TOGETHER: CANADA'S HOSPITAL PHARMACY CONFERENCE 2021 / ENSEMBLE : CONGRÈS DES PHARMACIENS D'HÔPITAUX DU CANADA 2021

Facilitated Poster Sessions: Discussions of original research and pharmacy practice projects
Séance animée de présentations par affiches : Discussions sur des projets de recherche originale et des projets dans le domaine de la pratique pharmaceutique

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ORIGINAL RESEARCH / RECHERCHE ORIGINALE

Atrial Fibrillation Patients' Experiences with Combination Antithrombotic Therapy Post-Percutaneous Coronary Intervention

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Background: Up to 30% of patients with atrial fibrillation (AF) have coronary artery disease (CAD). Many of these patients undergo percutaneous coronary intervention (PCI), requiring combination antithrombotic therapy (ATT) with antiplatelet (AP) agent(s) of variable durations and an oral anticoagulant (OAC) which may require dose adjustment. The complexity of these regimens may contribute to non-adherence, increasing the risk of thrombosis and/or bleeding.

Objective: To describe patient experiences with combination ATT, including unplanned modifications, after discharge from acute care.

Methods: This was an observational study. Eligible patients had documented AF requiring OAC, underwent a PCI and were discharged on combination ATT. Follow-up contact was planned at 1-, 3-, 6-, and 12-months post-PCI.

Results: Thirty-two patients were enrolled from January-September 2020. Follow-up data was collected for 26 patients (81.3%) at 1-month, 17 patients (53.1%) at 3-months, and 10 patients (31.3%) at 6-months post-PCI. Of the 26 patients with any follow-up data, 12 (46.2%) had at least one unplanned modification, and 6 (23.1%) had additional modifications at other follow-up time points for a total of 23 unplanned modifications. Four patients had unplanned modifications related to invasive procedures. Nine patients experienced modifications to APs and 9 patients experienced modifications to OACs. The most common modifications with AP therapy was a change in duration. The most common OAC modifications included dose reduction and discontinuation. Two patients did not stop acetylsalicylic acid when intended and both experienced bleeding. Two patients experienced a stroke; one after, and one resulting in, an unplanned modification to OAC.

Conclusion: Almost 1 in 2 patients with AF who underwent PCI experienced an unplanned modification to their ATT. Most patient-reported modifications appeared to be prescriber-driven. This underscores the challenges of managing combination ATT for patients and clinicians alike. Close monitoring and effective interdisciplinary communication are needed to optimize patient outcomes.

Assessment of a Standardized Discharge Prescription Implemented to Reduce Opioid Use Post-Surgery

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Background: Excessive prescribing of post-operative opioids is a recognized contributor to opioid misuse and related harms. As part of a provincial initiative to address the issue, a standardized discharge prescription was implemented for patients receiving day surgery, consisting of 20 hydromorphone tablets with part-fills of 10 tablets allowed every 3 days.

Objective(s): Primary: To evaluate the impact of reducing opioid quantities prescribed and part-fill use on patient's pain control. Secondary: To assess the feasibility of implementing follow-up calls on clinical pharmacy technician's (CT) workflow.

Methods: Prior to the implementation of this quality improvement initiative, as standard of care, nurses called patients 24-hours post-surgery. In the new process, CTs called patients who received the prescription on day 7 using a standardized questionnaire. Outcomes included number of standardized prescriptions dispensed, hydromorphone tablets consumed, patients who filled the second part-fill, pain score on day 7 assessed with a 5-point scale [0-no pain, 5-difficult to manage pain], and mean time taken to conduct the calls per day.

Results: Between November 2019-March 2020, 47 patients received a CT-led follow-up call. Of these 47 patients, 38 received the standardized discharge prescription without alterations by prescribers. At 7 days post-surgery, of 970 hydromorphone tablets prescribed, 29% were consumed with a mean of 6 tablets per patient (SD 7). Eighteen-percent of patients filled the second part-fill, 9% consumed all hydromorphone prescribed and 34% did not consume any hydromorphone. Patients reported a mean pain score of 1.6 on a 5-point scale (SD 1.6). The mean time for the calls was 29 minutes per day (0.01 Full-Time Equivalent of CT per day).

Conclusion(s): Reducing opioid quantities prescribed and using part-fills in the post-surgery discharge prescription helped reduce the availability of opioids in the community without compromising patients' pain relief. Follow-up calls were also feasible to incorporate into the CTs' workflow.

A Retrospective Analysis of Pharmacy Turnaround Times for Clinical Trial-Associated vs Non-Clinical Trial Intravenous Anticancer Regimens

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Background: Pharmacy turnaround time, which is the time required to process an intravenous admixture, is a metric of interest to outpatient pharmacies preparing sterile anticancer drugs. As anticancer drug research expands and evolves, there is a need to understand pharmacy service requirements for preparation of intravenous compounds within clinical trials.

Objective: To determine whether the pharmacy turnaround time for sterile intravenous admixtures of clinical trial regimens prepared at Odette Cancer Centre differs significantly from that for non-clinical trial regimens.

Methods: We estimated a multivariate linear regression model of pharmacy turnaround time for all intravenous anticancer regimens. Regimens administered in a separate hematology clinic were excluded. Timestamp data was retrospectively obtained from the CHARM patient management system over the 6-month period from July to December 2019. Pharmacy turnaround time was posited to depend on regimen type (clinical trial, non-trial) and time of day (lunch period, standard shift). Statistical analysis was conducted at a significance level of 0.05.

Results: A total of 9685 regimens were analyzed; 1054 clinical trial regimens and 8631 non-trial regimens. The multivariable model found that clinical trial regimens took 9.25 minutes longer to prepare than non-trial regimens (95% C.I. 7.00-11.49, $p<0.0001$). Any regimens prepared during the lunch period (1130h-1330h) took, on average, 20.39 minutes longer than those prepared during standard shifts (95% C.I. 18.91-21.87, $p<0.0001$).

Conclusion: Clinical trial regimens and regimens prepared during the lunch period were associated with longer processing times for pharmacy. These relationships should be confirmed prospectively using a precise measure of turnaround time and further investigated to explore the root cause factors. Findings may be of interest to pharmacy administrators and may be used to inform resource management for sterile compounding processes in the pharmacy department.

Evaluating the Impact of a Standardized Order Form on Appropriate Ordering and Use of Dexmedetomidine for Sedation in an Adult Intensive Care Unit

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Background: Dexmedetomidine is a novel intravenous sedative that does not produce respiratory depression or deep sedation. Its cost and inconsistent evidence demonstrating benefit compared to other sedatives have been prohibitive to its use as a first-line sedative in the intensive care unit (ICU). In November 2017, a standardized order form was implemented at a tertiary academic hospital to promote appropriate prescribing and use of dexmedetomidine.

Objective: To evaluate whether implementation of a standardized order form increased appropriate ordering and use of dexmedetomidine for sedation in an adult ICU.

Methods: A retrospective before-and-after study was conducted to assess adherence of dexmedetomidine ordering and use against institution-specific criteria for appropriateness. One hundred courses of dexmedetomidine (50 before and 50 after implementation) were adjudicated against criteria outlined in the standardized order form. Each course was adjudicated for appropriateness of both initial ordering and ongoing use. Data on adequacy of sedation and hemodynamic adverse effects were also collected. Descriptive statistics were used for data analysis.

Results: Standardized order forms from February 2015 to May 2020 were reviewed for 99 patients prescribed dexmedetomidine. Patients were primarily young men (85% male, mean age 43 +/- 19 years) admitted to an ICU due to trauma (68% trauma, 27% medicine, 5% surgery). The implementation of the standardized order form did not significantly improve ordering or use of dexmedetomidine (appropriate ordering: 86% before vs. 90% after, p=0.54; appropriate use: 84% before vs. 80% after, p=0.60). A non-significant reduction in duration of infusion was noted (mean 57.9 hours before vs. 48.6 hours after, p=0.08).

Conclusion: Implementation of a standardized order form did not increase appropriate ordering or use of dexmedetomidine, although a reduction in infusion duration was observed. Results will inform future iterations of the standardized order form to improve dexmedetomidine use.

Susceptibility Patterns for *Enterococcus spp.* Clinical Isolates Collected over a 14-Year Period at Sunnybrook Health Sciences Centre

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Background: *Enterococci* are commensal gram-positive cocci that are a common cause of urinary tract infections, endocarditis, intra-abdominal, skin, soft tissue and wound infections. While *E. faecalis* remains the most common pathogenic *Enterococci*, the frequency of *E. faecium* infections have increased globally.

Objective: To investigate the antimicrobial resistance patterns of *Enterococci spp.* clinical isolates collected at Sunnybrook Health Sciences Centre (SHSC) over a 14-year study period.

Methods: A retrospective review of susceptibility data for *Enterococcus spp.* clinical isolates collected from patients admitted to SHSC between October 2002 and September 2016 was completed with data extraction from the SHSC microbiology database. Trends in susceptibility to ampicillin, ciprofloxacin, gentamicin, nitrofurantoin, tetracycline and vancomycin were analyzed using linear regression models with a significance level of <0.05.

Results: Among the 2617 *Enterococcus* isolates, 57% (n=1486) were *E. faecalis*, 30% (n=775) *E. faecium* and the remaining 14% (n=356) were classified as other *Enterococcus* species. The majority of isolates came from blood cultures (n=1176, 45%). Susceptibility trends were assessed from 2008 forward. Of the *E. faecalis* and *E. faecium*, <1% and 10% were vancomycin resistant, respectively. For the aggregate of all *Enterococcus* isolates, the sensitivity to ampicillin and nitrofurantoin decreased each year by 3.2% (p=0.0055) and 3.4% (p=0.006), respectively. For *E. faecalis*, susceptibilities for ciprofloxacin (+3.9% susceptible/year, p=0.0117), gentamicin (+3.9% susceptible/year, p=0.0144) and tetracyclines (+7% susceptible/year, p=0.42) increased over time. Conversely, nitrofurantoin susceptibility increased by 24% each year (p=0.0013) for *E. faecium*. Although *E. faecium* susceptibility to tetracyclines (-4.5% susceptible/year) demonstrated a noteworthy decline, it was not statistically significant (p=0.562).

Conclusion: Enterococcal antibiotic susceptibility improved at SHSC during the study period. However, *E. faecium* infections constituted a substantial proportion (30%) of Enterococcal clinical isolates during the study period. *E. faecalis* and *E. faecium* demonstrated heterogenous susceptibility patterns supporting species targeted antimicrobial stewardship interventions for *Enterococcus*.

Managing Opioids and Mitigating Opioid Risks in Patients with Cancer: An Environmental Scan of the Attitudes, Confidence, and Practices of Pharmacists Practicing in Canada

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Background: The use of prescription opioids in Canada has increased steadily over the past 2 decades, with increases in overdose and death. Opioids are the mainstay of treatment for cancer-related pain (CP). Patients with cancer are not immune to the risks associated with opioid use but are underrepresented in available literature outlining risk mitigation strategies. Pharmacists would be ideally placed to employ risk mitigation practices to support safe and effective opioid use for patients with CP.

Objectives: Describe the attitudes, confidence, and practices among pharmacists in Canada when providing care for patients using opioids for CP management.

Methods: An environmental scan of pharmacists who provide direct patient care in Canada. An electronic questionnaire was distributed via email by pharmacy organizations, and online platforms. The questionnaire consisted of Likert-scale and open-ended questions and was open for 6 weeks. Analysis was conducted using descriptive statistics and qualitative content analysis.

Results: Eighty-one responses from 9 provinces were included in analysis. Respondents endorsed limited and varied practices when caring for patients with CP managed by opioids. Pharmacists were more confident in their ability to assess and provide education compared to managing these patients. Less than 50% of pharmacists were aware of resources available for their patients with aberrant medication taking behaviors, opioid use disorder, and/or patients at high risk of opioid overdose and 25% participated in education surrounding those topics. Education and resources were the most commonly reported facilitators and barriers to resource use.

Conclusions: Pharmacists in Canada report employing opioid risk mitigation practices with low but varied frequency when caring for patients receiving opioids for CP. They endorsed varied confidence and limited awareness of available provider and patient education. These findings can help inform development of education models and guidelines which will serve to support pharmacists in their care of this patient population.

Quality Improvement Assessment of Discharge Medication Reconciliation for Surgery Patients

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Background: Pharmacist-led medication reconciliation and patient education at discharge have been shown to decrease hospital readmissions when part of a medication management care bundle. Currently at our institution, these discharge services for surgical patients are prescriber-led with minimal pharmacy involvement. An opportunity exists to increase pharmacist involvement when providing discharge services for surgical patients.

Objectives: Our primary objective was to identify the proportion of surgical patients with at least one unintentional medication discrepancy at discharge. Our secondary objectives were to identify the proportion of surgical patients with at least one potential adverse drug event (PADE) at discharge and to identify the barriers and facilitators to providing interprofessional medication reconciliation and patient medication education at discharge.

Methods: This was a retrospective, quality improvement study that enrolled 160 general, thoracic, gynecologic oncology, and urology surgical patients discharged between August 1 and October 2, 2018. Focus groups with healthcare professionals were used to identify any barriers and facilitators to providing interprofessional discharge services. Descriptive statistics were used to identify trends in the data.

Results: Overall, 61.3% (98/160) of patients were discharged with at least one unintentional medication discrepancy and 39.4% (63/160) were discharged with at least one PADE. In total, there were 343 discrepancies with the most common being drug omission (62.7%). The most common barriers identified were resource limitations and a lack of time to complete discharge services. The most common facilitators included getting buy-in from prescribers and ensuring advanced notice of discharge to all team members.

Conclusion: The majority of surgical patients included in our study were discharged with at least one unintentional medication discrepancy. Various barriers and facilitators were identified from focus groups with healthcare providers. Common discrepancy awareness and implementation of pragmatic facilitators may enhance the delivery of an interprofessional collaborative practice model at discharge for surgical patients.

Second Dose Antimicrobial Delays in Sepsis and Septic Shock

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Background: Early recognition and timely initiation of antimicrobials are the cornerstone of treatment for sepsis and septic shock. Current evidence suggests that optimizing the time to first doses of antimicrobials can improve clinical outcomes. Little evidence exists describing the timing of subsequent doses of antimicrobials in this population.

Objectives:

Primary Objective: to determine the frequency and extent of delays greater than or equal to 25% of the recommended dosing interval in first-to-second dose parenteral antimicrobial administration for patients admitted through the emergency department (ED) with sepsis or septic shock.

Secondary Objective: to compare the frequency and extent of delays according to (1) the prescribing service (ED physician compared to an admitting/consulting physician); (2) how the order was written (one-time dose orders compared to ongoing orders); (3) when the institution's sepsis order sets are used.

Methods: This retrospective chart review occurred at a single, tertiary care teaching hospital for adult patients with sepsis or septic shock receiving the initial 2 doses of antimicrobials within the institution between January 2016 and December 2019. Descriptive statistics were used to examine patient demographics and characterize delays in antimicrobial therapy. Inferential statistics were used to assess secondary objectives.

