citrate Locking Solution on the Mechanical Properties of Hemodialysis Catheters

Lavern M. Vercaigne[1,2], Teresa A. Takla[1], J. Raghavan[3]

[1]Faculty of Pharmacy, University of Manitoba, Winnipeg, [2]Manitoba Renal Program, Winnipeg ,[3]Composite Materials and Structures Research Group, Mechanical and Manufacturing Engineering Department, Faculty of Engineering, University of Manitoba, Winnipeg, MB

Rationale: Catheter-related infections in the hemodialysis population increase mortality rates. Development of novel catheter locking solutions to prevent catheter-related infections is required. New locking solutions must be compatible with hemodialysis catheters.

Objective: To investigate the effect of a novel 30% ethanol / 4% sodium citrate catheter locking solution on the mechanical properties of hemodialysis catheters made of carbothane over 36 weeks.

Study Design and Methods: Twenty one hemodialysis catheters were used in this study. Three catheters, not exposed to locking solutions, underwent mechanical testing to determine baseline properties. Nine of the remaining eighteen catheters were filled with normal saline and underwent mechanical testing in groups of 3 at 12, 24, and 36 weeks. Similarly, 9 catheters were filled with the 30% ethanol / 4% sodium citrate locking solution and tested in a similar manner.

Results: The average force required to break the catheter lumens tended to be smaller in the catheters exposed to 30% ethanol / 4% sodium citrate compared to saline controls at 12 and 24 weeks, however there were no statistically significant differences between the groups after 36 weeks of exposure.

Lower Catheter Segments	Force at Break (Newtons; Mean ± SD)		P value*
	Saline	Ethanol / sodium citrate	
12 weeks	206.1±39.5	143.0±24.8	0.015
24 weeks	258.7±29.7	191.0±40.6	0.010
36 weeks	164.7±24.1	164.8±11.9	0.998

* = Analysis of Variance (ANOVA)

The forces required to break these hemodialysis catheters (>140 Newtons (N)) are magnitudes greater than forces generated during a typical hemodialysis session (1 N).

Conclusions: A 30% ethanol / 4% sodium citrate locking solution had minimal effects on the mechanical properties of hemodialysis catheters made of carbothane. Further studies are required to determine the efficacy and safety of this novel catheter locking solution in the hemodialysis population.

A Retrospective Comparison of the Cockcroft-Gault and Modified Diet in Renal Disease Equations for Renal Dosing of Oseltamivir in Continuing Care Patients

Geoffrey Norris, Adrienne Lindblad, Kristie McCue, Arron Service

Alberta Health Services, Red Deer, AB

Rationale: Oseltamivir is administered daily for influenza prophylaxis in continuing care. In renal dysfunction (<30 ml/min), every other day dosing is used. Frequency of dosing is determined manually by the weightless Cockcroft-Gault (WCG) or actual body weight Cockcroft-Gault (CG-ABW) equations. The 4-variable Modified Diet in Renal Disease (MDRD) equation provided by laboratory is more convenient but has not been compared to WCG and CG-ABW for drug dosing.

Objective: To compare the number of patients who would require daily versus every other day dosing of oseltamivir for influenza prophylaxis in continuing care, using the WCG, CG-ABW and MDRD equations.

Methods: This retrospective review included patients from 6 continuing care facilities within central Alberta using electronic patient medical records. Renal function and dosing estimates were calculated via the MDRD, WCG and CG-ABW equations using the most recent serum creatinine available and compared using a repeated measures chi-square test. Examination of differences in patient age were also conducted using an analysis of variance.

Results: Included were 538 patients. The percent of patients who would require every other day dosing was higher using CG-ABW than either WCG or MDRD (18.35%, 6.42%, 2.52%, respectively, $p < 0.001$). Those requiring daily dosing were younger than those requiring every other day dosing when using WCG (mean 82.71 vs 89.63 years, $p < 0.001$) and CG-ABW (81.57 vs 90.25 years, $p < 0.001$). This difference was not observed with MDRD (83.21 vs 84.20, $p = 0.719$).

Conclusions: No difference was found between the WCG and MDRD dosing recommendations. However, CG-ABW would have resulted in significantly more patients receiving every other day dosing of oseltamivir than WCG or MDRD. Unlike CG-ABW or WCG, the MDRD equation did not result in dose adjustments in older patients. Whether this leads to higher, inappropriate dosing is unknown.

Encore Presentation

Comparing Continuously-Infused Amphotericin-B with Liposomal Amphotericin: A Monte Carlo Analysis

Robert Ariano[1,2], Sheryl Zelenitsky[1,2]

[1]St. Boniface General Hospital, Winnipeg, MB; [2]Faculty of Pharmacy, University of Manitoba, Winnipeg, MB

Background: Liposomal amphotericin-B (L-AmB) has long been touted as a safer alternative to traditional amphotericin-B deoxycholate (AmB-d). In addition, continuously-infused AmB-d has been demonstrated to be less nephrotoxic than intermittent bolus dosing with the drug. There is a notable absence of literature, however, comparing L-AmB to continuously-infused AmB-d.

Objective: Our objective was to compare Monte Carlo generated free 'pharmacological' active drug concentrations between L-AmB and 2 different methods of AmB-d administration.

Setting and Methods: 500 critically ill patients were simulated with Monte Carlo analysis with an average body weight of 72 ± 12 kg. Body weight provided the covariate for the individualized volume of distribution of the central compartment in a 3-compartment amphotericin-B open model. Pharmacokinetic parameters derived from prior pharmacokinetic research on both L-AmB and AmB-d were utilized to generate free-concentration time profiles for each patient; such that average and peak concentrations could be compared between AmB products and methods of administration. These profiles were based on the regimens of 3 mg/kg/day for L-AmB, 0.6 mg/kg bolus per day for AmB-d, and 1 mg/kg/day of continuously-infused AmB-d.

Results: Continuously-infused (CI) AmB-d at 1 mg/kg/day generated concentrations at least 50% higher than the average concentrations achieved from intermittent boluses with 0.6 mg/kg per day. Free amphotericin-B concentrations provided by CI AmB-d were at least 5 times higher than average free concentrations achieved by intermittent dosing with L-AmB.

Conclusions: Prior research supports the safety of CI AmB-d over bolus method of administration, and this new evidence supports that concentrations of the antifungal are actually higher with this method. In addition, with greater free 'pharmacologically active' concentrations of AmB achieved with CI over L-AmB and its safety established, we recommend its immediate use in place of L-AmB.

The Utility of Acetaminophen Absorption Testing in the Critically Ill

Robert Ariano[1,2], Sheryl Zelenitsky[1,2], Joel Zivot[1], Rakesh Arora[1] & the CHaRM investigators

[1]St. Boniface General Hospital, Winnipeg, MB, [2]Faculty of Pharmacy, University of Manitoba, Winnipeg, MB

Objective: To examine the utility of performing acetaminophen absorption testing in critically ill patients. The ability to absorb greater than 50% of orally administered acetaminophen was used as a decision tool for transitioning patients from parenteral over to oral medication therapies.

Setting and Methods: A sampling of 12 critically ill patients who had acetaminophen absorption testing performed for clinical evaluation of their gastric emptying function was examined. Patients had 3 acetaminophen concentrations measured at ½ hour, 1 hour, and 2 hours after a standard nasogastric dose of either 650 mg or 975 mg (if >90 kg) of acetaminophen suspension. Non-linear least squares regression analysis was performed and all concentrations were weighted to the reciprocal of their assay error variance. Relative bioavailability to population expected values for that patient's body weight was generated, as well as pharmacokinetic parameters for the oral administration of acetaminophen.

Results: The patient demographics were: 60 ± 15 yrs of age, 87 ± 22 kg, and 75% male. The calculated pharmacokinetic parameters were: Vd/F = 0.76 ± 0.25 L/kg, t ½ of elimination = 0.88 hrs (0.77 – 2 hours, 25% - 75%-tiles), t ½ absorption = 6.5 mins (1.5 – 10.2 mins, 25% - 75%-tiles), lag time = 9 mins (0 – 24 mins, 25% - 75%-tiles), and an average oral bioavailability of 75% (53% - 85%, 25% - 75%-tiles). Three patients (25%) failed testing for adequacy of gastric emptying function, with relative bioavailabilities of 17%, 42%, and 49%, respectively. The remaining 9 patients were transitioned to oral drug therapies based on positive test results.

Conclusions: The relative overall bioavailability of acetaminophen was high in our population, with 75% able to transition over to oral therapies. Acetaminophen absorption testing may have utility in the critically ill as a medication decision tool for conversion from parenteral to oral drug administration.

Benefit of Achieving Higher AUC/MIC Targets with Ciprofloxacin when Treating Enterobacteriaceae Bloodstream Infections

S. Zelenitsky[1,2], R. Ariano[1,2], D. Collins[1]

[1]University of Manitoba and [2]St. Boniface General Hospital, Winnipeg, MB

Objective: Initial study of ciprofloxacin pharmacodynamics (PDs) in nosocomial infections found that AUC(total)/MICs exceeding 125 were associated with improved outcomes, and values less than 100 were linked to emergence of resistance during therapy. Given the important role that ciprofloxacin retains in treating Gram negative infections, our goal was to further characterize ciprofloxacin PDs in a population of patients with Enterobacteriaceae bloodstream infection (BSI).

Methods: 178 cases of Enterobacteriaceae BSI were characterized from medical records. Isolates were retrieved and MICs measured using Etest®. PD analysis with multivariate logistic regression was conducted in 42 eligible patients who received ciprofloxacin within 24 hours of a positive blood culture. Monte Carlo simulations (MCSs) were generated to evaluate the PDs of ciprofloxacin dosing in cohorts of 5000 study subjects using clinically relevant patient demographics, validated population PK model and local MIC distributions.

Results: Consistent with previous investigations, ciprofloxacin AUC/MIC was significantly associated with treatment outcome. However, additional benefit was observed beyond the AUC/MIC target of 125 to one exceeding 250. Factors significantly associated with treatment failure in descending order of significance were low AUC/MIC, high MIC, male and low AUC. In multivariate analysis, both AUC/MIC (P = 0.04) and MIC (P = 0.048) were factors significantly associated with failure, however only AUC/MIC (P = 0.046) remained after excluding two cases with ciprofloxacin-resistant isolates. An AUC/MIC threshold of 250 was most notable with cure rates of 91.4% (32/35) and 28.6% (2/7) in cases above and below this value. (P = 0.001) Based on MCSs, standard ciprofloxacin dosing would achieve this target with 0.88 probability.

Conclusion: A ciprofloxacin AUC/MIC target above 250, as opposed to the more conventional 125, proved most significant for optimizing clinical cure. Although standard ciprofloxacin dosing should effectively achieve this threshold when treating Enterobacteriaceae BSIs, these results raise question for more resistant infections.

Encore Presentation

Selecting the Best Empirical Therapy for Patients in Canadian Intensive Care Units

S. Zelenitsky[1,2], R. Ariano[1,2], G.Zhanel[1,3]

[1]University of Manitoba, [2]St. Boniface General Hospital and [3]Health Sciences Centre, Winnipeg, MB

Objective: Selecting appropriate empirical antibiotics is associated with improved outcomes including reduced mortality especially in high-risk patients like the critically ill. Using Monte Carlo Simulations (MCSs), this study tested the target attainment of various empirical monotherapies for pathogens in Canadian intensive care units (ICUs).

Methods: MCSs were used to generate cohorts of 5 000 adult patients with infection and empirical monotherapy including meropenem, piperacillin-tazobactam, cefepime and ceftobiprole. Recommended dosing and alternate regimens (eg, prolonged infusions) were tested. Population-PK models were used to simulate individual free concentration profiles in relation to pathogen MIC profiles from a 2005/06 national surveillance study of isolates from Canadian ICUs. Probability of target attainment (PTA) was determined for the PD index, $fT_{>MIC}$ >40% and >80%, as a suggested target for the critically ill.

Results: Recommended dosing of ceftobiprole (0.5g q8h over 2 hrs) had an overall PTA of 0.95, whereas meropenem (1g q8h), piperacillin-tazobactam (4.5g q6h) and cefepime (2g q8h) achieved 40% $fT_{>MIC}$ with probabilities of 0.88, 0.88 and 0.89, respectively. More discrimination was evident in PTAs for >80% $fT_{>MIC}$ with ceftobiprole (0.91 PTA) and cefepime (0.88), followed meropenem (0.81) and piperacillin-tazobactam (0.73). Prolonged infusions of meropenem, piperacillin-tazobactam and cefepime over 2 to 3 hrs did not improve the standard 0.5 hr infusion. Significant differences among therapies were evident if *P.aeruginosa* was isolated with cefepime (0.97 PTA) performing best compared to meropenem (0.84), piperacillin-tazobactam (0.81) and ceftobiprole (0.77) in achieving >40% $fT_{>MIC}$. Cefepime (0.94) also maintained *P.aeruginosa* coverage for >80% $fT_{>MIC}$, but there were significant reductions for meropenem (0.62), piperacillin-tazobactam (0.43) and ceftobiprole (0.58).

Conclusion: Ceftobiprole provided the best overall empirical therapy compared to meropenem, piperacillin-tazobactam and cefepime for patients in Canadian ICUs, but not if *P.aeruginosa* was isolated where cefepime was most active and combination therapy may be required.

Encore Presentation

Therapeutic Monitoring of Doxycycline in Q Fever Endocarditis

I fan Kuo[1], Sheryl Zelenitsky[2,3], Robert Ariano[2,3], Evelyn Lo[2,3]

[1]University of British Columbia, Vancouver, BC; [2]University of Manitoba and [3]St. Boniface General Hospital, Winnipeg, MB

Q fever is a zoonotic disease caused by *Coxiella burnetii*, a Gram negative, spore-forming bacteria. Q fever is an important cause of culture-negative endocarditis which is associated with high rates of morbidity and mortality. The recommended treatment includes combination therapy with doxycycline and hydroxychloroquine. Although this regimen has demonstrated advantages over other therapies, patients still require prolonged treatment (i.e., 18–24 months) and many experience relapse of the infection. Recent observational studies suggest significant correlations between doxycycline serum concentrations and treatment response as determined by antibody levels.