Results: Of 158 included patients, 52 (33%) patients experienced at least 1 delay in therapy. A total of 313 second doses were administered, with 60 (19%) doses delayed. Of these delayed doses, the median extent of delay was 48% (median: 1.48, IQR: 1.28 – 1.76). These delays occurred independently of the prescribing service (p-value: 0.19) and how the order was written (p-value: 0.41). The institution's sepsis order sets were not used for any patients included in this study.

Conclusion: Delays in first-to-second dose antimicrobial administration occurred in one third of patients, suggesting an opportunity for quality improvement initiatives to further explore this issue.

Potentially Inappropriate Drug Duplication in a Cohort of Older Adults with Dementia

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Background: Drug duplication in non-steroidal anti-inflammatory drugs (NSAIDs), selective serotonin reuptake inhibitors (SSRIs), loop diuretics, ACE-inhibitors, and anticoagulants is considered potentially inappropriate by the STOPP criteria.

Objective(s): To complete a drug utilization review of drug duplication for NSAIDs, SSRIs, loop diuretics, ACE-inhibitors, and anticoagulants in a cohort of older adults with dementia to assess concordance with prescribing guidelines.

Methods: A retrospective cohort study using administrative claims of Nova Scotia Seniors Pharmacare beneficiaries. The cohort was defined by ICD 9/10 codes for dementia between March 1, 2005 and March 31, 2015. Prescription drug dispensation data and sociodemographic characteristics were collected over the same period. Duplication was two drugs from the same class were dispensed at times allowing them to be in the patient's possession at the same time. We reported duplication in overlapping prescriptions, duration of overlap, and age at dementia diagnosis. All reporting was stratified by sex.

Results: We reported concurrent NSAID, SSRI, loop diuretic, ACE-inhibitor, and anticoagulant use in Nova Scotia Seniors Pharmacare beneficiaries with dementia (NSSPBD) (table 1). NSAID duplication was most commonly seen for celecoxib with naproxen or diclofenac. The most common SSRI pair was sertraline with citalopram. ACE-inhibitor duplication was largely combination products of ACE-inhibitor with a diuretic duplicated with the parent ACE-inhibitor; presumably to increase ACE-inhibitor dose without increasing diuretic exposure (115/183 cases (62.8%)). Duplicate anticoagulants combined oral with parenteral administration, likely for bridging. Neither NSAIDs, SSRIs loop diuretics, ACE-inhibitors, nor anticoagulants showed a sex difference in risk for drug duplication.

Conclusion(s): There was drug duplication for NSAIDs and SSRIs in NSSPBD. Loop diuretic duplication was rare but of long duration. Drug duplication in NSSPBD indicates an area requiring intervention.

For the table that goes with this abstract, please see Abstract Appendix, available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/204

Multidisciplinary Lung Cancer Care Pathway for EGFR Positive Advanced Non-Small Cell Lung Cancer Patients at the Sunnybrook Odette Cancer Centre: A Process Map

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Background: Cancer care is a complex and often fragmented process involving a variety of specialized healthcare providers. Increased use of oral anticancer medications (OAMs) has introduced additional complexity. Cancer Care Ontario has published pathways outlining best practices for the management of patients across the continuum of various stages of lung cancer. Real-world descriptions of the complex pathway are absent from scholarly literature.

Objective: To create a multidisciplinary process map describing the sequence of tasks clinical and non-clinical staff at Sunnybrook Odette Cancer Centre (SOCC) contribute to the diagnosis and management of EGFR positive advanced non-small cell lung cancer (EGFR+aNSCLC).

Methods: Four medical oncologists, two nurses, four pharmacists, two registered pharmacy technicians, one drug reimbursement specialist, and five administrative support staff were interviewed and observed over a 3-month period (January 2019 – March 2019). Interview responses, field notes, and internal documents were used to construct a process map, which was iteratively revised based on participant feedback. Opportunities to optimize the patient care pathway were identified.

Results: The process map is composed of 38 steps and illustrates the coordination of care across SOCC administrative staff and four teams (Lung Diagnostic Assessment Program, Lung Clinic, Oral Anticancer Medication Program, Outpatient Pharmacy). Delayed access to molecular pathology results created redundancy and delayed treatment decisions. Opportunities to improve communication between pathology and medical oncology, clinicians and patients, and Odette staff and community-based practitioners were identified. Creating combined OAM-supportive care electronic order sets and facilitating documentation by pharmacy technicians and drug reimbursement specialists would improve communication and efficiency.

Conclusions: This is the first real-world depiction of the complex EGFR+aNSCLC patient journey. Process mapping was an effective way to illustrate the multidisciplinary EGFR+aNSCLC care pathway at the SOCC and assisted with the identification of opportunities to improve service quality and efficiency.

Management of Febrile Neutropenia and Application of the Clinical Index for Stable Febrile Neutropenia Tool in a Retrospective Cohort of Breast Cancer Patients

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Background: Febrile neutropenia (FN) is a well-known and potentially life-threatening complication of cytotoxic chemotherapy; however, FN patients at low-risk for complication can be safely managed in outpatient settings. The Clinical Index for Stable Febrile Neutropenia (CISNE) is a validated tool used to identify candidates for ambulatory care.

Objectives: To describe FN management patterns in a retrospective cohort of breast cancer patients presenting to the Sunnybrook Health Sciences Centre Emergency Department (ED) and evaluate the accuracy of the CISNE tool for predicting risk of complication.

Methods: Breast cancer patients who received curative anthracycline- and/or taxane-based chemotherapy between August 2013 and July 2019 and visited the Sunnybrook Health Sciences Centre ED during the active treatment phase were identified from institutional databases. Demographic, treatment, and clinical information was extracted from electronic medical records for each FN ED encounter. CISNE scores were calculated for each FN ED encounter. Sample characteristics and CISNE performance were descriptively summarized.

Results: Sixty-six (5%) of the 1259 patients identified had an FN event during the active treatment phase. Seventy-two FN events were identified. Primary prophylaxis with granulocyte colony stimulating factors was provided in 64 (89%) cases. Most FN cases occurred during cycle 1 of the anthracycline phase (72%, 52/72), with presentation most often between cycle day 6-10 (79%, 57/72). Seventy-eight percent (56/72) of FN cases were admitted for inpatient care, with a 4-day median length of stay (range 1-12 days). Twenty-one percent (12/56) of inpatient encounters were classified as "low-risk" by the CISNE. However, 42% (5/12) of "low-risk" inpatients required an acute change in clinical management during the course of admission.

Conclusions: FN was an infrequent occurrence in breast cancer patients receiving curative cytotoxic chemotherapy. The subjective nature of CISNE parameters and retrospective reporting bias may limit tool accuracy when applied to early breast cancer patients.

Improving Patient Medication Management Capacity through a Self-Medication Program in a Rehabilitation Inpatient Setting

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Background: A self-medication program (SMP) is designed to help hospital patients better manage their medications by increasing medication knowledge, promoting independence, and preparing them for discharge. Studies that have assessed SMP have shown benefits in medication knowledge and patient satisfaction, but effectiveness has not been demonstrated.

Objective: To determine factors associated with better medication management and adherence in patients participating in an inpatient SMP.

Methods: This was a prospective cohort pre and post study of patients participating in an SMP in a rehabilitation hospital in Canada. Patients consented and were enrolled in the study from November 17, 2016 to January 15, 2018. The Drug Regimen Unassisted Grading Scale (DRUGS) was used to assess patient's medication management capacity pre- and post-SMP while in hospital. The proportion of days covered (PDC) evaluated medication adherence six months after hospital discharge using community pharmacy records and patient telephone interviews. Chi-square and multivariate analyses to determine significant factors associated with medication management and adherence were performed.

Results: Ninety patients (mean age 56.9 years, 51.1% male) were enrolled in the study. Patients participated in the SMP on average 42.9 days (± 32.6 SD) and were discharged home on 11.3 (±5.2 SD) medications. Mean DRUGS scores significantly increased from 86.3% (±16.9 SD) pre-SMP to 92.3% (±13.9 SD) post-SMP (p=0.0002). Medication regimen complexity and cognitive impairment were associated with DRUGS score changes on univariate analysis. Mean PDC was 1.0 (±0.2 SD) in 78 patients with evaluable data. Multivariate analysis did not reveal any factors significantly associated with DRUGS score or PDC.

Conclusions: Patients demonstrated significantly better medication management capacity after participating in a SMP in a rehabilitation setting. Medication adherence after discharge was very high and was not associated with medication management abilities while in hospital.

Antimicrobial Resistance Trends of *Staphylococcus aureus* Isolates Collected from Patients at Sunnybrook Health Sciences Centre over 14 Years

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Background: *Staphylococcus aureus* are designated as methicillin-susceptible (MSSA) or methicillin-resistant (MRSA), based on beta-lactam antibiotic resistance mediated by the *mecA* gene. Published Canadian data is heavily focused on MRSA resistance trends. The present analysis discusses both MRSA and MSSA, offering a more complete picture of *S. aureus* resistance patterns.

Objective: To identify antimicrobial resistance trends in *S. aureus* clinical isolates at Sunnybrook Health Sciences Centre (SHSC) from 2002 until 2016.

Methods: Susceptibility data was extracted from the SHSC Microbiology Database for *S. aureus* isolates collected from patients starting October 2002 until September 2016. Using univariate linear regressions with a significance level of <0.05, resistance trends for cefazolin, ciprofloxacin, clindamycin, cloxacillin, erythromycin, gentamicin, moxifloxacin, nitrofurantoin, penicillin, rifampin, tetracycline, sulfamethoxazole-trimethoprim, and vancomycin were generated for MSSA and MRSA isolates.

Results: The prevalence of antimicrobial-resistant and multidrug-resistant MSSA increased over time (+1.0%/year and +0.5%/year, respectively). MSSA resistance increased to ciprofloxacin (+0.5%/year), penicillin (+1.7%/year), and sulfamethoxazole-trimethoprim (+0.1%/year). Conversely, a significant decrease in resistance was found for MRSA isolates to ciprofloxacin (-1.7%/year), clindamycin (-4.0%/year), erythromycin (-1.4%/year), moxifloxacin (-4.0%/year), and rifampin (-0.5%/year). For all other antimicrobials analyzed, there were no significant trends in MSSA or MRSA resistance. One hundred percent (7398/7398) of MSSA isolates were susceptible to cloxacillin and over 99% (3556/3559) were susceptible to cefazolin. In addition, 100% (1819/1819) MRSA isolates identified across the 14-year study period were susceptible to vancomycin.

Conclusion: MSSA resistance rates to individual antibiotics increased or remained stable, whereas MRSA resistance rates decreased or remained stable. The modest reduction in MRSA resistance at SHSC may be a commentary on the reversibility of institution-level antimicrobial resistance due to more prudent antimicrobial use and infection control policies. However, multivariate models would be required to confirm this optimism.

Real World Comparison of Gefitinib, Afatinib, Erlotinib, and Osimertinib in Advanced Non-Small Cell Lung Cancer Patients: A Multicenter Retrospective Cohort Study

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Background: Our single-centre study at Sunnybrook Health Sciences' Odette Cancer Centre (OCC) found exposure to oral anticancer medication (OAM) clinical pharmacy services (CPS) increased the likelihood of early treatment interruption in non-small cell lung cancer (NSCLC) patients, but the effect was confounded by OAM prescribed.

Objective: To evaluate OAM agent, treatment centre, and OAM-dedicated CPS exposure as predictors of early OAM modification, disease progression, and survival in a multicenter retrospective cohort of advanced NSCLC patients.

Methods: Electronic medical records were reviewed for OAM-naïve NSCLC patients from OCC and Princess Margaret Cancer Centre (PMCC) prescribed gefitinib, afatinib, erlotinib and osimertinib between January 2012 and December 2018. Likelihood of early OAM modification (temporary hold, dose reduction, or discontinuation within two months of starting therapy), disease progression at 36 months, and mortality at 36 months were assessed using multivariable logistic regression and cox-proportional hazards models. Predictors included OAM agent (gefitinib as referent), treatment centre, and CPS exposure.

Results: Two-hundred and sixty-nine patients from OCC (53%) and 236 patients from PMCC (47%) were identified. The majority were prescribed gefitinib (336 gefitinib, 64 afatinib, 66 erlotinib, 39 osimertinib) and were unexposed to OAM-CPS (358 unexposed, 147 exposed). Afatinib (OR 4.92, 95% CI 2.63-9.20, p<0.001) and erlotinib (OR 2.06, 95% CI 1.10-3.88, p=0.025) use was associated with increased likelihood of OAM modification. Erlotinib use was associated with increased likelihood of disease progression (OR 1.68, 95% CI 1.24-2.27, p=0.001) and death (OR 2.46, 95% CI 1.72-3.53, p<0.001). Afatinib use reduced likelihood of mortality at 36 months (OR 0.55, 95% CI 0.32-0.96, p=0.036).

Conclusion: Afatinib increased the likelihood of early OAM modification but was associated with a survival advantage at 36-months. Erlotinib was inferior to gefitinib for all outcomes, consistent with its use in the second line setting. Treatment centre and OAM-CPS exposure did not predict early OAM modification, disease progression, or mortality.

A Retrospective Review of Opioids Prescribed for Post-Surgical Acute Pain in Children upon Hospital Discharge

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Background: Nearly 60% of opioids prescribed for pediatric post-surgical patients remain unconsumed after therapy to treat pain. Opioid stewardship has emerged to address concerns surrounding opioid prescription (mis)use. Opioid stewardship practices identified by Drug Free Kids Canada are defined as coordinated interventions to improve, monitor, and evaluate opioid use.

Objectives: The objective of this retrospective review was to assess prescribing patterns of pediatric post-discharge surgical opioid prescriptions and identify the amount of opioids prescribed in opioid-naïve patients from January 1st to June 30th 2019. This multi-phase project will help define modern opioid stewardship programs.

Methods: All children under the age of 19 with opioid discharge prescriptions following a surgical procedure were included. Electronic medical charts (EPIC) were used to determine medication prescribed, length of therapy, number of total doses, dose and frequency. Types of surgeries (day and inpatient) were general, orthopedic, cardiac, urologic, plastic, ear/throat, dental, and oro-maxillofacial.

Results: A total of 3594 surgical procedures were performed, 1095 (30%) prescribed opioids. Morphine represented ~91% (n=985) and hydromorphone represented ~9% (n=102) of opioids prescribed; mean length was 3.4 (±2.3) days, where ~42% (n=454) were under 3 days, and ~82 percent (n=886) were under 4 days. When dichotomizing by body weight across all surgery types the mean doses (mg/kg) were as follows:

Conclusions: Our findings indicate that pediatric post-discharge surgical opioid prescriptions were within or below recommended Lexicomp guidelines for dose (mg/kg), most were for less than 4 days. Future research will be focused on assessing un-used opioids that remain post treatment, safe disposal and adequate use of non-opioid medications in an effort to describe the success of stewardship programs.

Trends in Opioid Adverse Event Reporting Rates in Canada since 1965

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Background: Opioids are frequently used to treat acute and chronic pain. However, opioid-related adverse reactions (AR) are common and have been associated with worse outcomes. Only 5% of drug-related AR (including opioids) would be reported to health authorities. Even though the government has issued clinical recommendations and policies, the opioid crisis is raging in Canada and little is known about declaration opioid-related AR at the population level.

Objective: To investigate how rates of opioid-related AR declarations occurring in and out of hospitals have evolved since 1965 in Canada.