A case of Q fever endocarditis in a 39 year-old male patient (97 kg) who underwent bicuspid aortic valve replacement is described. Endocarditis was first suspected during surgery, and the patient received 2 weeks of empirical antibiotics post-operatively for culture-negative endocarditis. The diagnosis of Q fever was made based on serology, and the patient was started on doxycycline 100 mg twice daily and hydroxychloroquine 200 mg thrice daily as recommended. Given the recently demonstrated value of therapeutic monitoring, a pharmacodynamic analysis of doxycyline in this patient was performed. Pharmacokinetic (PK) modeling was used to simulate doxycycline serum concentrations in relation to the expected MIC (minimum inhibitory concentration) for *C. burnetii* obtained from the literature. Given the variability in doxycyline PKs and effect of patient-specific factors such as body weight, it was found that significant under-dosing and poor pharmacodynamic target attainment was likely.

This report reviews the use of doxycycline in the treatment of Q fever endocarditis including pharmacodynamic correlations with clinical outcome. It also highlights the risk of treatment failure resulting from fixed-dosing and variable PKs, and demonstrates the use of therapeutic drug monitoring to optimize therapy in such cases.

Hospital-wide Multidisciplinary Intervention Improves Prescribing for Prophylaxis of the Most Common Preventable Cause of Hospital Deaths

Jan Coates, Julie Mistri

Victoria General Hospital, Winnipeg, MB

Rationale: Few studies describe hospital wide interventions that engage all hospital staff and patients to improve evidence based prescribing of prophylaxis for VTE.

Description of Concept: We sought to improve prescribing for thromboprophylaxis at a community hospital through engaging multiple health disciplines in development and implementation of a hospital wide intervention

Steps Taken to Develop New Program: We implemented a multifaceted educational and policy intervention in March 2009. We developed a hospital wide prescribing policy in adherence to the 8th American College of Chest Physicians (ACCP) practice guidelines requiring patient assessment for VTE risk, subsequent prophylaxis where indicated, and documentation if no prophylaxis is ordered. The procedure provided guidance for VTE risk assessment, thromboprophylaxis options, daily monitoring requirements, and reference to bridging therapy. With this policy as a framework, preprinted orders for prophylaxis (including choice of low molecular weight heparin, low dose heparin or mechanical) were added to existing standing order sets for all admitted hospital patients (except psychiatry). Finally, an education campaign was developed including grand rounds presented by the medicine director, face to face presentations with nursing and support staff, and printed (posters, table tent cards, and pamphlets) for all hospital staff and public.

Evaluation: Charts for all admitted medical and ICU patients were reviewed for thromboprophylaxis appropriateness on a single day before (February 2009) and after (April, 2009) the intervention. Appropriateness was determined by assessing indication for VTE prophylaxis, contraindication to pharmacologic VTE prophylaxis, and current status of VTE prophylaxis (pharmacologic and mechanical). Of all patients who had an indication for thromboprophylaxis at baseline 30/57 (52.6%) were receiving prophylaxis. On repeat audit 6 weeks after intervention, this increased to 47/57 (82.4%)

Importance to Practice: We demonstrated that a hospital wide multidisciplinary intervention including a prescribing policy, preprinted orders and education, improved prescribing of thromboprophylaxis for medical patients.

Establishing an Interprofessional Medication Reconciliation Process for Elective Surgery Patients

Cong Xie, Jan Coates

Victoria General Hospital, Winnipeg, MB

Rationale: Admitting medication orders for elective surgical patients are a source of medication discrepancies and medication errors.

Description of Concept: We sought to develop a medication reconciliation process for elective surgery patients that could be completed by any health professional and which would decreased medication discrepancies as compared to the traditional nurse led preoperative clinic interview.

Steps Taken to Develop New Program: We reviewed the literature and consulted with multiple surgery program stakeholders. We developed a new medication reconciliation process which consisted of a telephone interview following a standardized script, completion of a medication reconciliation form, and a protocol to discontinue non-prescription and herbal medications. The new medication reconciliation process was implemented in summer 2008. Home medications were compared to hospital orders to determine medication discrepancies and incomplete orders using a retrospective chart review before and after the new medication reconciliation process. Nurse and pharmacist satisfaction with the new medication reconciliation process was evaluated before and after implementation.

Evaluation: Home medication histories for 32 patients were reviewed to evaluate the traditional nurse led preoperative clinic interview, and compared to 46 patients who had the new medication reconciliation process. The mean number of discrepancies per patient decreased from 2.57 to 0.54 ($p<0.05$) with the new process. The mean number of medication orders with incomplete information decreased from 1.5 to 0.26 per patient ($p<0.05$). Time for patients to receive home medications decreased from 0.62 to 0.27 days, ($p<0.05$). Six (75%) nurses and 6(100%) pharmacists felt that the new process improved knowledge of the patient's medication history.

Importance to Practice: We developed a medication reconciliation process for elective surgery patients which can be completed by any health professional, serves to streamline and standardize admitting medication orders and reduce medication discrepancies.

Conversion from Darbepoetin Alfa to Epoetin Alfa for the Treatment of Anemia Associated with Chronic Kidney Disease in Dialysis Patients

Colette B Raymond, Lori D Wazny

Winnipeg Regional Health Authority / Manitoba Renal Program, Department of Pharmaceutical Services, Health Sciences Centre, Winnipeg, MB

Objective: This initiative sought to describe dose conversion ratios between darbepoetin alfa and epoetin alfa for Manitoba Renal Program patients after a province-wide switch between agents that occurred in 2006.

Methods: Hemodialysis (HD) and peritoneal dialysis (PD) and patients at 2 teaching hospitals who received both agents were included. Laboratory parameters and darbepoetin alfa doses were measured over three months and compared to three months of epoetin alfa use (same administration route). Dose conversion ratios were calculated by dividing mean doses of epoetin alfa by darbepoetin alfa. Mean values for hemoglobin, and iron stores were compared with a paired student's t test.

Results: Of 390 (277 HD and 113 PD) dialysis patients, a total of 214 (169 HD and 45 PD) patients (55%) met the inclusion criteria.

Patient Group	Epoetin alfa	Darbepoetin alfa	Conversion Ratio
Hemodialysis (n=169)			
Mean Hb (g/L)	113.3	116.4*	257:1
Mean weekly dose	13,211 units IV	51.4 ug IV	
Peritoneal Dialysis (n=45)			
Mean Hb (g/L)	120.3	113.6*	259:1
Mean weekly dose	12,222 units SC	47.2 ug SC	

* $p<0.05$

Anemia management parameters at both time points were within the Canadian Society of Nephrology guidelines (range HgB 110-120 g/L, target 110 g/L).

Conclusion: In a retrospective observational study of HD and PD patients using erythropoiesis stimulating agents, the dose conversion ratio after a switch from darbepoetin to epoetin was observed to be greater than 250:1. Renal programs across Canada can consider our observed dosage conversion ratios in addition to available drug acquisition costs when considering a formulary decision about erythropoiesis stimulating agents.

New Brunswick (NB) Heart Centre Health Improvement Challenge

Dr. Greg Searles, Dr. Sohrab Lutchmedial, Dr. Rob Stevenson, Dr. Robert Teskey, Dr. Marc Pelletier, Susan Morris, Francine Bordage, Marcie Crawford, Cleo Cyr, Trudy Arbo

New Brunswick Heart Centre, Saint John Regional Hospital, Saint John, NB

Background: The NB Heart Centre Health Improvement Challenge is a workplace wellness initiative designed by a team of physicians, nurses and pharmacists at the New Brunswick Heart Centre in Saint John, New Brunswick. The challenge was designed as a team-based, friendly competition to encourage colleagues to participate in healthy lifestyle changes to improve upon their overall cardiac health as set out by established cardiovascular risk parameters.

Purpose: The Challenge was designed to 1) improve the overall cardiac health of our employees, 2) raise awareness of the importance of healthy lifestyle choices, and 3) to inspire others to improve their overall health.

Methods: Five teams were formed under the guidance of a physician and led by 1 to2 nurse "champions" who facilitated group activities and coordinated the team. All participants (n=196) were assessed at baseline for 1) weight, 2) body mass index (BMI), 3) waist circumference, 4) blood pressure (BP) and 4) lipid profile. Over the following five and a half months, each team strived to improve on these parameters by lifestyle intervention. A point system was designed to reward both daily effort (up to two points per day for healthy eating and exercising), and final results.

Results: Mid-term results have already demonstrated a significant drop in body weight (average of 4 lbs per person, or 896 lbs overall), decrease in BMI (from 30 to 29), and reduction in systolic BP (from 120 to 118). The relative improvements in these parameters per team are shown in the attached table (table 1). Final results will be available in June and will be presented in August.

Conclusions: A team competition-based model is an effective way to improve lifestyles among employees, to raise awareness of the importance of healthy eating and regular exercise and increase morale among health care workers

Table 1. NB Heart Centre Health Improvement Challenge Mid Point Results

Team	Total wt loss in lbs	Wt loss average in lbs	BMI	SBP change	DBP Change	Effort points total (per person)
OVERALL (n=188)	896	4.8 per person (182.1 to 177.4)	30.1 to 29.3	120.6 to 118.4	73 to 74.5	5279 (28)
TEAM 1 (n=39)	253.5	6.5 per person (178.9 to 172.4)	29.8 to 28.9	No change (118.6 to 118.6)	71.6 to 74.54	2060 (52.8)
TEAM 2 (n=35)	206.7	5.9 per person (200.6 to194.9)	33.2 to 32.2	124.3 to 120.9	77.3 to 75.5	1231 (40.1)
TEAM 3 (n=49)	199.5	4.1 per person (183.7 to 179.6)	30 to 29.3	123.6 to 118.3	75.1 to 73.2	912 (18.6)
TEAM 4 n=33	157.8	4.78 per person (178.4 to 173.6)	29.2 to 28.5	118 to 116.3	69.9 to 71.6	342 (10.4)
TEAM 5 n=32	78.5	2.4 per person (167.4 to 165.2)	28.1 to 27.8	116.6 to 117.8	69.9 to 72.6	734 (22.9)

Development and Implementation of a Clinical Performance Assessment Tool

Karen Riley, Christine Donaldson

Department of Pharmacy, Hotel Dieu Grace Hospital and Windsor Regional Hospital, Windsor ON

Rationale: This quality improvement initiative was to develop a standardized tool to measure staff performance and to compare 2 hospital pharmacy departments.

Description: Staff pharmacists at the Windsor Hospitals (Hotel Dieu Grace and Windsor Regional Hospitals) were individually assessed using the performance criteria developed. A score card and performance rubric using 5 clinical criteria was developed and provided to each pharmacist.

Steps Taken: The initial step involved writing a Pharmacist Performance Standards document to clearly identify the roles and responsibilities of staff pharmacists and clinical specialists. An electronic documentation system was developed and implemented at both hospitals to measure pharmacist interventions. A series of 5 competencies that each staff member was required to review and be evaluated on was developed.

The clinical performance assessment score card was developed. This tool's measures included a 6 month average of percent time documented and the number of drug related interventions documented per day, the pharmacists' contributions to a monthly review of pertinent journal articles, the grade achieved on a competency assessment and the submission of their OCP learning portfolio for review annually. Pharmacists were asked for a self-assessment of their top 3 educational goals that will be used for the development of staff education programs for 2009.

Evaluation: The performance score card validated those pharmacists who were already known as high performers and identified those pharmacists who needed further follow up and mentoring for improvements at more frequent intervals. The score card clearly identified which areas that individual pharmacists could make strides to improve in.

Usefulness to Practice: This tool provides one example of how a hospital pharmacy department can use clinical performance, commitment to stay current with new literature, competency evaluation scores and the maintenance of a continuing education learning portfolio to create parameters to develop an assessment tool.

Development of a Regional Program for the Safe Handling of Hazardous Drugs by Hospital Pharmacies

Cenzina Caligiuri, Sheri Dyck, Susan Mestdagh, Heather Milan, Blair Seifert, Barbara Sproll

Winnipeg Regional Health Authority – Pharmacy Program, Deer Lodge Centre, Winnipeg, MB

Rationale: Historically, great care has been exercised in the storage, preparation, distribution, administration and disposal of cytotoxic medications. Although other medications have been acknowledged as potentially hazardous, most facilities do not have processes to identify and ensure the consistent safe handling of these agents.

Description of Concept: The purpose of this project was to develop a list of drugs that pose a hazard to those handling them and to develop pharmacy procedures for safe receiving, storing, preparing, distributing, administering and disposing of these drugs.

Project Development: We reviewed existing regional policies, literature and policies from Canadian and select American hospital pharmacies. The National Institute for Occupational Safety and Health (NIOSH) recommends that all potentially hazardous medications have full "cytotoxic handling" precautions. Upon review of workload and complexity of services, we identified that such extensive precautions were not achievable for all such medications. We categorized medications as cytotoxic (use full NIOSH-recommended handling precautions) or non-cytotoxic hazardous (use modified handling precautions to ensure staff safety).

We created a Cytotoxic and Non-cytotoxic Hazardous Drugs list and a wall chart, entitled Pharmacy Safe Handling of Drugs, summarizing handling precautions for both categories of medications. Procedures for "compromised" dosage forms (e.g. compounding suspensions, dissolve and dose drug administration) for both pharmacy and nursing staff were also developed and summarized in the Pharmacy Safe Handling of Drugs Resource Manual.

Evaluation: This management-endorsed program has been implemented with mandatory education sessions throughout all seven Winnipeg Regional Health Authority (WRHA) hospital pharmacies.

Usefulness to Practice: This unique regional project provides complete, easily accessible information to all pharmacy personnel on the safe handling of hazardous drugs. Nursing benefits from the safe drug administration information provided by pharmacy. It also helps fulfill several standards under Accreditation Canada - Managing Medications.

Pharmaceutical Care in a Prehabilitation Clinic for Patients Undergoing Elective Total Joint Arthroplasty

Jamie Falk, Colette B Raymond

Kildonan Medical Centre, Winnipeg, MB

Rationale: Little data describes the role of the pharmacist in a prehabilitation clinic.

Objective: We sought to categorize pharmacist interventions by type and significance level in patients undergoing elective total joint arthroplasty (TJA) who attended a newly established prehabilitation clinic within the Winnipeg Regional Health Authority (WRHA). We also sought to categorize drug-related problems (DRPs) by type, predicted outcome, and to evaluate the acceptance of interventions made.

Methods: A convenience sample of 119 consecutive patients referred to pharmacists at the WRHA prehabilitation clinic (June – September 2008) had prospective DRP collection and evaluation. The DRPs and pharmacist interventions were categorized by type, significance, outcome and acceptance. For patients with pharmacist follow-up within one month for pain, pain scores (0-10) were evaluated.