Methods: We conducted a retrospective study examining the trends of opioid-related AR declared to Canada Vigilance from January 1st, 1965 to October 31, 2019 using Canada Vigilance and Statistic Canada databases. Yearly rates of AR declarations were computed and descriptive analyzes were performed along with a Joinpoint regression and a post-hoc sensitivity analysis.

Results: Among 14,135 AR, oxycodone was the most and normethadone was the least involved causing agent. The highest and lowest rates of AR declaration were 3.2 and 0.1 per 100,000 person-years, respectively in 2015 and 1965. Since 1965, with physicians, pharmacists are among those reporting the least (respectively n=2,062 and n=2,379) compared to health care professionals (n=2,838) and non health care professionals (n=3,366). Overall, from 1965 to 2019, trends of AR declarations increased. Precisely, a non-significant decrease was measured from 1965-2003 (0.31%, standard error ± 0.59, p=0.6045), then an increase of 25.59% ± 6.18% until 2012 (p=0.0002) and finally a decrease of 23.90% ± 7.53% until 2019 (p=0.0026). The post-hoc sensitivity analysis revealed similar findings.

Conclusion: Opioid-related AR declarations seem to increase in Canada, even though huge fluctuations were observed in the last 20 years. Knowing that the absolute number of AR might be seriously underestimated, upcoming studies should investigate how to overcome this gap, along with clinician-pharmacists.

Risk of Burnout in Hospital Pharmacists Transitioning to an Electronic Health Record

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Background: High levels of burnout have been correlated with increased medical errors, higher patient mortality ratios and increased clinician depression. Electronic health records (EHR) have been identified as contributing to higher burnout rates in physicians.

Objective: Assess and compare the risk of burnout before, during and after implementation of an EHR in Alberta and identify stressors related to burnout.

Methods: An anonymous longitudinal survey containing the Maslach Burnout Inventory (MBI), demographics, pharmacy stressors and career satisfaction was distributed to Alberta Health Services pharmacists in September 2019 (Y1) and 2020 (Y2). The EHR was implemented at some sites in November 2019 and October 2020. Individual MBI scores were calculated and a binary logistic regression was used to analyze high risk scores against demographic information, stressors and career satisfaction. The survey will be redistributed yearly for 3 more years as the EHR is implemented at other sites.

Results: Response rates were 14.7% (Y1) and 14.1% (Y2). Pharmacists with high burnout risk comprised 40% and 46% of respondents in Y1 and Y2, respectively, and was driven by emotional exhaustion. In pharmacists using the EHR the risk of burnout was 43%. Several factors were identified as significant predictors of burnout in Y1: years of practice, a hostile work environment, inadequate support for administrative duties, feeling contributions are underappreciated and overall career satisfaction. In Y2 only lack of time available for professional growth significantly predicted a high risk of burnout.

Conclusion: Similar to other clinicians, hospital pharmacists are at an increased risk of burnout. These preliminary results does not show an increased risk with the implementation of EHR.

Potential Drug-Drug Interactions in Hospitalized COVID-19 Patients (CATCO-DDI)

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Background: Therapies for managing COVID-19 disease may interact with other drugs, particularly in hospitalized patients with comorbidities.

Objectives: Characterize the prevalence of drug-drug interactions (DDIs) between investigational/approved medications for managing COVID-19 (COVID-meds) and co-medications (co-meds) in hospitalized COVID-19 patients.

Methods: Multicentre retrospective observational study of hospitalized COVID-19 patients screened for the CATCO trial between 1-Apr-20 and 15-Sep-20. Patients' co-meds were assessed for potential DDIs with the following COVID-meds: hydroxychloroquine (HQ), lopinavir/ritonavir (LPV), remdesivir (REM), dexamethasone (DEX), azithromycin (AZ), interferon beta-1B (IFN) and tocilizumab (TOC). The Liverpool-COVID DDI website and Lexicomp were used to identify and characterize DDI severity (red: do not co-administer, amber: potential interaction) and potential clinical impact. QT prolongation risk was assessed with the Tisdale risk score. The primary outcome was the prevalence of subjects with ≥1 potential clinically significant (red/amber) DDI between each COVID-med and co-med. Secondary outcomes included DDI severity and potential clinical impact. Descriptive statistics are presented as medians (range) or proportions.

Results: Data from 51 patients are available: 61% male, age 74 (44-95) years, 6 (1-15) comorbidities, Tisdale risk score 6 (31.4% moderate risk, 11.8% high risk) and 10 (0-19) co-meds. LPV had the highest rate of potential DDIs (92.2%, 45% red, 3 DDIs per patient) with risk of increased co-med toxicity (most commonly psychotropics, anticoagulants/antiplatelets), while REM and IFN had the least (2% and 9.6%, respectively). Most patients (75%) had ≥1 DEX DDI (mostly amber, 1per patient) with risk of increased co-med toxicity. The most common DDIs with HQ and AZ involved increased risk of QTc prolongation. Over one-third (35%) of patients were deemed ineligible for CATCO at screening due to DDIs with LPV.

Conclusions: Hospitalized COVID-19 patients are at high risk of DDIs with many investigational/ approved COVID medications. Routine DDI screening is recommended, ideally using both general and COVID-specific DDI resources.

Population Pharmacokinetics of Vancomycin in Paediatrics – A Systematic Review

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Background: Vancomycin is commonly used to treat gram-positive bacterial infections in the paediatric population, but dosing can be challenging. Population-based PK (PopPK) modelling can improve individualization of dosing regimens.

Objective: The primary objective was to describe popPK of vancomycin and factors that influence PK variability in paediatric patients.

Methods: Systematic searches were conducted in Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, International Pharmaceutical Abstracts and the grey literature without language or publication status restrictions from inception to August 17, 2020. Any observational study that described popPK analyses of vancomycin in paediatric populations were included. Risk of bias was assessed using National Heart, Lung and Blood Institute Study Quality Assessment Tool for Observational Cohort.

Results: Seventy-two observational studies (n=10,457 patients with at least 27,257 serum vancomycin concentrations) were included. The mean age was 2.5 years (range: 1 day to 18 years), serum creatinine was 47.1 ± 33.6 µmol/L, creatinine clearance was 97.4 ± 74.4 mL/min/1.73m^2. Most studies found that vancomycin pharmacokinetics was best described by one-compartment model (70.8%). There was wide range of clearance and central volume of distribution (Vd) values (range: 0.014 to 0.27 L/kg/h, 0.18 to 1.5 L/kg, respectively) with inter-individual variability as high as 50.4% for clearance, 232% for Vd and proportional residual variability up to 40.8%. Most significant covariates for clearance were weight, age, and serum creatinine or creatinine clearance; for Vd was weight. Variable dosing recommendations were suggested.

Conclusions: Numerous popPK models of vancomycin were derived, however, external validation of suggested dosing regimens and analyses in subgroup paediatric populations such as dialysis patients are still needed before a popPK model with best predictive performance could be applied for dosing recommendations. Significant intra- and inter-individual PK variability were present, which demonstrated need for ongoing therapeutic drug monitoring and site-specific derivation of pharmacokinetic models for vancomycin.

Pathways to Developing Independent Clinical Pharmacist Practitioners: Is There a Better Way Forward?

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Background: The scope of practice of Canadian pharmacists varies widely, ranging from traditional dispensing roles to independent direct patient care practice with prescribing authority. Given the substantial body of literature that supports the beneficial impact of pharmacists in direct patient care, it would be desirable to address barriers and enhance enablers to pharmacists attaining clinical pharmacist practitioner (CPP) level of practice. Access to a greater number of CPPs could benefit the Canadian healthcare system.

Objectives: To propose a pathway that facilitates the attainment and/or recognition of CPP level practice in Canada. This pathway will be informed by the perspectives of current Canadian CPPs and other key healthcare system stakeholders.

Methods: Qualitative descriptive study which employs thematic analysis and grounded theory methodology. Semi-structured interviews were conducted with two main populations nominated by their peers: I) Canadian CPPs (N=13) and II) Canadian healthcare system stakeholders (key individuals identified from academia, regulatory and practice domains; N=6). Thematic analysis of the interviews yielded emergent themes, concepts and representative quotes. Grounded theory methodology utilized these themes and concepts in developing CPP pathways.

Results: Key theme categories that were identified amongst Canadian CPP and healthcare system stakeholder interviews included: I) A sense of dissatisfaction with the status quo for pharmacy practice II) A need for pharmacists to reframe their role and better advocate for themselves within the healthcare system. Pathways forward may include development of a unified national credential which signifies high level practice or increased advocacy for provincial government implementation of expanded pharmacist scope, as has been done in certain provinces.

Conclusions: Pathways for increasing CPP level practice are attainable; however, pharmacists first need to clearly define their role within the Canadian healthcare system.

Opioid Prescribing and Usage Patterns among Orthopaedic Fracture Patients in an Alternate Level of Care Unit at a Community Teaching Hospital

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Background: In response to the opioid crisis, limiting opioid use in acute pain management is recommended. At North York General Hospital, patients with fractures, whether managed surgically or conservatively, are often prescribed opioids. The extent to which they remain on opioids is unknown. The literature reports prolonged opioid use, 6 months and longer, among fracture patients.

Objective: To assess whether opioid usage is minimized without compromising pain control in fracture patients who are deemed medically stable and transferred to an alternate level of care (ALC) unit.

Methods: A retrospective observational study was conducted to examine opioid prescribing patterns, usage and pain scores in fracture patients who were transferred to the ALC unit from June 1, 2018 to May 31, 2019. Patients were followed until discharge. Medical records of these patients during the study period were reviewed. Fracture patients on at least one opioid at time of transfer were included. Duration of opioid use post-fracture, daily dose of opioids (converted to morphine milligram equivalents (MME)) prescribed and used, as well as pain scores on transfer and discharge were collected. Descriptive statistics were calculated.

Results: Thirty-six of 52 fracture patients met the inclusion criteria. Patients were prescribed opioids for an average of 30 days post-fracture. Opioids were discontinued at discharge in 17 of 36 patients (47%). There was a 49.1% reduction in the mean MME prescribed at transfer versus discharge (24.7 mg vs. 12.6 mg). There was a 74.8% reduction in the mean MME used on transfer compared to discharge (14.9 mg vs 3.8 mg). Seventeen of 36 patients (47%) had complete resolution of pain scores at discharge.

Conclusion: This study demonstrates that in medically stable fracture patients in an ALC unit, there is de-prescribing of opioids, reduced opioid usage and reduction in pain at discharge compared to time of transfer.

Medication Management Education for Chronic Kidney Disease: Development of a Conceptual Digital Media Framework

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Background: Patients with chronic kidney disease (CKD) have complex treatment regimens requiring extensive medication management support and education. Patients increasingly rely on digital resources for health information, necessitating the need to tailor requirements in digital education tools for this population.

Objective: To objective of this study was to develop a conceptual framework for digital media supporting medication management in patients with CKD.

Methods: A prospective qualitative study design was followed to derive a conceptual framework. First, patients with advanced CKD participated in semi-structured interviews to discuss their experiences in medication management, including needs and preferences for education delivery. A scoping review followed, using OVID Medline, CINAHL, PubMed and EMBASE databases from 1946 to 2020. Studies describing CKD medication education tools were analyzed to identify common features. Finally, a conceptual framework for digital medication management education was developed, integrating thematic findings from patient interviews and the scoping review.

Results: Eleven patients were interviewed, reporting strong adherence and understanding of their medication regimens. Knowledge gaps included side-effects, sick-day management, and over-the-counter (OTC) medication safety. For digital medium, participants reported a preference towards websites and electronic documents over video or audio-based formats. Ten eligible papers described 13 CKD medication education tools. Themes in the review included medication adherence, safety, and CKD medications. The framework for digital media education includes content focused on practical daily medication management written in lay language, delivered through an accessible and familiar platform. Suggested medication topics include an overview of CKD-specific drug classes, adherence, sick-day management, and OTC safety. Targeting sick-day management, a digital infographic incorporating principles from the framework was developed and implemented.

Conclusion: Digital media represents a potential channel for medication management education. The proposed framework can inform the development of future tools tailored to the specific needs and preferences of the CKD patient population.

Improving Communication during External Hospital Transfer: Development and Pilot of a Transfer Medication Reconciliation Form

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Background: Transitions in patient care are vulnerable to preventable medication errors. Medication reconciliation (MR) at care transitions has been declared a Required Organizational Practice by Accreditation Canada and an effective method for reducing medication errors and improving communication. The Saskatoon area of the Saskatchewan Health Authority does not have a formalized process for transfer medication reconciliation (TMR).

Objective: To develop and pilot a standardized form and process for MR when a patient is transferred from one acute care facility to another.

Methods: The study involved 5 phases: development of a paper-based TMR form; Plan-Do-Study-Act cycles to refine content, comprehension, and flow; transition to an electronic form; development of work standards and education for intended users of the form; and pilot of the form and process on the wards. Completed TMR forms were assessed through quality audits and survey feedback from end users.

Results: The TMR form underwent 12 revisions. Work standards, educational posters and presentations were provided to end users. Thirty-one TMR forms were completed at sending sites. Quality audits showed 19 (61.3%) TMR forms were completed with all medications reconciled correctly. However, almost 10% of best possible medication history (BPMH) medications were not reconciled on the TMR form. Twenty-seven (87.1%) forms arrived at receiving sites and 20 (74.1%) were used as admission orders. Survey data showed the TMR form was user-friendly and improved the transfer of medication information, but barriers to use included time constraints, lack of education/awareness, and lack of physician on site to complete form.

Conclusions: The results show a structured, collaborative, electronic TMR form and standardized process that promotes review of key documents can reduce medication discrepancies at transfer, enhance efficiencies, and improve communication of medication information. Engagement and education of all users of the form is essential for future implementation.

Geographic Variation in Antithrombotic Therapy for Patients with Atrial Fibrillation Undergoing PCI across 5 Zones in Alberta, Canada

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Background: Combination antithrombotic therapy is recommended for atrial fibrillation (AF) patients undergoing percutaneous coronary intervention (PCI). Two of the five zones of Alberta have PCI facilities and patients may be followed outside these zones, so antithrombotic therapy may differ.

Objectives: To describe geographic variation and associated factors in use of direct oral anticoagulants (DOAC), warfarin, no anticoagulant, and P2Y12 inhibitors, and thrombotic and bleeding events in Alberta, Canada.

Methods: Using linked administrative data, this retrospective review included patients with AF undergoing PCI with stenting from September 2014 to December 2019 who filled prescriptions for anticoagulants and P2Y12 inhibitors. Valvular AF, non-AF indication for anticoagulation, and non-Alberta residency were exclusions.

Results: Of 1305 patients included: 23% female, median age 72 years and 63% acute coronary syndromes. Proportion of patients on anticoagulants (53%) was consistent across zones (p=0.47) with increasing age associated with increased anticoagulant use. Calgary and South used significantly more warfarin (42.6% vs 27-32%, $p < 0.05$ for comparisons of Calgary to North, Central, Edmonton; 51.0% vs 27-32%, $p < 0.05$ for comparisons of South to all others), with the remainder filling DOACs. Greater patient weight, previous myocardial infarction, and PCI after publication of the PIONEER-AF PCI trial were associated with greater DOAC use. In those on anticoagulants, clopidogrel was the predominant P2Y12 inhibitor in all zones though use was significantly greater in Calgary (95% vs 81-88%, $p < 0.05$ for comparisons to Edmonton, Central, North). Associations were found between older age and warfarin use with increased bleeding events, and female sex and previous MI with increased thrombotic events.