Results: Pharmacists saw 119 patients (mean age 65.5 years, 31.1% male); the majority (75%) were referred for pain control. One hundred-ninety three DRPs were identified (1.62 DRPs per patient); only 4 patients (3.4%) had no DRPs. The most common DRPs were: dose too low (29.0%), need for education (22.3%) and need for an additional drug (17.6%). The most common interventions were: recommendation for a dose change (34.7%), recommendation to discontinue or initiate a medication (31.6%), and provision of education (25.4%). The majority (51%) of interventions were for pain control. Most recommendations made to physicians (63.8%) and patients (90.3%) were accepted. The majority (64.5%) of interventions had a perceived significance rated as moderate (21.2% minor and 13.5% major). Most (72%) interventions were expected to enhance efficacy, while 21.2% were expected to prevent adverse drug reactions. Of 23 patients with baseline and follow-up pain scores, mean pain score decreased from 6.80 to 5.44 ($p<0.05$).

Conclusion: Pharmacist involvement in a TJA prehabilitation clinic resulted in identification of many DRPs, leading to interventions of primarily moderate significance. The majority of interventions were accepted.

A Regional Continuing Professional Development Program for Hospital Pharmacy Technicians

Clayton Hayes, Donna Woloschuk, Colette Raymond

Winnipeg Regional Health Authority, Department of Pharmaceutical Services, Health Sciences Centre, Winnipeg, MB

Description of Concept: Learning needs assessment (LNA) of learning preferences and continuing professional development (CPD) among approximately 120 pharmacy technicians (PT) in the Winnipeg Regional Health Authority (WRHA) was conducted in 2005. It revealed limited quantity and perceived limited quality of CPD programming related to PT practice.

Description: We developed a PT CPD program with regularly occurring presentations that was presented and attended by PT at six WRHA hospital pharmacies.

Project Development: A Practice Development Team (PDT) PT centrally coordinated a CPD program consisting of face-to-face 30-minute presentations. The CPD program encouraged PT presenters and had regularly scheduled presentation times. Topics were selected by presenters with input from the PDT PT. Presenters were permitted up to 6 paid hours to prepare plus up to 3 paid hours to deliver the presentation at each facility (n=6). Presentations were conducted on unpaid time (lunch hour).

Evaluation: Twenty nine presentations were delivered (48% by PT) at six facilities from May to October 2008. On average, 51% of available PT attended, but attendance varied from 14% to 90% at individual facilities. Attendees, presenters and managers were supportive of PT CPD. PT presenter's experienced increased confidence in their ability to deliver a presentation. Challenges to continuing PT CPD include the ongoing development of PT presenters and securing release time for presenters. Limited numbers of PT presenters and intercurrent regional projects have necessitated a reduced frequency of PT CPD events per site since October 2008.

Usefulness to Practice: PT attendees, presenters and managers were satisfied with the PT CPD program. Ongoing encouragement of PT presenters is required to ensure a sustained PT CPD program.

Adherence to Thromboprophylaxis in Post-Orthopedic Surgery Patients at a Community Hospital

Megan A Jones, Aaron M Tejani, Lily Cheng
Fraser Health Pharmacy Services, Burnaby, BC

Rationale: The American College of Chest Physicians Guidelines recommend that patients undergoing total knee replacement (TKR), total hip replacement (THR), and hip fracture surgery (HFS) receive post-operative thromboprophylaxis (TPx) for at least 10 days as this reduces the risk of developing venous thromboemboli. Little is known about guideline adherence rates post-discharge as previous studies have only evaluated adherence during hospitalization.

Objective: This study aimed to determine the TPx adherence rates in an urban community hospital, as well as after discharge, using the British Columbia PharmaNet prescription medication database.

Study Design: A retrospective review of patient's charts that had undergone TKR, THR, or HFS between March 30th, 2007 and April 1st, 2008, was conducted. The total TPx duration was then calculated by adding the in-hospital TPx duration (days) to the number of prescription day's supply of anticoagulants filled after discharge. From this information the percent of patients who received the minimum recommendation of 10 days of TPx was calculated.

Results: A total of 170 patient records were reviewed (57 TKR, 49 THR, and 64 HFS). Only 44% of HFS patients, 44% of THR patients, and 38% of TKR patients received the minimum of at least 10 days (in-hospital plus after discharge) of appropriate TPx. It was unclear whether this lack of adherence was a result of physicians not writing discharge prescriptions or patients not filling discharge prescriptions. These adherence rates also represent an ideal situation, as it was not possible to determine if patients that filled anticoagulant prescriptions actually were compliant with therapy.

Conclusion: Adherence to the ACCP guidelines for the duration of TPx post-orthopedic surgery was sub-optimal. Further research is needed to determine if this is the case in other centres and to identify specific reasons for this high-rate of non-adherence so recommendations can be made to improve this gap in care.

Unusual Presentation of Heparin-Induced Thrombocytopenia Due to Dalteparin

Orysya Fetterly, Crystal Evans, Heather Markmann, Dyan Hadley, Don Thompson, Erin Ramalho
Department of Pharmaceutical Services, Grace Hospital, Winnipeg Regional Health Authority, Winnipeg, MB
Christine Davis
Faculty of Pharmacy, University of Manitoba, Winnipeg, MB

Rationale: Dalteparin is a low molecular weight heparin (LMWH) used for thromboprophylaxis after orthopedic surgery. Heparin-induced thrombocytopenia (HIT) associated with LMWH is uncommon. HIT presenting with adrenal hemorrhage and skin necrosis is also rare. We report a case of HIT associated with LMWH, presenting with both adrenal hemorrhage and skin necrosis.

Description: A 67-year old female presented with low-grade fever, confusion, dizziness, nausea, abdominal pain, hypotension and a necrotic patch on her abdomen. She had a left total knee replacement 13 days prior to presentation and received dalteparin 5000 units subcutaneously daily post-operatively for prevention of venous thromboembolism. On presentation her platelet count was $93x10^9$/L (the highest recorded count post-operatively was $204x10^9$/L). She was initially treated for sepsis and a suspected pulmonary embolism. Intravenous heparin was started, but discontinued once HIT was suspected. An abdominal CT scan showed bilateral adrenal hemorrhage.

Assessment of Causality: The Pretest Probability for HIT was 7 (high probability). HIT was confirmed with both ELISA (optical density > 3.0) and a positive Serotonin Release Assay. The Naranjo Probability scale yielded a score of 6, suggesting a probable adverse drug reaction.

Evaluation of the Literature: The incidence of HIT associated with LMWH prophylaxis post-operatively is 0.1-0.5%. Skin lesions occur in 5-10% of patients who develop HIT from subcutaneous heparin/LMWH injections. Bilateral adrenal hemorrhage is reported in 3-5% of HIT patients, however only 5 case reports of bilateral adrenal hemorrhage associated with HIT due to LMWH were found in the literature. To our knowledge this is the first and only reported case of HIT due to LMWH that presents with necrotizing skin lesions and bilateral adrenal hemorrhage.

Importance to Pharmacy Practitioners: Because LMWH is commonly used in both inpatient and outpatient settings, recognition of potential adverse reactions and patient counseling are important for both hospital and community pharmacists.