Conclusions: Almost half of patients were not on anticoagulants after PCI. South and Calgary had greater proportions of warfarin than other zones. Anticoagulant choice was not associated with recurrent thrombotic events; however, warfarin was associated with an increase in bleeding events.

Factors Associated with the Prescription of Fluoroquinolones as an Initial Treatment Option for Community-Acquired Pneumonia in Adult Patients in a University Hospital

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Background: Fluoroquinolones (FQ) are antibiotics often targeted by antimicrobial stewardship strategies because of their overuse and the established link between their use and *Clostridioides difficile*-associated diarrhea.

Objective: To identify factors associated with prescribing a FQ as first-line antibiotic treatment for community-acquired pneumonia (CAP) in adult hospitalized patients before and after the publication of local treatment guidelines.

Methods: Cross-sectional etiological study with retrospective data collection from between 2014 to and 2018. Medical records of patients 18 years or older admitted for CAP treatment were reviewed. Several variables related to the patient and their hospitalization episode at the time of prescription of the antibiotics (e.g., COPD, penicillin allergy) were considered. These factors were analyzed using Pearson's chi-squared and T-Student tests based on the presence or absence of a fluoroquinolone in the initial treatment.

Results: A total of 98 out of 451 patients (22%) received a FQ as first-line therapy. There were significantly fewer FQ prescribed after publication of the local guidelines (31 % before vs. 13 % after, $p < 0.0001$). Age greater than or equal to 75 years was significantly associated with a higher rate of prescribing FQ compared to other treatments (78% vs. 61%, $p = 0.0027$). Smoking is a factor that appears to be a deterrent to the use of FQ compared to other treatments (7% vs. 15%, $p = 0.0313$). There was no significant difference in other co-morbidities, allergies, or recent antibiotic use.

Conclusion: An age of 75 years or older is the main objective factor significantly associated with the prescription of a fluoroquinolone as initial treatment for CAP in hospitalized patients. The other objective factors studied did not show an association, which may indicate the potential for subjective factors to influence prescribers.

Exploratory Study to Assess the Efficacy of a 4-Step Cleaning Protocol and Its Lasting Effect after 30 Days

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Background: Guidelines recommend deactivating, decontaminating, cleaning and disinfecting surfaces exposed to antineoplastic drugs, but products used and cleaning frequencies vary per center. Some surfaces in pharmacy Departments remain systematically contaminated over the years.

Objectives: Explore the efficacy of a 4-step cleaning protocol and its lasting effect on surface cyclophosphamide contamination after 30 days, in Canadian hospital pharmacies.

Methods: Nine Directors of pharmacy departments were contacted in 2020. Sites that were systematically contaminated were identified. Surface cyclophosphamide contamination was quantified at T0 (at the end of a working day), T1 (after a 4-step decontamination consisting of a detergent, 2% sodium hypochlorite, alcohol 70% and water) and T2 (at the end of a working day, 30 days later). Cyclophosphamide was quantified by ultra-performance liquid chromatography-tandem mass spectrometry.

Results: Nine hospitals were recruited and 17 sampling sites were identified. One front grille of the hood sample was excluded (unexplained outlier value). 88% (14/16) of T0 samples were contaminated. After the 4-step cleaning protocol, 44% (7/16) of T1 samples were not contaminated and 94% (15/16) of concentration was lower than T0 concentration. After 30 days, 75% (12/16) of T2 samples were contaminated again, but 100% (16/16) of T2 cyclophosphamide concentration was lower than T0 concentration. The 4-step cleaning had a lasting effect on the storage areas (n=2); they were not contaminated at T1 nor at T2. Seven samples had an increased concentration in T2 (>0.001 ng/cm^2), six were similar and three decreased.

Conclusions: The 4-step cleaning protocol proved insufficient to remove all cyclophosphamide traces, but it reduced the contamination. The effect lasted after 30 days, especially on the storage shelves which were entirely free of contamination both at T1 and at T2. A future study will explore the effect of an improved cleaning protocol (i.e., using a microfiber wipe and less liquid).

Evaluating the Influence of Intravenous Ketamine on Post-Operative Opioid Use in Surgical Patients at a Tertiary Care Centre

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Background: Intravenous (IV) ketamine is one strategy for reducing opioid use postoperatively. Subanesthetic doses of IV ketamine have been shown to improve the efficacy of opioids, increase pain control, and exemplify opioid-sparing effects when used in adults as postoperative analgesia.

Objectives: To determine the impact of IV ketamine on opioid usage in hospital, opioids prescribed within 24 hours of discharge, and pain scores in surgical patients.

Methods: A retrospective trial was conducted in surgical patients exposed to IV ketamine compared to those not exposed to IV ketamine. Patients were matched for age, surgical service, and sex. Primary outcomes include mean opioid use postoperatively on day 0 through day 3, mean opioid use 24 hours prior to discharge, and patient-reported pain scores. Secondary outcomes include the use of naloxone and the presence of hallucinations or delirium during admission. All opioid doses were converted to oral morphine equivalents. The mean and standard deviation were used to capture opioid usage and pain scores, and the student's t-test was used to compare outcomes between groups.

Results: A total of 104 patients were included in the trial. Overall, there was no significant difference in mean total opioid use in hospital in patients exposed to ketamine compared to those that were not (171.7 mg versus 115.5 mg, p=0.09), nor was there any difference in opioid use 24 hours prior to discharge (28.2 mg versus 12.2 mg, p=0.14). Patient-reported pain scores did not differ between groups. More patients in the ketamine group experienced hallucinations compared to those not exposed to ketamine (5 versus 0, p=0.02).

Conclusions: Overall, subanesthetic doses of IV ketamine used post-operatively in surgical patients did not decrease opioid use or patient-reported pain. Though the incidence was small, IV ketamine did increase hallucinations. Results will help guide post-operative analgesia and strategies to reduce opioid use.

Drug Prescriptions Requiring Compounding at a Canadian University Affiliated Pediatric Hospital: A Cross-Sectional Study

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Background: Many drugs administered to Canadian children remain unavailable in commercial formulations that suit their needs. This leads to compounding which can increase the risk of dosing error, exposure to unsafe excipients, and therapeutic failure. Though compounding is common in pediatrics, the importance of this practice in recent years is not well described.

Objectives: To determine the proportion of 1) active prescriptions (aRx) of compounded drugs for enteral administration (CDEA) in hospitalized children, among all aRx; 2) hospitalized children prescribed at least 1 CDEA, among all children with aRx.

Methods: In this retrospective study conducted at a Canadian academic pediatric hospital, all aRx for hospitalized patients under 18 years of age were identified using the hospital pharmacy database on 2 randomly selected summer and winter days. Demographic data was collected from medical records for patients with at least 1 aRx. CDEA was defined as any drug requiring manipulation including solids, such as tablet splitting, and liquids, such as solutions prepared with an active ingredient.

Results: A total of 606 hospitalized children with 5465 aRx were included in this study. Overall, CDEA represented 13.1% (n=714) of all aRx, and 23.2 % of aRx for enteral administration. Nearly half of patients (N=298 [49.2%]) were prescribed at least 1 CDEA. CDEA were mostly liquids (n=478 [66.9%]), and included mainly drugs of central nervous and cardiovascular systems (Table 1).

Conclusion: Availability of suitable pediatric formulations in Canada remains challenging, with compounding still required to treat almost half of the hospitalized pediatric population. International collaboration is mandatory to facilitate access to child-friendly formulations as they become available in trusted foreign jurisdictions.

For the table that goes with this abstract, please see Abstract Appendix, available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/204

Description of Pharmacists' Interventions during the Prescription Validation Process Using a Pharmaceutical Care Model Based on Patient Prioritization in a Specialized Hospital

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Background: The validation of prescriptions in a hospital setting is an integral part of the pharmacists' tasks to ensure an adequate and safe medication dispensing process. A new patient prioritization-based pharmaceutical care model was recently implemented in our hospital. Considering the lack of data and multiple recent changes in pharmaceutical care, it is essential to redefine the role of pharmacists during the prescription validation process.

Objective(s): The main objective was to describe the interventions performed by pharmacists during the prescription validation process in a center using a new pharmaceutical care model based on patient prioritization.

Methods: A prospective study identifying oral and written interventions made by pharmacists during the prescription validation process using a pharmaceutical care model, during a 21-day period. Data collection was carried out from computerized pharmacological files and a standardized collection tool. The pharmacists' written consent and the project approval by the local ethics committee were obtained.

Results: A total of 1651 interventions during the prescription validation process were carried out, of which 1076 were verbal and 575 written. The most frequent interventions were related to pharmaceutical opinions (26.3%), prescriptions at admission (12.0%), drug doses (11.3%) and administration schedules (10.7%). Amongst the interventions, 53.2% (n = 878) were documented in the patient's pharmacological or medical file and 339 (20.5%) stemmed from the pharmaceutical care model. The activities reserved to pharmacists according to Bill 41 represented 206 interventions (12.5%).

Conclusion(s): Many types of interventions are performed by pharmacists during the prescription validation process in our hospital. This study provides a portrait of the pharmacists' interventions using a pharmaceutical care model based on patient prioritization.

Delivery of Clinical Pharmacy Services at Odette Cancer Centre during the COVID-19 Pandemic

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Background: Virtual methods have been innovatively utilized by healthcare professionals to provide a variety of clinical services during the COVID-19 pandemic. In March 2020, the Odette Cancer Centre pharmacy modified the delivery of clinical pharmacy services (CPS) to minimize patient contact and decrease the risk of viral transmission. As part of the modified delivery model, CPS such as best possible medication histories (BPMH), baseline assessments, and medication therapy counsels were conducted via telephone.

Objective: To describe the Odette Cancer Centre Pharmacy's modified CPS delivery model for ambulatory patients treated with intravenous anticancer therapy during the first wave of the COVID-19 pandemic.

Methods: The modified CPS delivery model was implemented on 25 March 2020. A process map illustrating differences in workflow between the standard and modified CPS delivery models was created, and challenges to remote CPS delivery were identified. The number of BPMH/baseline assessments and medication therapy counsels completed virtually and in-person were tracked over a six-week follow up period and summarized as process metrics.

Results: The high-level process map illustrates the stepwise differences in workflow for a single patient across a four-day period. During the six-week follow up period, 202 BPMH/baseline assessments and 199 medication therapy counsels were completed. Seventy-four percent (149/202) of BPMH/baseline assessments and 36% (74/199) of medication therapy counsels were provided remotely. Challenges to remote CPS delivery included patient acceptance and lack of technology to support system-level processes.

Conclusion: By incorporating remote delivery approaches, clinical pharmacy service levels at the Odette Cancer Centre were maintained during the first wave of the pandemic without significant investment in resources. Further research to develop, refine, and individualize virtual clinical pharmacy care models will help to consolidate the role of these approaches in the post COVID-19 pandemic era.

Characterizing the Role of Home Care Pharmacists in the Edmonton Zone

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Background: With the gradual shift towards outpatient health care delivery in Canada, the need for home care services is increasing. Home care patients often have multiple comorbidities and correspondingly complex medication regimens; however, there is limited literature exploring the role of home care pharmacists and the clinical activities that they perform.

Objectives: To describe the type and frequency of clinical activities performed by home care pharmacists upon initial consultation. To determine which patient characteristics resulted in the highest number of clinical activities, and the frequency of pharmacist initiated clinical interventions and recommendations.

Methods: Retrospective chart review of patients who had an initial consultation with home care pharmacists within the Edmonton Zone from June 2018 to May 2019.

Results: Amongst 318 patients (89.6%), 60.1% were female and the median age was 79 (IQR 68-86). The median number of medical conditions and medications was 6 and 10, respectively. Of a total of 1172 clinical activities, there was a median of 3 (IQR 2-5) per patient and this did not change for those with the top 5 most common medical conditions namely, hypertension, type 2 diabetes, osteoarthritis, depression and dyslipidemia. The most common activities were patient counselling (13.7%), collaboration with another health provider (13.4%), and deprescribing (11.9%). Among all activities, pharmacists made 562 interventions and 610 recommendations. Older age, and having more medications was associated with an increased number of clinical activities (increase of 0.01, p= 0.003, and 0.03, p <0.001, for each additional year of age and each additional medication, respectively).

Conclusions: Home care pharmacists in the Edmonton Zone performed a wide range of clinical activities, in particular, for older patients and those with more medications. Further research is required to evaluate outcomes as a result of pharmacist consultation.

Cannabis Use, Experiences, and Perspectives in a Hemodialysis Population: A Descriptive Patient Survey

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Background: Patients with end-stage kidney disease (ESKD) suffer an average of 13 symptoms per day. Pharmacologic treatment options are limited by adverse effects, high pill burden, and poor efficacy. Interest in cannabis as a therapeutic alternative to manage refractory symptoms has been described in the literature. Currently, limited data exists about cannabis use or patient perspectives in the ESKD population.

Objectives: The objectives of this study were to characterize the use of cannabis among hemodialysis (HD) patients, describe patient perspectives related to cannabis, and explore patient experiences related to cannabis and the healthcare team.

Methods: We developed a 33-item questionnaire about cannabis with input from nephrology expert groups (pharmacists, nephrologists, nurse practitioners, and current HD patients). Patients of a tertiary hospital ambulatory HD unit were invited to complete the anonymous questionnaire. Descriptive analyses were performed.

Results: Three hundred HD patients were invited to participate, and 52 patients (17%) completed a questionnaire. Eleven patients (21%) reported cannabis use within the last 3 months. Most reported using cannabis recreationally (73%) and/or for symptom management without medical authorization (45%). Apart from recreation, the most reported reasons for use were insomnia, anxiety, and non-neuropathic pain. Smoked dried flower was the predominant method of consumption (73%). Among patients who used cannabis, 82% believed it has beneficial health effects and 18% believed it has harmful effects. Only 8% reported ever being asked about cannabis by a member of the HD team.

Conclusion: This is the first characterization of cannabis use among HD patients. Key findings were that a significant proportion of patients who use cannabis do so with minimal healthcare involvement, use via the smoked route is common, and a majority of patients surveyed believe cannabis has beneficial effects. These findings represent opportunities for patient education initiatives and harm reduction strategies.

Canadian Hospital Pharmacists' Perceptions of Preparedness and Wellbeing during the Coronavirus Disease 2019 Pandemic

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Background: The perceptions of some healthcare workers have been evaluated during the coronavirus disease 2019 (COVID-19) pandemic, but little is known about the perceptions of hospital pharmacists.

Objectives: To evaluate pharmacists' perceptions of their preparedness for the COVID-19 pandemic and to report their mean Warwick-Edinburgh Mental Wellbeing Score (WEMWBS).

Methods: Pharmacists working in a Canadian hospital inpatient setting during the COVID-19 pandemic were invited to participate in an online survey. Part A was a 46-item survey instrument including statements related to directions and support from leadership, personal protective equipment practices, professional role, and work environment. Part B assessed the mental wellbeing of respondents using the validated 14-item WEMWBS. The survey was open from July 21 to September 11, 2020. Descriptive analyses were used.

Results: A total of 457 hospital pharmacists from across Canada consented to participate in the study. Seventy-four percent of respondents were female with 64% aged 25-44 years old. Sixty-seven percent of respondents agreed they felt confident that their pharmacy department had been managing the pandemic effectively. The majority of respondents (81%) agreed their workplace had been able to manage the patient demand and had confidence they would continue to. The majority of respondents agreed their teams were working well together despite the stress they perceived they were under. Twenty-two percent of respondents did not agree they received training for COVID-19 infection prevention and control practices. The mean WEMWBS score was 48.9 +/- 8.6, indicating average mental wellbeing.

Conclusions: After the first wave of the COVID-19 pandemic, pharmacists perceived their hospitals, departments and teams were able to manage the pandemic. Ensuring all hospital pharmacists receive training for effective COVID-19 infection prevention and control practices is crucial. How their perceptions and wellbeing have changed since the second wave of the pandemic is unknown.

Implementation of an Antimicrobial Suggests Order in a CPOE System

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Background: Antimicrobial stewardship teams provide recommendations for antimicrobial optimization without consistent documentation of the interventions. Recent implementation of computerized prescriber order entry (CPOE) has supported electronic documentation of recommendations and tracking of acceptance rates.

Objectives: The objective of this study was to describe the implementation of Antimicrobial Stewardship Suggests orders as a tool for audit-and-feedback interventions in a large tertiary care academic hospital.

Methods: The Antimicrobial Stewardship Program (ASP) implemented an information technology developed CPOE-based "Antimicrobial Stewardship Suggests" order. The ASP Team routinely used this tool for documenting recommendations on prospective audit-and-feedback and hospital wide antimicrobial surveillance for patients during a 1-year period from January 1, 2020 to December 31, 2020. The orders generated an alert for the primary team to acknowledge by accepting or rejecting the suggestions. Rates of acknowledgement and full adoption of recommendations were assessed.

Results: During the study period, a total of 1153 electronic conversational interventions were made using the Antimicrobial Stewardship Suggests tool. Of these, 1024 (89%) were acknowledged by the admitting clinical service. The most common interventions included no drug indication (32%), de-escalation (25%) and bug-drug mismatch (15%). Stewardship recommendations were fully adopted in 93% of cases.

Conclusions: Our CPOE-based alert tool for communicating antimicrobial stewardship interventions proved to be effective in supporting judicious antimicrobial use and documentation of antimicrobial stewardship interventions.

Acetylsalicylic Acid Desensitization in Patients with Coronary Artery Disease

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Background: Allergy to acetylsalicylic acid (ASA) can be problematic for patients with imperative cardiologic indications for dual antiplatelet therapy with ASA and clopidogrel. In 2007, the first ASA desensitization protocol was used in our center. In 2019, following a literature review, two ASA desensitization protocols were adopted; a short and a long one depending on the severity of the previous allergic reaction. The most suitable ASA desensitization protocol for patients with ASA hypersensitivity remains to be determined.

Objective(s): The main objective was to describe our experience with desensitization in patients with ASA hypersensitivity who completed a desensitization protocol. The success rate of ASA desensitization was determined. The cases requiring a modification to the protocol to achieve successful desensitization or those where the desensitization was unsuccessful were described. Finally, the management of allergic reactions when the desensitization failed was also reported.

Methods: A longitudinal descriptive study with retrospective data collection including patients who completed an ASA desensitization protocol between January 2007 and June 2020 was performed.

Results: The study included 105 episodes of administered ASA desensitization protocols. The overall success rate of the desensitization protocol is 92.4%. There is no statistically significant difference between the success rate for the ASA desensitization protocols, whichever the one used. Of the 105 protocols administered, 19 patients experienced a hypersensitivity reaction. Of these, 12 patients had their desensitization protocol modified. A total of six patients failed to complete the ASA desensitization protocol. The study could not determine whether adherence to the pre-protocol desensitization recommendations had an impact on the outcome.

Conclusion(s): The desensitization protocols used have a high success rate. A study including a larger number of patients will be necessary to determine if there is a statistically significant difference between the old and the new protocol.

System-Level Interventions to Decrease Opioid Prescribing at Discharge in General Surgery: A Systematic Review

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Background: Previous studies have shown that general surgery patients are often prescribed opioids in greater quantities than are used. Overprescribing has been shown to be a contributor to chronic opioid use and the development of opioid use disorder.

Objective(s): The purpose of this systematic review is to evaluate system-level interventions aimed at reducing opioid discharge prescription quantities.

Methods: A systematic review of general surgery opioid stewardship literature was conducted using the databases PubMed, EMBASE and MEDLINE from database inception to June 22, 2020. The search terms used included: "opioid", "general surgery", "quality improvement" and "prescribing". Included studies were assessed for quality of study design and risk of bias using three validated critical appraisal tools. The primary outcome was the change in opioid quantities prescribed on discharge. Studied interventions were assessed for feasibility of implementation at our institution.

Results: The search strategy yielded nine primary studies; seven pre-post studies and two interrupted time series analyses, including a total of 17,551 general surgery patients. Six studies reported that the implementation of general surgery-specific opioid prescribing guidelines was associated with a 25-70% reduction in the quantity of opioids prescribed. Two studies reported that opioid prescribing legislation did not result in a reduction in opioid quantities prescribed at discharge. One study evaluated the addition of stand-alone oxycodone to the hospital formulary, which was not associated with a statistically significant reduction in the quantities of opioids prescribed on discharge. In the studies that reported safety outcomes, hospital visits for uncontrolled pain and opioid refill requests are uncommon.

Conclusion(s): The implementation of general surgery-specific opioid prescribing guidelines is a safe and effective method of reducing opioid prescribing quantities at discharge. We recommend that St. Michael's hospital implement and disseminate general surgery-specific, opioid prescribing guidelines.

Coordination and Delivery of Remote Clinical Pharmacy Services during the COVID-19 Pandemic: A Survey of Pharmacy Professionals at Cancer Centres across Canada

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Background: Clinical pharmacy services such as medication reconciliation, medication counselling, and toxicity follow up are integral elements of cancer patient care. Pharmacy professionals responded to the challenge of maintaining oncology clinical pharmacy services (CPS) while minimizing patient contact during COVID-19 pandemic restrictions.

Objective: To survey pharmacy professionals from across Canada and describe how cancer centre pharmacies adapted to deliver oncology CPS at the onset of the COVID-19 pandemic.

Methods: Pharmacy professionals at Canadian cancer facilities were invited to complete an online questionnaire. Recruitment occurred via the Canadian Association of Pharmacy in Oncology and Oncology Pharmacists of Toronto Regional Association networks. Survey items addressed practice site characteristics, changes to oncology CPS delivery models to accommodate COVID-19 pandemic restrictions, and barriers and facilitators to maintaining oncology CPS during the pandemic. Responses were summarized using descriptive statistics.

Results: Twenty-one (45%) of the 47 respondents were from Ontario, with the remainder distributed across the provinces and one territory. Of the 43 participants who completed the survey, 63% (27/43) reported a decrease in face-to-face CPS interactions, and 63% (27/43) reported an increase in telephone CPS encounters during the first pandemic peak. Video communications were seldom used before or during the pandemic. Most respondents (34/43, 79%) were confident that CPS levels were maintained during the pandemic. Flexibility in the method and timing of service provision was a commonly reported facilitator to CPS delivery during the pandemic. Common factors which impeded successful CPS delivery included lack of resources (technology, equipment) and inadequate time to plan.

Conclusion: Most pharmacists were satisfied with the level of oncology CPS maintained during the first wave of the COVID-19 pandemic. The majority of sites adapted by increasing telephone consultations and decreasing in-person encounters. Opportunities to improve remote CPS delivery include improved access to video technology and development of virtual patient-education aids.

Patient Satisfaction and Experience with Oral Anticancer Medication Pharmacy Services at the Odette Cancer Centre: A Cross-Sectional Survey Study

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Background: In 2015 the Odette Cancer Centre introduced clinical pharmacy services (CPS) to optimize the care of patients prescribed oral anticancer medications (OAMs). As part of this program, pharmacists employ information and communication technology to provide OAM education and remote toxicity management support.

Objective: To evaluate patient satisfaction and experience with the OAM CPS of the Odette Cancer Centre.

Methods: Breast cancer, lung cancer, and leukemia patients who completed 1-3 months of OAM therapy (palbociclib, afatinib, erlotinib, gefitinib, osimertinib, ibrutinib) between January-March 2020 were recruited to participate. Participants completed an investigator developed questionnaire about counselling experiences and ability to self-manage OAM toxicities, as well as three validated surveys: (1) Health literacy, (2) modified Satisfaction with Medication Information Scale (mSIMS), and (3) Part B of Satisfaction with Medication Information Scale (SCIP-B). Associations between health literacy, satisfaction, and reported medication self-management behaviors were assessed with chi-squared tests.

Results: Thirty-four patients completed the study. Among the 24 patients reporting OAM toxicity, 19 (79%) indicated they were the first person to identify the side effect, and 11 (46%) reported independent self-management. High rates of satisfaction were reported for OAM CPS and the OAM information provided (median aggregate mSIMS score 19/22, median aggregate SCIP-B score 24/30). One participant (3%, 1/34) was identified as having inadequate health literacy. OAM drug interactions (58% endorsement), toxicities (58% endorsement), indication (55% endorsement), and onset time (39% endorsement) were identified as the most important things to know about OAMs. No statistically significant relationship between health literacy, patient satisfaction, and reported ability to self-manage OAM toxicity was found.

Conclusion: Patients reported high levels of satisfaction with OAM CPS and OAM information provided by the Odette Cancer Centre pharmacists, and identified drug interactions, drug toxicity, indication, and onset time as the top four things to know about OAMs.

Risk of Prosthetic Joint Infection Treatment Failure in an Outpatient Intravenous Program

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Background: Prosthetic joint infections (PJIs) are a major complication of total joint replacement surgeries. Treatment includes surgical intervention with prolonged courses of intravenous (IV) antibiotics in outpatient IV programs. The risk of PJI relapse or reinfection is high and may be associated with risk factors.

Objectives: To identify PJI treatment failure rate and risk factors in patients admitted to an outpatient IV program.

Methods: A retrospective chart review was conducted in adult patients with PJI admitted to an outpatient IV program between July 1, 2013 and July 1, 2019. Chi-square tests were used to examine demographic data, comorbidities, surgical intervention, pathogens and antimicrobial regimens. Treatment failure included infection relapse and reinfection and was further defined by pre-determined criteria.

Results: One hundred patients associated with 137 admissions to the outpatient IV program for PJI were included. Twenty-eight patients had multiple admissions and accounted for 65 of the total admissions. Most common location of PJI was knee (52%) and hip (41%) and methicillin-susceptible *Staphylococcus aureus* was the most frequent pathogen (22.6%). Patient comorbidities included obesity (58%), diabetes (41%), smoking (25%) and depression (24%). The overall rate of treatment failure was 56.2%. Risk factors associated with treatment failure vs. success were diabetes (50.9% vs. 29.8%; p = 0.03), depression (32.1% vs. 14.9%; p = 0.04), chronic liver disease (9.4% vs. 0%; p = 0.03), previous history of methicillin-resistant *S. aureus* infection (13.2% vs. 2.1%, p = 0.04) and Gram positive infections (63.6% vs. 43.3%; p = 0.02).

Conclusion: The overall PJI treatment failure rate in the study population was high. Patients with diabetes, depression and chronic liver disease experienced higher incidences of failure. Primary prevention of modifiable comorbidities and increased monitoring of high-risk patients is required to ensure successful eradication of PJI in outpatient IV programs.

Clinical Utility of Switching to Insulin Degludec from Other Basal Insulins in Patients with Type 1 or 2 Diabetes

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Background: Insulin degludec has demonstrated superiority in clinical trials compared to some basal insulins, but the effects of switching Canadian adults with type 1 or 2 diabetes mellitus (T1DM, T2DM) to degludec in clinical practice are unknown.

Objectives: To evaluate the clinical effectiveness and safety of switching insulin-treated adults with either T1DM or T2DM to degludec under conditions of routine clinical practice.

Methods: This was a retrospective observational cohort study of patients in Alberta (using administrative databases and electronic medical records (EMR)) who were switched to degludec between December 1, 2018 and December 1, 2019 and were followed till March 1, 2020. We used interrupted time series for the primary outcome analysis.

Results: A provincial cohort of 5294 patients, 287 of which were also included in the clinic cohort, were analyzed. After switching to degludec, the adjusted HbA1c decreased by -0.28 [95% CI, -0.37; -0.19] % (p <0.001) and is predicted to be sustained post-switch (p<0.001). Rates of all-cause hospitalizations/emergency department (ED) visits (p = 0.5/p = 0.3) and diabetes-related ED visits (p = 0.3 (T1DM), p = 0.1 (T2DM)) remained consistent post-switch vs pre-switch. The proportion of clinic patients with EMR-documented hypoglycemia post-switch vs pre-switch was not statistically significant (p = 0.8 (T1DM), p = 0.6 (T2DM)). In the clinic cohort, at switch, there was an average basal insulin dose reduction of 11.2% (T1DM), 12.3% (T2DM), and 16.3% (patients with insulin resistance) (p<0.001 vs pre-switch), which was sustained at follow-up.

Conclusions: Patients with T1DM or T2DM who have inadequate glycemic control or find their current basal insulin dosing inconvenient (especially those with insulin resistance) may benefit from switching to degludec with a potential for a small improvement in HbA1c at lower basal insulin doses.

Vancomycin Loading Doses in Critical Care Practice: A Retrospective Audit

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Background: Vancomycin is a critical agent against MRSA infections in ICU. Patients often have wide fluctuations in volume of distribution, impeding success of conventional maintenance dosing. Vancomycin loading can help rapidly achieve therapeutic drug concentrations. New guidelines debate the use of Bayesian derived AUC-guided dosing versus monitoring trough levels.

Objectives: Primary outcome characterizes the practice of vancomycin loading in an urban ICU. Secondary outcome reported concordance rates to guidelines, generating practice recommendations.

Methods: This study is a retrospective audit for quality improvement. A chart review on ICU patients receiving vancomycin from January to March 2018 was completed by recording information with customized extraction sheets. Data was analyzed with pivot tables using a spreadsheet program.

Results: 94 cases were identified. Prominent indications for vancomycin included pneumonia and abdominal infections. One fifth had positive blood cultures for staphylococcus aureus. 67% were vancomycin loaded, usually with 1-2g. 29% were dosed at 25-30 mg/kg and guideline concordant. Two-thirds of these doses achieved a trough of 10-20 mg/L. One third were dosed within 20-24.9 mg/kg and half achieved levels over 15 mg/L. 9% developed an acute worsening in renal function. 70% of dialysis patients were loaded with less than 25 mg/kg. 29% achieved a trough of 10-20 mg/L and 71% achieved troughs over 15 mg/L. Two-thirds of patients in this audit survived ICU.