Implementation and Evaluation of a Database for "Non-Formulary" Anticancer Drug Requests at CancerCare Manitoba

Danica Lister[1], Sri Navaratnam[1,2], Venetia Bourrier[1], David Szwajcer[1,2], Scott Streilein[1], David Phillips[1], Kimberly Watkinson[1], Marc Geirnaert[1]
[1]CancerCare Manitoba, Winnipeg, MB; [2]University of Manitoba, Winnipeg, MB

Rationale for Report: New anticancer agents and protocols are being reported at a rapid rate. The budget impact of these emerging drug therapies must be continually evaluated given the escalating costs of oncology drugs, thus cancer agencies face significant pressures on their drug budgets. At CancerCare Manitoba, the Provincial Oncology Drug Program (PODP) provides the infrastructure to enable the effective use and management of oncology drugs by integrating the principles of evidence-based decision making, stewardship, transparency and equal access. For new drug treatments that may represent a new standard of care, rigorous review at oncology pharmacotherapeutic ("P & T") committees is required. This comprehensive process requires time and resources so interim access to these new agents/protocols is often facilitated through a "non-formulary" drug request process. The "non-formulary" process also facilitates requests for rare indications for which treatments may not be incorporated onto the formulary.

Description of Service/Development of Program: In October 2007, a clinical pharmacist was incorporated into the existing non-formulary drug request process at a provincial cancer agency. Requests for new drug treatments for both rare and more common cancer diagnoses are adjudicated on a case-by-case basis and evaluated for both evidence-based potential clinical benefit and potential budget impact. A prospective database of the requests reviewed by the clinical pharmacist and P& T committee chair was developed in January 2008. This database was designed to capture the quantity and nature of requests received, to identify drug treatments requiring formal review at the P & T committee level, and to quantify projected versus actual costs of those non-formulary requests approved for use.

Evaluation of Project: *(A full evaluation of the database is pending at the time of this abstract. Complete results will be available at the time of presentation.)*

A total of 310 requests were received in 2008; 278 of these were approved. These approvals consisted of 93 different drugs/protocols from 17 different disease site groups. The projected incremental drug cost of these 278 approvals was over $1 million.

In 2009, we reviewed each approved request for actual use and compared this to the projected use calculated at the time of approval. Preliminary results for the first 114 approvals show a difference between projected and actual incremental drug costs of -$133,837 (-31.6%).

Usefulness to Current/Future Practice: This database has become a valuable reference for the projection of use and potential budget impact of emerging anticancer drug therapies. Additionally, it has provided a framework for consistent practice within the review of non-formulary drug requests. Future directions may involve evaluating the clinical outcome of patients for whom non-formulary drug treatments are utilized.

Concurrent Development of a Prescriber Order Entry System with a Bidirectional Pharmacy Interface

Natalie Thickson
Manitoba e-Health, Winnipeg, MB
Luke McKenzie
St. Boniface General Hospital, Winnipeg, MB

Background: A regional initiative to implement an Electronic Patient Record (EPR) with Prescriber Order Entry (POE) in an acute care setting was under taken to achieve 100% POE, replacing handwritten orders. A bidirectional interface to the existing Pharmacy application would replace faxed or photocopied Physician orders used by pharmacists for order entry into the Pharmacy application. The handwritten Medication Administration Record (MAR) used by nursing would be replaced with an electronic MAR. The interface from the Pharmacy application to the automated dispensing cabinets would remain intact.

Description: Multidisciplinary input was sought when developing design principles for medication configuration. The EPR medication catalogue was developed to reflect the existing catalogue in the Pharmacy application while integrating national medication safety guidelines (ISMP), regional med safety initiatives and the regional medication formulary. Local initiatives targeting high alert medications were leveraged in content development.

Historical data from the Pharmacy application was utilized to develop pre-formatted orders reflecting local prescribing patterns. Review and input from Pharmacists and physicians provided validation. Pre-printed protocol orders were scrutinized with an eye to "best practice" in conjunction with the development of electronic "order sets".

Documentation of present and future state workflow facilitated the development of change management and clinical adoption strategies.

Evaluation: Establishing design principles, goals and boundaries streamlines the development process. Resourcing inadequacies in key areas (testing) risk a successful outcome.

A 2 week separation between EPR and pharmacy interface activation contributed to a successful implementation. Concentrated attention on each aspect ensured resolution of EPR related issues prior to activation of the interface to a well established pharmacy system.

Usefulness to Practice: POE with a Pharmacy interface ensures all orders are reviewed by a Pharmacist. The single order intake source promotes efficient Pharmacy processing and a more controlled workflow.

A Systematic Review of Voluven® vs. Pentaspan® for Volume Expansion in Surgery

Aaron M Tejani[1,2], Patricia Fortin[1], Vijaya Musini[1], Ken Bassett[1], James W Price[1]

[1]Therapeutics Initiative (Vancouver), [2]Fraser Health Pharmacy Services (Langley)

Rationale: Colloid solutions are used for plasma volume expansion in patients undergoing surgery. Canadian Blood Services (CBS) provides 2 synthetic hydroxyethyl starches commonly known as HES 200/0.5 (Pentaspan®) and HES 130/0.4 (Voluven®). It is thought that Voluven® may have less of an effect on the coagulation pathway, less accumulation, faster elimination, and may potentially offer a renal protective, anti-inflammatory and micro-circulatory benefit compared to Pentaspan®.

Objective: To determine if Voluven® provides a therapeutic advantage over Pentaspan® in terms of efficacy and safety when used for plasma volume expansion patients undergoing surgery.

Methods: Electronic databases were searched for randomized controlled trials (RCT) in MEDLINE, EMBASE, the Cochrane Library, Web of Science, and www.clinicaltrials.gov up to December 2007. Reference lists of included studies were hand searched for additional RCTs. Two reviewers independently extracted data from trials and a third reviewer was consulted to resolve discrepancies. Data was extracted for the following outcomes: mortality, serious adverse events, length of hospital stay, organ failure/dysfunction, bleeding, need for transfusions, and total adverse events.

Results: Six trials compared Voluven® to Pentaspan®. The trials included a total of 488 patients and lasted 1 to 7 days. There were too few deaths and inadequate reporting of organ dysfunction/failure and bleeding in the trials to conclude on differences between the 2 colloids for these outcomes. No significant differences were found for serious adverse events (4 RCTs, relative risk 1.74, 95%CI 0.39 to 7.76), length of hospital stay (3 RCTs, mean difference 0.11 days, 95%CI -0.18 to 0.36), need for transfusions (3 RCTs, relative risk 0.89, 95%CI 0.68 to 1.15), and total adverse events (2 RCTs, relative risk 1.04, 95%CI 0.70 to 1.54).

Conclusions: There is insufficient evidence that Volvuen® provides a therapeutic advantage over Pentaspan® when used for plasma volume expansion in patients undergoing surgery.

Establishing a Process for Pharmacy Technician Initiated Medication Histories in the Emergency Department

Julie Mistri, Pat Miller, Jan Coates

Victoria General Hospital, Winnipeg, MB

Rationale: Medication Reconciliation is designed to prevent medication errors and adverse drug reactions at all transition points in patients' care. The first step is to obtain a complete list of current home medications (best possible medication history, or BPMH). While pharmacists are skilled at collecting BPMH, resources are not always available to routinely assign them to this role. Given that the pharmacist-pharmacy technician team is well established, the pharmacy technician can be trained to initiate the reconciliation process by obtaining BPMH.

Description of Concept: We sought to develop a training process to ensure that pharmacy technicians can achieve an acceptable level of competency in BPMH collection in the emergency department.

Resolution: We developed a process to train pharmacy technicians to obtain BPMH. Technicians attend an education session, observe a pharmacist obtaining 4 BPMH, perform 4 mock medication histories, obtain 15 BPMH under pharmacist supervision, perform 2 test BPMH using simulated patients, and undergo a quality assurance audit by the pharmacist. All patient interviews were evaluated using the Empathetic Interviewing Skills Global Rating Scale. When the BPMH cannot be resolved by the technician, the pharmacist is consulted.

Evaluation: One technician has completed the training process and now collects BPMH in the emergency department. Over a 6 week evaluation period, the technician collected 75 BPMH (average 5 patients per 2.5 hour shift, range 4-7). Each BPMH took an average of 13 minutes to complete (range 2-30 minutes), and each patient took an average of 8 home medications (range 0-19). Referral to pharmacist for BPMH resolution occurred for 15% of patients.

Usefulness and Importance: Expanding the role of the pharmacy technician to obtain BPMH addresses the issue of allocating pharmacist resources in the face of competing requests for pharmacy services and strengthens the role of the pharmacy technician on the health care team.

Using a Web Based Community of Practice to Drive Change with Medication Reconciliation

Alejandro Montoya[1], Olavo Fernandes[2,3], Virginia Flintoft[4], Margaret Colquhoun[2], Brenda Carthy[2], G. Ross Baker[4]

[1]Health Care Quality Residency Program, Tec de Monterrey -School of Medicine, Monterrey, Mexico, [2]Institutes for Safe Medication Practices, Toronto, ON, [3]Toronto General Hospital, UHN; Leslie Dan Faculty of Pharmacy, University of Toronto, Toronto, ON, [4]Department of Health Policy, Management and Evaluation (HPME), University of Toronto, Toronto, ON

Rationale: The Safer Health Care Now! patient safety campaign has developed a web-based tool for centralized inter-team communication called the community of practice (CoP) which enables member collaboration nationally. The Medication Reconciliation (Med Rec) CoP has over 1,000 members and receives up to 18,000 visits per month. Members communicate and share processes, challenges and solutions using the discussion board.

Description: Information posted on the Med Rec CoP was systematically evaluated to identify main topics of discussion, common team issues, frequency of use and general trends. Information was collected from intervention launch in 2006 until July 30th 2008.

Evaluation: There were a total of 18 main folders which contained information covering 232 topics. These were accessed a total of 17,677 times and 708 messages were posted on discussion board over the analysis period. The majority of the topics are located in 5/18 main folders: "Acute Care, Audits & Measurement, Education and Marketing, Tools & Forms, and Staff Role in Med Rec". From these 5 folders, 21 discussion topics represented 22.5% of the total activity. It appeared that new teams sequentially accessed the same topics, and posed similar questions to seek solutions at similar intervals from the time of enrolment. Postings demonstrated that the needs of teams change at different phases of implementation.

Importance: Evaluation of the Med Rec CoP provided valuable information required to help teams successfully implement medication reconciliation. The analysis identified that only selected critical topics guided the foci of the discussion. Similar retrospective analyses of established discussion boards may help future quality improvement teams by informing awareness of key topics to help direct new teams to proactively accelerate their learning curve. For intervention coordinators, it further serves to identify genuine team challenges and targets for enhancing educational resources, preparing frequently asked questions and identifying useful resources.

Implementation of a First Dose Antibiotic Pharmacy Program to Ensure Timely Delivery of Antibiotics to Patient Care Areas

Cenzina Caligiuri, Melanie Green, Jesslin Cecon, Linda Carroll

Health Sciences Centre, Winnipeg, MB

Rationale: Timely administration of first doses of intravenous antibiotics has been shown to decrease morbidity and mortality.

Objectives: We sought to implement a pharmacy program to deliver all first doses of intravenous antibiotics (premixed bags, vials and pharmacy prepared admixtures) from pharmacy to wards within one hour of medication order receipt at an 800 bed tertiary care hospital.

Design and Methods: The "First Dose Antibiotic" program was implemented in September 2007. All pharmacy staff attended mandatory education sessions. Additional technician resources were available 0730-2330, seven days a week, to deliver antibiotics to wards. Finally, automatic stop times for intravenous antibiotics from were changed from 4 to 7 days. We evaluated consecutive patients receiving intravenous antibiotics on one medical and one surgical ward over a three week period pre and post implementation. Time of order arrival, pharmacist entry and antibiotic exit from pharmacy were documented using a time stamp and the pharmacy computer system. Antibiotic duration was determined through chart review. Patients who were admitted to critical care for severe sepsis were excluded due to existing processes to expedite emergent care.

Results: We compared 49 patients at baseline (June 2007) to 64 patients 10 months post-implementation (July 2008). The proportion of first dose intravenous antibiotics exiting the pharmacy within one hour improved from 37% to 92% ($p<0.01$). The average time from order receipt to antibiotic exit from pharmacy decreased from 80 to 34 minutes ($p<0.001$) and average time from pharmacist entry to antibiotic exit from pharmacy decreased from 50 to 19 minutes ($p<0.001$). Antibiotic duration decreased from 4.8 to 2.8 days ($p=0.01$)

Conclusion: This quality assurance project found that the addition of dedicated technician time, extension of automatic stop dates and mandatory education for all pharmacy staff resulted in faster delivery of intravenous antibiotics.

A Computerized Pharmacy Generated Medication Reconciliation Process for Transfer from the Intensive Care Unit Reduces Discrepancies and Order Writing Time

Cenzina Caligiuri, Michelle Staub, Department of Pharmaceutical Services, Health Sciences Centre, Leslie Galloway, Department of Quality, Children's Hospital, Tom Blydt-Hansen, Department of Pediatric and Child Health, Children's Hospital, Winnipeg, MB

Rationale: The Safer HealthCare Now program has identified medication errors as a critical area for improvement, especially at points of transfer between wards for hospitalized patients. CSHP 2015 Objective 1.1 strives for pharmacist medication reconciliation across the continuum of care.

Description of Concept: We sought to develop and implement a multi-disciplinary transfer process to accurately communicate transfer orders from the intensive care unit (ICU) to the receiving unit for pediatric inpatients.

Project Development: We developed a process for a pharmacy computer system (Cerner) to generate a complete and accurate medication reconciliation form to serve as a transfer order. On transfer from ICU, a pharmacy technician prints this transfer order form for completion by prescribers. The process was implemented January 2009.

Evaluation: We retrospectively reviewed a random selection of charts for unintentional and undocumented intentional discrepancies by comparing ICU orders to transfer orders at baseline, early implementation and post implementation. We also surveyed prescribers about the length of time to complete transfer orders before and after the new process and measured time from transfer order printing to physician signing of transfer orders.

	N	Unintentional Discrepancies (per patient)	Undocumented Intentional Discrepancies (per patient)	Proportion of correct medication transfer orders
Baseline	60	0.53	0.22	83.6%
Early Implementation	20	0.10	0.15	96.7%
Full Implementation	20	0.05	0	99.4%

Feedback from 5 prescribers showed a decrease in time spent writing transfer orders to an average of 5 minutes with the new process (range of 1-10 minutes). The average time for completion of the new medication reconciliation process was 27 minutes (range of 1-110 minutes)

Usefulness to Practice: The pharmacy computer system generated medication reconciliation process reduced medication discrepancies and physician time spent writing ICU transfer orders for hospitalized pediatric patients, and moves towards CSHP 2015 Objective 1.1.