Conclusion: Starting vancomycin early for critically ill patients suspected of MRSA infections is vital for survival. Guidelines suggest a vancomycin loading dose range of 25-30 mg/kg. Most patients in this study were underdosed yet achieved therapeutic levels. This audit suggests expanding the loading dose range to 20-30 mg/kg and a lower 20-25 mg/kg range for dialysis patients with recoverable kidney function to avoid further nephrotoxicity. The audit refrains from making trough level suggestions, but raises hypothesis seeking questions for future clinical studies.

Feasibility of a Pharmacy Student-Led Screening Program to Prioritize Hospital Patients for Clinical Pharmacy Activities: A Pilot Project

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Background: Prioritizing patients for clinical pharmacy activities is challenging and requires further study. Entry-level Pharm D programs have

increased demand for Canadian pharmacy practice placements. Programs which integrate pharmacy learners into patient care could support learning, and potentially increase access to clinical pharmacy services.

Objectives: Determine feasibility of a pharmacy student-led patient screening program which provides pharmacy students with opportunities to practice information gathering and communication skills and helps unit-based pharmacists prioritize patient care activities.

Methods: This was a prospective, single-site, observational study. Patients admitted to a 35-bed family practice unit at The Dr. Everett Chalmers Regional Hospital, a 314-bed regional hospital in Fredericton, NB during the study timeframe were eligible. A Pharmacy Patient Screening Tool (PPST), workload and audit forms were developed, and a pharmacy student was trained to complete study forms. The student and two pharmacists were interviewed at study completion and responses underwent thematic analysis.

Results: The student screened 95 patients. Ten screenings were randomly audited, with a student to pharmacist discrepancy rate of 1.0%. Average screening time was 15 minutes per patient, with an average of 2 minutes per patient to review with the pharmacist. Thematic analysis revealed that the program increased the student's therapeutic knowledge, communication and data collection skills. Hands-on learning was identified as very valuable. Pharmacists felt that the student utilizing the PPST helped their workflow and patient prioritization, and that the student contributed to patient care via the screening program.

Conclusions: Results suggest it is feasible for a pharmacy student to screen patients using the PPST. The tool has the potential to integrate students into clinical pharmacy activities and aid in patient prioritization. Future directions involve PPST validation and exploring additional student-led processes to optimize patient outcomes, workflow efficiency, and student learning.

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Opioids Co-Prescribed with Sedatives: Prescribing Patterns Following an Intensive Care Unit Admission

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Background: Opioid misuse is a health care crisis in Canada. Opioids and sedatives are utilized in the intensive care unit (ICU), and the use of opioids is promoted by the recommended analgesia-first approach. Opioids co-prescribed with sedatives have been associated with adverse events, including death. The impact of the analgesic-first approach on continuation of opioid-sedative combinations after an ICU admission at our institution is unknown.

Objectives: To determine the rates of opioid co-prescriptions following an ICU admission, and to identify risk factors associated with continuation of hospital-initiated opioid co-prescriptions.

Methods: This was a retrospective chart review of patients admitted to two ICUs at a tertiary care centre between April 1, 2018 and March 31, 2019. Baseline characteristics were obtained from an ICU clinical database and medication information was collected from medication reconciliation forms. An opioid co-prescription was defined as an opioid prescribed in combination with a sedative (benzodiazepine, z-drug, gabapentinoid, tricyclic antidepressant, or antipsychotic). Opioid co-prescriptions were categorized as "hospital-initiated" or "any". "Any" included home opioid co-prescriptions continued in hospital and hospital-initiated. Factors independently associated with hospital-initiated opioid co-prescription were analyzed by multivariable logistic regression.

Results: At ICU transfer 23.0% (169/735) were prescribed any opioid co-prescription of which 20.1% (147/733) were hospital-initiated. At hospital discharge 8.6% (44/514) were prescribed any opioid co-prescription of which 4.9% (25/513) were hospital-initiated. Male gender, home opioid co-prescription, surgical patient, prolonged hospital stay, and in-hospital mortality were risk factors for hospital-initiated opioid co-prescription at ICU transfer. Younger age, home opioid co-prescription, surgical patient, and prolonged hospital stay were risk factors at hospital discharge.

Conclusions: Hospital-initiated opioid co-prescriptions were common at ICU transfer but occurred less frequently at hospital discharge. Pharmacists can monitor for important risk factors such as younger age, male gender, home opioid co-prescription, surgical patient, and prolonged hospital stay.

Measuring Dispensing Capacity in a Chemotherapeutic Compounding Pharmacy

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Background: Due to an increase in the aging population, the number of new cancer cases have been steadily increasing in Canada within the last 10 years. We expect the demand for sterile compounded chemotherapeutic drugs to continue to increase for the next 10 years. For this reason, understanding the current workflow and capacity of Hospital Oncology Sterile Compounding unit is important. Two technicians (Chemo 1 and Chemo 2) begin their work day at 7:30 A.M. 90% of chemotherapeutic preparations are mixed before 12 A.M. The technicians utilize protective clothing and a biological safety cabinet. The technicians usually rotate stations so it is a different pair of technicians working in the clean room every day. A time motion study is crucial to provide deeper understanding of current workload as well as safe sterile compounding capacity.

Objective: Determine the total daily capacity by measuring the time for fixed tasks and variable tasks. Comparing the sterile compounding procedure against Sterile Compounding Guidelines.

Methods: This study will capture the workflow details daily from Monday to Friday. Data collection will be done using a pre-completed data collection form. Data is divided into variable and fixed tasks. Additionally, the final delivery form (IV bag, syringe or infuser) is also recorded. Fixed time is measured using a timer. Variable time will be measured using a clock located in the clean room. Secondary objective is measured against a predetermined checklist. Data analysis is performed on Excel.

Results: The average time to prepare one compound is 5 minutes and 43 seconds. The total morning maximum capacity is 47 compounds. Certain drugs require longer reconstitution time.

Conclusion: Current maximum capacity may be increased should there be any future increases in demand for sterile compounded chemotherapeutic drugs.

Stability of Dr. Reddy's Cabazitaxel in the Manufacturer's Original Vials, and Non-PVC Bags at -20°C, 4°C, and 25°C

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Background: Generic versions of cabazitaxel raises the question about the reliability of extending stability data between brands.

Objective: To evaluate the stability of Dr. Reddy's cabazitaxel reconstituted with the manufacturer's diluent then diluted to concentrations of 0.1 and 0.26mg/mL with 0.9% sodium chloride (NS) or 5% dextrose (D5W) stored in non-PVC bags at 25°C and 4°C for 21 days and -20°C for 49 days. Three additional vials of cabazitaxel reconstituted with the manufacturer's diluent to a concentration of 10mg/mL in the original glass vial were evaluated at -20°C for 49 days.

Methods: On day 0, Dr. Reddy's cabazitaxel was reconstituted in the original glass vial with the provided diluent to a concentration of 10mg/mL and three vials were stored at -20°C. The remaining vials were further diluted to concentrations of 0.1 and 0.26mg/mL with NS and D5W in non-PVC bags. Three units of each were stored at 25°C, 4°C, and -20°C. Physical inspection and concentrations were evaluated on days 0,1,2,3,4,5,7,9,11,14,18,21 for samples stored at 25°C and 4°C; and on days 0,7,14,21,28,35,42,49 for samples stored at -20°C.

Results: The analytical method separated degradation products from cabazitaxel such that the concentration was measured specifically, accurately (deviations from known averaged 0.93%) and reproducibly (replicate error averaged≤1.04%). Multiple linear regression revealed significant differences in percent remaining due to study day ($p<0.01$), diluent ($p<0.01$), temperature ($p<0.01$), and concentration ($p<0.01$). During the study period, solutions retained ≥98% of the initial concentration for all diluents, concentrations, and storage temperatures.

Conclusions: Dr. Reddy's cabazitaxel reconstituted and diluted with NS and D5W to concentrations of 0.1 and 0.26mg/mL are physically and chemically stable ≥21 days when stored in non-PVC bags at 25°C and 4°C. When stored at -20°C, all concentrations and diluents, including 10mg/mL reconstituted with the manufacturer's diluent stored in original glass vials, are stable for ≥49 days.

Hospital Pharmacists' Readiness to Independently Prescribe or Deprescribe Controlled Substances and Narcotic Medications

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Background: Pharmacists practicing in Alberta, Canada have had an expanded scope of practice since 2007. Any pharmacist can legally continue and prescribe narcotic and controlled substances during states of emergency like the Fort McMurray wildfire or the pandemic. We sought to measure and compare Alberta pharmacists' attitudes towards prescribing or deprescribing of controlled substances and narcotics in non-emergency situations.

Objective: The primary objective was to compare the attitudes between community and hospital pharmacists in Alberta towards independently prescribing or deprescribing narcotics and controlled substances. The secondary objectives were to assess their level of readiness, identify barriers and determine ways that pharmacists would use this authority to improve patient care.

Methods: The study was an anonymous self-administered electronic survey of pharmacists registered with the Alberta College of Pharmacy who agreed to receive emails about research. The survey was composed of multiple choice, ranking, and open-ended questions to gather demographic data, practice setting information and attitudes towards both independently prescribing and deprescribing narcotics and controlled substances. Data was quantified and reported from responses received.

Results: Of the 1135 surveys returned, hospital pharmacists made up 15.4% of respondents. Compared to community pharmacists hospital pharmacists were more motivated (28.6% vs.17.4%) and felt it was more important (28.6% vs. 18.2%) to have the authority to prescribe or deprescribe narcotics and controlled drugs. Advantages were better crisis management, improved patient care and increased autonomy. Patient expectations, liability, lack of follow up and need for training were identified as barriers.

Conclusion: Hospital pharmacists are more willing to incorporate prescribing and deprescribing of narcotics and controlled drugs into their practice than community pharmacists.

Exploration of Patients' Perspectives on Enablers and Barriers to Medication Adherence in the Treatment of Depression

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Background: Non-adherence to antidepressants is well-described, with up to 60% of patients discontinuing antidepressants within the first three months. To our knowledge, few studies have explored patients' perspectives regarding their needs and expectations around antidepressants. A better understanding of these factors will benefit the development of educational strategies that improve medication adherence and treatment outcomes in patients with depression.

Objectives: To identify and describe patients' enablers and barriers to adherence to antidepressants, and to explore the educational needs of patients around initiating or continuing antidepressants.

Methods: A qualitative descriptive study using individual, semi-structured interviews was conducted. Eligible participants were outpatients at an academic family health team diagnosed with depression and who had a new antidepressant prescription within three months of recruitment. Interviews were performed by phone or video, audio-recorded, and transcribed verbatim. Transcripts were coded using inductive thematic content analysis by two independent coders.

Results: This was a pilot study based on the transcripts of 4 patient interviews. Four key themes were identified: perceived effects of antidepressants, patient-provider relationship, access and ease of administration, and social relationships. In terms of enablers, participants alluded to visual reminders, feeling informed by their healthcare provider, and observing noticeable improvement in their mood. In terms of barriers, participants reflected on social stigma, perceived subtle benefits of the medication, and adverse effects from taking antidepressants. Patients expressed that education should be evidence-based, tailored to their symptoms, and presented in both written, verbal, and digital formats.

Conclusion: In order to address key barriers and identify benefits to treatment, a combination of strategies targeting both patients and prescribers should be implemented. Examples include shared-decision making, regular patient-provider follow-up, and identifying personalized treatment goals.

PHARMACY PRACTICE / PRATIQUE PHARMACEUTIQUE

"Good job!" Feedback Training for Pharmacists Teaching in a PharmD Program Simulation Lab

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Background: Feedback is an essential element for pharmacy students on their path to professionalization and widely used in professional practice labs. However, students report that they receive poor quality feedback. This is also reflected in the literature. Our professional practice labs are facilitated by pharmacist clinical instructors (CIs) who are generally selected based on clinical proficiency as opposed to teaching skills. Nevertheless, if CIs are not able to communicate their clinical knowledge and observations in a useful and meaningful way, it will hinder student growth and achievement of required practice competencies.

Description: We describe an intervention rooted in a cognitive constructivist paradigm to improve the quality of CI's written feedback in a required 3rd year patient care simulation lab in a PharmD. Program.

Action: An orientation workshop was developed and included experiential training on providing effective feedback. All CIs (n=45) observed a role play involving a student-patient interaction and provided written feedback using the course rubric. CIs then conferred with each other in small groups to discuss their ratings and comments, and to reconcile or justify any differences. This activity was followed by a didactic session on best practices in feedback and writing comments.

Evaluation: A post-session survey indicated 100% of participants either strongly agreed or agreed that the session helped them prepare for their role. CIs felt the feedback activity was helpful to benchmark their assessments with each other and gave them a better understanding of the expectations of each component of the rubric. Respondents also reported an improved understanding of the types of comments that were useful to foster student development. Suggestions for improvement included increasing opportunities to practice. Anecdotally, students have reported increased satisfaction regarding the practicality of CI's feedback.

Implications: A simple intervention can improve feedback quality and could be used in future experiential practice settings.

Baseline Inventory of SHA-Regina Pharmacy Department's Wellness and Environmental Priorities

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Background: Workplace wellness programs led by frontline committee members have demonstrated improved health behaviours, reduced elevated health risks, improved productivity, and improved satisfaction. Wellness also includes the health of the environment, which healthcare has a significant impact on through single use plastics, pharmaceuticals, and other personal and professional practices.

Description: A Pharmacy Department wellness committee (Living Well Committee) was established with the mission to promote and implement initiatives for 1) environmental sustainability applicable to the workplace and at home, and 2) enhanced pharmacy employee's wellness in all domains. The first goal of this committee was to complete a staff wellness and environmental inventory to serve as a baseline for prioritizing and measuring committee activities.

Action: A presentation to staff was completed to introduce the Living Well Committee and provide context for departmental wellness and environmental issues. The environmental inventory consisted of observing and documenting current practices within the department in main categories (e.g., paper use, plastic use, recycling, power use). The wellness inventory involved pharmacists and pharmacy technicians independently completing a validated wellness assessment. Staff were then asked to complete a survey to identify the top three wellness domains and environmental priorities for the Living Well Committee.

Evaluation: The environmental and wellness survey was completed by 22 staff members (22/80, 28%). The top three wellness domains identified were occupational (32%), environmental (23%), and emotional wellness (18%). The top environmental areas were paper use (73%), recycling (64%), pharmaceutical use and wastage (55%), and single-use plastics (50%). These responses were corroborated by the environmental inventory.

Implications: The Living Well Committee will use the survey results to tailor initiatives based on identified priorities. This will ensure initiatives align with departmental needs to support a healthy and sustainable workplace, which will enable staff to provide optimal and environmentally sustainable patient care.

Reducing Pharmacists' Alert Fatigue: A Data-Informed Approach

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Background: Clinical decision supports (CDS) in electronic medication order systems help to identify important alerts for clinicians. However, CDS may cause alert fatigue. Alert fatigue is the tendency for clinicians to ignore prompts presented by CDS due to the excessive number and/or their perceived limited clinical significance. Alert fatigue may increase the risk of missing important alerts and decrease work efficiency.

Description: In 2019, North York General Hospital (NYGH) began to utilize a data analytics tool to quantify and guide efforts to improve pharmacists' alert fatigue. Additional information including type, severity and frequency of medication CDS alerts were also reviewed. At baseline, pharmacists dealt with over 80% of all medication CDS alerts at NYGH amounting to approximately 373 alerts per day per pharmacist. Pharmacists' override rate was over 90% indicating a high likelihood of alert fatigue. Data analysis showed that alerts were mainly for non-significant duplicate orders or drug interactions.

Action: Three targeted interventions were designed to reduce pharmacists' alert fatigue. First, a filter to suppress unnecessary duplicate checking with home medications was implemented. Second, the drug-drug interaction alerts firing threshold was increased from "moderate" to "major". Finally, shifting of "moderate" drug interaction alerts from an interruptive to a non-interruptive, on-demand function.

Evaluation: Alerts decreased by 74.3% when comparing the data 1 month prior to 1 month post- implementation. For NYGH pharmacists, this reduced alerts to 97 per day per pharmacist. However, override rate was minimally reduced from a pre-intervention rate of 97.3% to a post-intervention rate of 96.0%. Further analysis on override rates and improvements are being planned for next phase.

Implications: Data analytic tools help to quantify medication CDS alerts, guide system improvements and identify areas for further analysis. It is imperative that hospital pharmacies review and re-assess alert settings periodically to manage excess alerts and to decrease alert fatigue.

Systèmes d'aide à la préparation magistrale de médicaments : une revue de littérature

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Introduction : Une bonne compréhension du flux de travail des préparations magistrales stériles et non stériles est nécessaire à la prestation sécuritaire de soins. De plus, le cadre normatif applicable aux préparations magistrales est de plus en plus exigeant.

Objectif : Décrire la littérature entourant les systèmes d'aide à la préparation magistrale de médicaments (SAPMM).

Méthode : Revue de littérature à partir de Pubmed, Embase, Google Scholar. Ont été inclus les études comportant une évaluation de l'impact des SAPMM publiés en anglais ou en français du 1er janvier 2015 au 31 décembre 2020.

Résultats : Des 31 études identifiées par le titre, 16 ont été retenues après analyse du résumé et du texte. Une majorité des études proviennent des États-Unis (75%, 12/16); plusieurs études évaluent l'impact pré-post d'un SAPMM (63%, 10/16). Les études évaluent des produits commerciaux (14/16) ou maison (2/15). Les SAPMM incluent, selon la solution proposée, un logiciel d'aide à la préparation (16/16 études), l'utilisation de lecteurs code-barres (15/16), la prise de photos ou de vidéos (16/16) et la gravimétrie (6/16). Les études ont évalué l'impact des SAPMM sur les erreurs (13/16), le temps de préparation (7/16) et de validation (4/16), sur les coûts (6/16) et la satisfaction du personnel de la pharmacie (3/16). Plusieurs études suggèrent que les SAPMM sont associés à une détection accrue des erreurs de préparation et une perception de sécurisation du circuit de préparations magistrales. Toutefois, il est difficile de conclure à l'impact des SAPMM sur la charge de travail et les coûts.

Conclusion : L'utilisation de SAPMM est associée à une capacité accrue de détection d'erreurs de préparation. D'autres travaux sont nécessaires afin d'évaluer le rapport avantage-coût de ces systèmes.

Mots clés : Préparations magistrales, systèmes d'aide à la préparation magistrales, erreurs

Implementing a Pharmacist Scope of Practice Policy in a Large Community Teaching Hospital

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Background: As pharmacist scope of practice evolves, opportunities arise for hospital pharmacists to practice more independently. Traditional models can lead to delays in addressing drug therapy problems and optimizing medication management.

Description: The Pharmacists' Clinical Scope of Practice Policy grants hospital pharmacists the ability to independently adapt and modify prescriptions, reorder home medications, and order lab tests, if in the patient's best interest and the pharmacist possesses the necessary knowledge, skills and judgement.

Action: A stepwise roll-out process was conducted to ensure smooth and sustainable implementation of the policy. Existing policies and surveys were utilized to assess current practice and hospital pharmacists' perceptions on full clinical scope. Meetings with stakeholders were conducted to obtain feedback on policy development and education strategies. The policy received final approval by the Medical Advisory Committee. Before implementation, policy awareness was created through pharmacist training sessions, and hospital-wide communication. Post-implementation, weekly touch-points and quality assurance activities were organized.

Evaluation: We sought to characterize and assess the impact of the policy by conducting a post-implementation Plan-Do-Study-Act (PDSA) cycle. In total, 479 orders were written over the first 30 days by pharmacists under the scope of practice policy. Preliminary analysis of the data has suggested 97.7% of pharmacist orders complied with the policy. The leading intervention was adaptations (49.7%), and 57.4% of interventions have enhanced patient safety. A sustainability PDSA cycle is planned for 1 year post-implementation.

Implications: Pharmacists adhered to the Pharmacists' Clinical Scope of Practice policy and their interventions led to improved efficacy, safety and optimization of medical management. Further understanding its impact and pharmacists' experience, may empower pharmacists to practice at their fullest scope and could inspire change within the current model of hospital pharmacy practice.

Seamless Care between Clinical Pharmacists Caring for Patients with COVID-19 through the Implementation of an Electronic Handover Tool

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Background: At the beginning of the COVID-19 pandemic, it was predicted that hospitals would accommodate both a high volume of COVID-19-related patient admissions as well as frequent patient transitions of care, including discharge. Effective communication between healthcare providers during transitions of care is crucial for promoting patient safety and continuity of care.

Description: A mnemonic-based electronic handover tool was created to facilitate streamlined communication between clinical pharmacists caring for patients hospitalized with COVID-19.

Action: The *COVID Handover Tool* was developed, refined, and implemented by clinical pharmacists working in COVID-19 care areas in early 2020. The tool provided a standardized template to communicate basic patient information and pharmaceutical care issues. The patient-specific handover tools were stored centrally using OneNote™, and shared for updating amongst pharmacists as patients transitioned between COVID-19 care areas (e.g., intensive to acute care).

Evaluation: Pharmacists were surveyed to assess the tool's ease of use, perceived usefulness, and other subthemes. All eight clinical pharmacists working in COVID-19 care areas responded to the survey (100% response rate). The majority of respondents agreed or strongly agreed it was easy to learn to use the tool, and that the content was relevant and organized. Half agreed or strongly agreed that the tool made handover easier, quicker, and more effective. Responses trended towards neutrality regarding the tool being useful in respondents' jobs. Most pharmacists continued using previous handover methods in addition to or instead of the tool.

Implications: Survey responses suggest the *COVID Handover Tool* is intuitive, and facilitated organized and efficient patient handover between clinical pharmacists. Pharmacist perceived usefulness during the study period was mixed, and the tool has been updated further based on feedback. The tool is adaptable to any patient care area or population, and may be useful to other institutions for patient handover between clinical pharmacists.

Quality Audit of Best Possible Medication Histories by Pharmacy Technicians in Ambulatory Care Clinics

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Background: In 2019, the organization implemented electronic Medication Reconciliation (eMedRec) in Ambulatory Care clinics where medication management was a major component of care, and where medication

reconciliation must be provided, according to Accreditation Canada. Four clinics requested pharmacy technicians' support to document the Best Possible Medication Histories (BPMHs).

Description: Pharmacy trained and deployed pharmacy technicians to document BPMHs for patients at their initial visits with a prescriber. In 2020, the organization sought to measure the quality of the BPMHs obtained by pharmacy technicians by comparing them to BPMHs obtained by pharmacy students who had been trained and certified by pharmacists.

Action: In July 2020, two pharmacy students were trained by a pharmacist to obtain BPMHs. Checklists were developed to provide the pharmacy students with criteria to compare documentation. The students met with the technicians prior to the audit to explain the reason for the audit, and show them the measurement criteria. The pharmacy students called and obtained BPMHs for patients previously contacted by technicians. The students then compared the BPMHs they obtained with the BPMHs obtained by the technicians. They then identified and recorded the differences between the two BPMHs. The pharmacy students conducted the audit from July 30 to August 11, 2020.

Evaluation: The pharmacy students contacted 102 patients and reviewed 679 order sentences/prescriptions. Four discrete items were compared on each order sentence. The total number of discrete items compared equals 2,716. This number is the denominator. There were 111 differences between the BPMHs documented by technicians and the BPMHs obtained by students. This represents a 96% concurrence rate between the BPMHs completed by the technicians and the BPMHs recorded by the students. This accuracy is consistent with that stated in the literature.

Implications: Utilizing pharmacy technicians to document BPMHs is an effective and efficient option for ambulatory clinics.

Gestion des approvisionnements de médicaments en pandémie à la COVID-19 : expérience québécoise en établissement de santé

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Contexte : Un état d'urgence sanitaire a été déclaré le 13-3-2020 au Québec et des pénuries de médicaments étaient anticipées.

Description : Décrire la gestion de l'approvisionnement en médicaments hospitaliers durant la pandémie à COVID-19.

Action : Une cellule de crise composée de six chefs de départements de pharmacie est formée, arrimée à deux pharmaciennes conseil, le personnel des groupes d'approvisionnement en commun et le Ministère de la santé. Une liste de 120 médicaments critiques et une simulation des besoins par jour-patient COVID-19 est établie avec mise à jour périodique en tenant compte de sondages terrain auprès de pharmaciens de soins intensifs et des projections ministérielles en nombre de cas anticipés. Des rencontres sont organisées avec les fabricants afin d'évaluer les enjeux. En vertu d'un arrêté ministériel, deux réserves de médicaments sont établies (#1-mai-août 2020 et #2-septembre 2020-juin 2021) avec la collaboration des grossistes. Différentes rencontres statutaires sont établies afin de discuter et de relayer l'information à tous les chefs de départements. De nombreuses actions sont menées (p.ex. demande de changement de priorisation de fabrication de médicaments auprès de certains fournisseurs, changements de pratiques cliniques, partage de médicaments inter-hôpitaux pour limiter les pertes par péremption, partage urgent pour pallier des pénuries). Les seuils d'inventaire de médicaments par hôpital sont rehaussés: médicaments critiques (>90 jours), autres médicaments (>60 jours), médicaments d'oncologie (>30 jours).

Évaluation : En dépit du nombre d'hospitalisations liées aux deux vagues d'infections, il n'y a pas eu de pénuries de médicaments dans les hôpitaux du Québec et nous sommes en mesure de faire face à la prochaine année.

Implications : La cellule de crise de pharmaciens hospitaliers est pérennisée avec la création du Centre d'acquisitions gouvernementales du Québec. La prestation sécuritaire de soins repose notamment sur un approvisionnement adéquat de médicaments et des actions concertées avec les chefs de département de pharmacie hospitaliers.

Mots clés : COVID19, Approvisionnement en médicaments, hôpital, pénurie

Evaluation of Expanded Pharmacist Coverage in Critical Care Areas during COVID-19

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Background: During the first wave of the COVID-19 pandemic, an increased need for critical care pharmacist (CCP) coverage in the two medical/surgical intensive care units (ICUs) at the Queen Elizabeth II Health Sciences Centre (QEII HSC) in Halifax, Nova Scotia was identified.

Description: CCP coverage was expanded in two medical/surgical ICUs from 8 hours per day, 5 days per week excluding holidays to 8 hours per day, 7 days per week including holidays.

Action: Workflow within the pharmacy department was rearranged so that two CCPs, on a rotating schedule, provided dedicated clinical coverage to each ICU seven days a week. CCPs were not responsible for dispensary coverage during this time period.

Evaluation: A 22 question survey was developed by the research team and distributed to all health care providers (HCP) who work in the medical/surgical ICUs. Survey questions solicited HCP perceptions and opinions on the impact of expanded CCP coverage; importance of 25 evidence-informed CCP activities was assessed via 5-point Likert scale. Clinical pharmacist output, reported as the number of drug-therapy problems (DTPs) addressed over a 6-week period, was retrospectively evaluated. The majority of respondents agreed/strongly agreed with the following: CCP are integral members of the multidisciplinary healthcare team, CCP play an important role in improving patient outcomes, CCP presence in the unit and on patient care rounds allows HCP to concentrate on their own professional responsibilities, and that the expanded CCP coverage improved patient care. The majority of respondents categorized 23 of the 25 CCP activities as very important. During the 6-week time period, four CCPs addressed 798 DTPs for 140 discreet patients: an average of 5.7 DTPs per patient.

Implications: HCPs felt that expanded CCP coverage improved patient care and that evidence-informed CCP activities were very important. Given the perceived impact of CCP in the ICU, novel staffing models are being explored to optimize CCP coverage.

Development and Implementation of a Novel Model for Pharmacist Practice Expectations on Medicine Wards in Hospital: The Pharmacists' Circle of Care

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Background: Our pharmacy program previously set task-list style practice expectations based on staffing levels for mixed acuity wards. Regional restructuring based on acuity created a need to redefine pharmacist practice expectations in medicine.

Description: The *Pharmacists' Circle of Care* (PCC) is a novel approach to practice expectations. The PCC transforms the task-list style approach into a fluid decision making tool allowing pharmacists to use their professional judgement to prioritize work while still providing guidance regarding the standardized activities expected of decentralized clinical pharmacists. The PCC maintains a minimal number of mandatory activities, then describes other functions paired with a 4-level prioritization scheme.

Action: A group of clinical resource pharmacists developed a practice model for medicine wards. Small group, problem-based training sessions with facilitated discussions were provided to front line pharmacists at 3 hospitals.

Evaluation: An online survey was conducted at the 3 hospitals to gather feedback on the PCC. The primary objective was to determine pharmacists' perceptions of the utility of the PCC. Secondary objectives were to better understand where pharmacists perceive their time is spent and to determine how frequently pharmacists utilize this practice model. The survey was circulated to 29 pharmacists; 19 responded (66%). Respondents indicated they used the PCC for training new staff as well as teaching pharmacy learners (15, 79%), followed by prioritizing their own work (7, 37%). Respondents indicated that the PCC confirmed what they already do when prioritizing daily work tasks (14, 74%); this indicates this tool is reflective of the realities of hospital practice. Most respondents indicated their activities were ones which prevented imminent harm (7, 37%) promoted patient flow (4, 21%) or were mandatory (4, 21%).

Implications: The PCC empowers pharmacists to prioritize their activities to have the greatest impact on patient care while balancing the demands of a fluid practice environment.

The Pharmacy Services Employee Engagement Team Journey

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Background: Alberta Health Services (AHS) Pharmacy Services employee engagement team formed in 2018 as a change network of leaders and employees nicknamed the Rebel Alliance (RA). The purpose was to develop, implement, monitor and sustain the AHS Pharmacy Services Pharmacy Services strategic objective of ensuring that pharmacy employees are actively engaged in transformative changes.

Description: The RA supports pharmacy leaders in improving skills and knowledge in active listening of frontline employees, showing respect and appreciation for their opinions and actively involving employees in decision making opportunities.

Actions: The RA launched a communication strategy involving storytelling through the Star Wars theme, paralleling characters and universal concepts of rebellion with healthcare language and ideas of patient safety, just culture, and employee engagement. The formation of mini-networks amongst members of the Pharmacy Leadership Team (PLT) helped build capacity for engagement work throughout Alberta.

Evaluation: The RA grew from five individuals in July 2018 up to16 members from across the province. Additionally, 30% of PLT signed a pledge of commitment to enhance employee engagement as well as participated in sessions about the importance of opinions, as outline in Table 1. Lastly, the strategic objective will be further evaluated through the results of the 2019 AHS Gallup survey, with a goal to increase the engagement score of employees to feel that their opinion counts to 4.0 (out of a 5 point Likert scale) by 2021. In 2016, AHS Pharmacy Services employees answered this question with a mean of 3.29.