Medication Reconciliation: Towards a "Best Practice Medication Discharge Plan" in a Pediatric Hospital

Justin Ling, Cenzina Caligiuri, Department of Pharmaceutical Services, Health Sciences Centre, Leslie Galloway, Department of Quality, Children's Hospital, Winnipeg, Tom Blydt-Hansen, Department of Pediatric and Child Health, Children's Hospital

Rationale: A Best Possible Medication Discharge Plan (BPMDP), as defined by Safer Healthcare Now (SHN), reduces medication errors. CSHP 2015 Objective 1.1 strives for pharmacist medication reconciliation across the continuum of care.

Description of Concept: We sought to compare current discharge medication practice on a pediatric medical ward to a BPMDP.

Process Steps: Interdisciplinary groups flowcharted the current medication discharge process. Retrospective chart review was performed for patients discharged over a four week period in July 2008. The BPMDP was determined for each patient by reviewing the admission medication reconciliation information, inpatient orders, pharmacy profile, administration records and discharge prescriptions. Discrepancies were noted. The medications were classified as: unchanged preadmission, adjusted preadmission, discontinued preadmission, new medications started in hospital or those to be started at the time of discharge. Documented communication of the BPMDP, to the caregiver, community physician and community pharmacy was reviewed. Focus groups with community and hospital health professionals identified improvement opportunities.

Evaluation: Flowcharting revealed a complex process with variability in documentation and communication. Of 28 patients charts audited, 12 patients (43%) had at least one medication discharge discrepancy. Of a total of 111 medications prescribed on discharge, 17 (15%) showed discrepancies. Of the 17 discrepancies, 9 were related to "unchanged preadmission medications". The pharmacy electronic medication profile was found to be the most accurate source of information. Documented communication to the caregiver occurred in 25/28 patients. Communications to other health care professionals could not be confirmed. Focus group participants strongly supported the BPMDP criteria. There was very strong support for an electronic Medication Reconciliation form to improve reconciliation and legibility.

Usefulness to Practice: We discovered many areas to improve our discharge medication practice. An efficient consistent process is currently being developed in order to meet the SHN BPMDP criteria and move towards CSHP 2015 Objective 1.1.

Impact of the Medical Home on the Safety and Quality of Health Care in Canada

Andrea Scobie[1], Neil J. MacKinnon[1], Sean Higgins[1], Holly Etchegary[2], Rhonda Church[3]

[1]College of Pharmacy, Dalhousie University, Halifax, NS, [2]IWK Health Centre, Halifax, NS, [3]Gateway Family Practice, Bridgewater, NS

Rationale: A growing body of research suggests that the availability of primary health care providers and teams can improve health care system efficiency, and the quality and safety of care. Still, there has been little research conducted to obtain the patient perspective on these issues.

Objective: To examine the relation between medical homes and the safety and quality of health care in Canada.

Study Design and Methods: As part of a seven-country health policy survey, the Commonwealth Fund surveyed a sample of 3003 people 18 years and older in Canada's 10 provinces and 3 territories in 2007. We examined the Canadian data with a particular focus on the presence of a medical home. The medical home is a concept first proposed in 1967 by the American Academy of Pediatrics that is analogous to the concept of primary healthcare in Canada. We explored the effect of having a medical home on a number of outcome variables using χ^2 tests for categorical variables and Mann–Whitney *U* tests for ordinal variables.

Results: Of Canadians surveyed, 51% did not have a medical home. Based on the 2006 census, this extrapolates to nearly 13 million adult Canadians. Overall, the presence of a medical home was associated with self-reported improved access to health care services, coordination of the services received, confidence in the services received and provider knowledge. Self-reported medical and medication error rates were higher among those without a medical home. However, emergency department use patterns were similar among those with and without a medical home.

Conclusion: The presence of a medical home is associated with perceived safer and higher-quality patient care. Ensuring that Canadians have a medical home through primary health care reform may be an effective means to mitigate medical and medication errors while increasing patient satisfaction and strengthening patient–provider relationships.

Identifying, Understanding, and Overcoming Barriers to Medication Error Reporting in Hospitals in Nova Scotia, Canada

Nicole R Hartnell[1], Neil J MacKinnon[1], Ingrid Sketris[1], Steven M Smith[2], Mark Fleming[2]

[1]College of Pharmacy, Dalhousie University, Halifax, NS, [2]Saint Mary's University, Halifax, NS

Rationale: While there has been an increase in the awareness of the safety of the medication-use system in recent years, health professional reporting of medication errors continues to be problematic.

Objectives: The objectives were to: (1) Identify barriers and incentives to medication error reporting, (2) Understand why barriers exist; and (3) Explore how some hospitals have successfully broken down barriers.

Study Design and Methods: Focus groups (with physicians, pharmacists, and nurses), in-depth interviews (with risk managers), and safety-specific physical artifacts (such as error reporting policies and incident report forms) were used to complete a comparative case study analysis of medication error reporting beliefs and practices at four community hospitals in Nova Scotia, Canada. Audio tapes were transcribed verbatim and analyzed for thematic content using the template style of analysis. The development and analysis of this study were guided by Safety Culture Theory.

Results: Thematic analysis of the transcripts identified incentives for and barriers to medication error reporting, as well as actions that participants felt could positively facilitate reporting. Incentives were thematized into two categories: patient protection and provider protection. Barriers were classified into four categories: reporter burden, professional identity, information gap, and cultural deficiencies. Positive facilitators were classified into three categories: reducing reporter burden, closing the communication gap, and educating for success. Participants indicated they would report medication errors more frequently if reporting were made less time and work intensive, if they were adequately educated on all aspects of the reporting process, and if they received timely feedback.

Conclusion: The results of this study may lead to a better understanding of not only the barriers to medication error reporting, but why these barriers exist and what can be done to successfully break them down.

Latent Opportunities for Errors in Medication Orders in Four Health Authorities

Rumi Pattar[1], Neil J. MacKinnon[2], Rita Nigam[2], Vaneeta K. Grover[2], Tiffany T. Nguyen[2]

[1]Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC; [2]College of Pharmacy, Dalhousie University, Halifax, NS

Rationale: One of the latent opportunities for medication errors in prescribing is use of potentially dangerous abbreviations and dose designations. Little is known about the frequency and potential consequences of errors related to misinterpretation of medication order information in Canada.

Objective: The objective was to validate a subset of Canadian consensus-approved safety indicators for medication-use systems in four Atlantic health authorities.

Study Design and Methods: Five medication-use safety indicators selected from a list of 20 such indicators derived using the Delphi technique were prospectively tested for feasibility, reliability and validity in four health authorities. Medications and abbreviations chosen for testing were based on the Institute for Safe Medication Practice's lists of high-alert medications, error-prone abbreviations and dose designation.

Results: Over the three-month data collection period, 7113 medication orders were reviewed in each participating health authority. Seventy-seven percent of medication orders had at least one latent opportunity for error according to the composite indicator. Most latent opportunities were related to route of administration and dose unit. Clinical clerks and nurses generated the most latent opportunities, while pharmacists and nurse practitioners generated the least. The percentage of medication orders containing at least one latent opportunity for error was high for all sites. Latent opportunities for error were mostly due to use of "U or u" for units and "SC or SQ" for subcutaneously.

Conclusion: The safety indicators described in this study are feasible and reliable performance measures of safety during medication prescribing. These performance measures will allow organizations to evaluate the frequency and types of potentially dangerous medication abbreviations and dose designations and also, to target selected healthcare providers for further education.