Implications: The implications of enhancing employee engagement is greater employee retention, positive patient experiences as well as improved safety and quality care outcomes.

For the table that goes with this abstract, please see Abstract Appendix, available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/204

Using Gap Analysis Tools to Determine Compliance with Hazardous Sterile Preparation Standards in Chemotherapy Outreach Program of Saskatchewan Sites

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Background: Compliance with National Association of Pharmacy Regulatory Authorities (NAPRA) model standards is required by the Saskatchewan College of Pharmacy Professionals.

Description: To assess current state compared to the NAPRA model standards a gap analysis can be completed. Conducting the gap analysis survey at all Chemotherapy Outreach Programs of Saskatchewan (COPS) sites provides an opportunity to determine local and provincially commons deficiencies. For completeness, Saskatchewan Cancer Agency (SCA) sites in Regina and Saskatoon were also included in the gap analysis.

Action: The CSHP Assessment Tool for Aseptic Compounding (ATAC) was purchased for each site to provide gap analysis based on CSHP Compounding: Guidelines for Pharmacies (2014). An in-house survey we named the Hazardous Sterile Preparation Assessment Tool (HSPAT) was developed to survey specific statements for hazardous sterile compounding also based on the CSHP Compounding: Guidelines for Pharmacies (2014). Both tools cross referenced for statements similar to the NAPRA standard.

Evaluation: Across the 11 Key Parameters for sterile preparation identified by ATAC, the average score was 58.5% for non-urban sites while large urban sites scored better at 71.6 %. The parameters directly associated with the compounding process (5, 6, and 7) the scores improved to 79.1% for COPS and 76.3% for SCA sites.

Implications: Within Saskatchewan, pharmacies are quite good at preparing to compound, compounding, and labelling of sterile hazardous preparations. Improvements are generally needed to controlled work areas, staff training, and quality assurance processes. A standardized, province-wide program should be developed to address gaps followed by repeating the gap analysis survey to gauge success.

For the figure that goes with this abstract, please see Abstract Appendix, available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/204

The Impact of Pharmacist-Initiated Screening on Influenza Vaccination Status of Hospitalized Patients at a Community Academic Hospital

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Background: Approximately 12,200 Canadian hospitalizations are attributable to influenza each year, straining valuable resources. Routine influenza immunization is a key preventative measure that can significantly reduce hospitalizations, yet immunization remains below the national goal for high-risk patients. Many discharged patients remain unvaccinated representing a missed opportunity for hospitals.

Description: Standing orders have shown to improve in-patient immunization, however, assessment is a required step despite vaccine eligibility. Pharmacists can serve an important role by assessing vaccination history and eligibility. To increase immunization rates of patients at a community academic hospital, pharmacist-initiated influenza vaccination screening was implemented in the 2013-14 influenza season.

Action: A standardized workflow was developed for pharmacists to proactively assess and identify opportunities for influenza immunization in hospitalized patients which included: initial screening during the Best Possible Medication History interview, confirmation of vaccine eligibility and patient consent, and discussion of vaccination with the most responsible provider. Electronic documentation templates and yearly pharmacist education sessions were developed to facilitate the process.

Evaluation: A statistical process control chart was retrospectively constructed for 9 influenza seasons (2010-11 to 2018-19) using influenza vaccine orders (IVO) and pneumococcal vaccine orders (PVO) as a non-dependent control. Pharmacist-initiated screening resulted in special-cause variation starting in 2013-14, with 1 standard deviation (8.7 orders/1000 admissions), 2 standard deviations (11.3 orders/1000 admissions) and exceeding the upper control limit (13.8 orders/1000 admissions) by the last 2 years of analysis. PVO rates did not show special-cause variation. Mean IVO per season increased by 126% after implementation of pharmacist-initiated screening (6.2±1.5 vs. 14±1.9 orders/1000 admissions, $p<0.05$) and was consistent in the adult subgroup ≥60 years. No change was observed in PVOs.

Implications: Pharmacist-initiated vaccination screening led to increased influenza immunization rates. Expansion of in-patient pharmacist-initiated vaccine screening for other important vaccines (e.g. pneumococcal) should be considered for improved uptake.

Audit of Clinical Pharmacists' 3-Day Antimicrobial Reviews Using EPIC®

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Background: Research has shown that pharmacists play an integral role in improving the appropriateness of patient's antimicrobial therapy, dose with therapeutic drug monitoring and reducing antimicrobial costs. At our institution, the unit pharmacists and the dedicated antimicrobial stewardship pharmacist play an important role in evaluating antimicrobial therapy for their respected teams.

Description(s): Through the use of the electronic health information system (EPIC®) an antimicrobial tool was developed which prompts pharmacists to reassess and document their assessments of their patients' antimicrobials after three days of therapy. It is an expectation of the clinical pharmacists to review and document their assessments of their patient's antimicrobial therapy for interventions such as intravenous to oral step down, spectrum narrowing, and therapeutic drug monitoring.

Action: An audit was done throughout July 2020 to assess how often pharmacists on inpatient units were completing the antimicrobial review on the third day of therapy and on the quality of documentation of the assessment.

Evaluation: It was found 65% of all reviews were being completed on the 3rd day of therapy. When analyzed by different units; the intensive care unit (ICU) had the highest rate, 91%, followed by general internal medicine (GIM), 81%. Quality assessments of documentation were completed for the ICU and GIM units. In review of the documentation; ICU and GIM pharmacists documented the antibiotic 100 versus 96%, indication 100 versus 96%, duration 83 versus 93%, dose 93 versus 1% and pharmacists' next steps 90 versus 49% of the time respectively.

Implications(s): To improve best practices to better patient care two practice changes were recommended from these results; 1) Standardized documentation using a smart phrase manager for thorough assessment and 2) Documenting assessments in patients' charts to further foster implementation of interventions and to advocate for the pharmacist's role in antimicrobial stewardship.

Redesigning a Pharmacy Resident Antimicrobial Stewardship Rotation

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Background: Antimicrobial Stewardship (AS) is a mandatory one-week pharmacy resident program rotation. Prior to 2020, five residents would complete this rotation individually. The model consisted of daily clinical AS rounds, twelve hours of AS teaching sessions and a 3-hour resident lecture series. A 3-week Infectious Diseases (ID) rotation follows later in the year.

Description: A formal redesign of the resident rotation structure was trialed to improve the quality and efficiency of AS content delivery for five residents.

Action: The AS rotation was restructured to have all 5 residents complete their one week of AS training concurrently. Residents participated in prospective audit-and-feedback (PAF) AS rounds and targeted antimicrobial reviews then tracked their own metrics. They also participated in 15 hours of case-based education sessions on clinical microbiology, antimicrobial stewardship metrics, pharmacokinetics, pneumonia, urinary tract infections, skin/soft tissue infections, perioperative antibiotics, and antibiotic allergies. A pre-post rotation survey was administered.

Evaluation: Preceptors indicated that the new model created consistency and efficiency in curriculum delivery. It set a foundation to increase residents' comfort working up more complex patients on subsequent rotations. Pre and post-rotation surveys indicated that residents felt more confident being able to identify and intervene on antimicrobial drug therapy problems. They also reported a better understanding of antimicrobial stewardship and how to apply metric analysis to quality improvement initiatives. Over 1 week, residents reviewed 439 antibiotic orders and identified 129 interventions. Seventy percent of the interventions occurred during PAF rounds versus targeted antibiotic reviews.

Implications: Overlap of pharmacy residents in a rotation can be an effective method of mentoring pharmacy residents in AS and ID related topics. This model offers the benefit of collaborative education, consistency in foundation of antimicrobial knowledge, offers a forum for knowledge application and increases efficiency for preceptors.

Patient Pay Iron Infusion in an Ambulatory Care Setting

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Background: Choosing Wisely Canada recommends to limit the use of blood transfusions in hemodynamically stable anemic patients, which led to an increased use of iron infusions in the ambulatory care setting. Iron isomaltoside, a new intravenous iron approved by Health Canada in 2018, is offered to outpatients in addition to iron sucrose starting April 1, 2020.

Description: Drug access facilitator pharmacy technicians helped patients navigate the switch to iron isomaltoside from iron sucrose depending on patient coverage and preferences. Iron sucrose is covered under the Exceptional Access Program (EAP) through the Ontario provincial government while iron isomaltoside is only covered by private insurance.

Action: A hospital iron task group created order sets and a patient information pamphlet to facilitate the change to patient pay iron infusions. Iron sucrose has appeared to require a lengthier infusion time requiring longer chair time compared to iron isomaltoside. To evaluate this observation, an audit was conducted on patient usage of iron sucrose and iron isomaltoside.

Evaluation: Iron sucrose patient data was collected and compared from April 1, 2019 to March 31, 2020, and from April 1, 2020 to Dec 31, 2020. A total of 243 patients used iron sucrose in 2019 while 77 and 92 patients, respectively, used iron sucrose and iron isomaltoside in 2020. Iron sucrose required a 2-14 days lag time for EAP approval while iron isomaltoside did not. Iron sucrose also required lengthier infusion time ranging from 5.5 to 6 hours while iron isomaltoside required an average of 2 hours infusion time. Revenue from prescriptions was $2068.10 for iron sucrose and $5069.93 for iron isomaltoside.

Implication: Using iron isomaltoside in the ambulatory care setting decreases chair time and has no approval lag time, while providing a greater source of revenue to the outpatient pharmacy in comparison to iron sucrose.

CASE REPORTS / OBSERVATIONS CLINIQUES

Adrenal Insufficiency Secondary to Inhaled Corticosteroids in Paediatric Twins

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Background: Inhaled corticosteroids (ICS) are the first-line treatment for asthma in paediatrics. Through suppression of the hypothalamic-pituitary-adrenal axis, ICS therapy has been associated with adrenal insufficiency; however, the incidence and risk factors are not well described.

Case Description: Four-year-old identical twin girls were found to have adrenal insufficiency following long-term, high-dose ICS therapy. Both patients were diagnosed with asthma before age one and subsequently treated with mometasone, titrated to 800 mcg/day. After multiple admissions for acute otitis media and other respiratory infections, endocrinology investigations resulted in a diagnosis of adrenal insufficiency for both girls. Chronic oral hydrocortisone was initiated as physiologic replacement with planned stress dosing to prevent hospital admissions, and the dose of maintenance ICS was decreased.

Assessment of Causality: Based on the Naranjo Scale, this case is considered a probable adverse drug reaction (score = 8). The same reaction occurring in identical twins both on high-dose ICS therapy is another compelling argument for causality.

Literature Review: A Cochrane review investigating adrenal insufficiency manifesting as growth suppression found that children receiving high-dose ICS exhibited slower growth velocity compared to low-dose ICS. A nested case-control study showed greater risk of hospital-diagnosed adrenal insufficiency with higher doses of ICS (odds ratio 1.84; 95% confidence interval 1.16-2.90). There are few studies comparing the frequency of adrenal insufficiency with different ICS, but some data suggests ciclesonide carries less risk of adrenal suppression.

Importance to Practitioners: Adrenal insufficiency can be a serious consequence of ICS treatment, and no guidance on the choice of ICS in this context exists. Patients on long-term, high-dose ICS therapy should be monitored for signs and symptoms of adrenal insufficiency. As accessible front-line healthcare practitioners, pharmacists are well-suited to participate in the safety monitoring of ICS therapy.

Acetazolamide Induced Hypersensitivity Reaction in a Pediatric Low-Grade Glioma Patient: A Case Report

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Background: Acetazolamide is a reversible inhibitor of the enzyme carbonic anhydrase. It can be used off-label for treatment of hydrocephalus, and intracranial hypertension. This case report describes a hypersensitivity reaction to acetazolamide of a young boy for which acetazolamide was being used for increased intracranial pressure post- neurosurgery.

Case Description: We present a 2-year-old male patient with a low-grade glioma who underwent a debulking neurosurgery procedure. Post-surgical procedure he was started on a chemotherapy protocol consisted of vincristine and carboplatin. The following day, he was started on acetazolamide for elevated intracranial pressure and two days after this developed the first of a series of cyclic fevers with chills and a blanchable diffuse red rash that did not appear to be pruritic. He was started on multiple antibiotics and antipyretics that did not aid in the resolution of the fever, and no infectious source could be identified with blood cultures or imaging. It was determined that acetazolamide was the potential cause of a drug-fever and rash and was therefore discontinued 17 days after initiation. The patient's fevers and rash subsequently improved over the course of the next week, and no other cause was identified.

Assessment of Causality: This case of hypersensitivity to acetazolamide would receive a score of 4 on the Naranjo Scale, indicating a possible adverse reaction.

Literature Review: Case reports have described other severe cutaneous adverse reactions such as Stevens-Johnson Syndrome to acetazolamide. A case-series of acetazolamide post-cataract surgery also describes cutaneous adverse reactions.

Importance to Practitioners: Acetazolamide is a medication that is used in hospital to treat patients for different indications. Recognizing that a hypersensitivity reaction could develop secondary to acetazolamide and differentiating this from an infection or other causes is important in discontinuing the causative medication as well as avoiding unnecessary use of antipyretics and antibiotics.

Visual Hallucinations Associated with Levodopa-Carbidopa Formulation Change

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Background: Levodopa-carbidopa is the mainstay therapy for Parkinson's disease (PD). Approximately 5% of patients with PD on levodopa-carbidopa develop visual hallucinations correlated with dose and duration of therapy, as well as PD severity and progression. Levodopa-induced hallucinations often respond to dose reduction. Among the main pharmacokinetic differences between controlled release (CR) and immediate release (IR) formulations are a longer half-life and time-to-peak with the CR formulation, thus producing more stable plasma concentrations and lower likelihood of adverse effects.

Case Description: An 85-year-old woman with PD was well-maintained on IR levodopa-carbidopa for several years. She was inadvertently ordered the CR formulation in hospital and developed visual hallucinations. In response, a dose reduction was made which slightly improved but did not resolve the hallucinations entirely. The pharmacist noticed the discrepancy and switched the patient back to the IR formulation at home dose. The patient's hallucination resolved within 24 hours.

Assessment of Causality: This case of visual hallucination received a score of 4 on the Naranjo Scale indicating a possible association with the use of CR levodopa-carbidopa. The CR formulation was designed to provide release over 1.6 hours, thereby requiring less frequent dosing. As patient received CR formulation at the same frequency, this may have potentially led to drug accumulation and visual hallucinations. Unfortunately, no drug levels were taken to confirm this hypothesis.

Literature Review: A 5-year randomized multicenter study demonstrated that both the IR and CR levodopa-carbidopa formulations maintained similar level of PD control after 5 years, despite its progressive nature. There are no studies comparing the difference between IR and CR formulations in visual hallucination incidences.

Importance to Practitioners: Adverse drug reactions such as visual hallucinations should be considered when switching between levodopa-carbidopa formulations. This case also illustrates the importance of medication reconciliation as this adverse reaction may have been preventable.

Cutaneous Mucormycosis Infection: Isavuconazole as an Oral Stepdown Option in Patients with Contraindicated Drug Interactions to Posaconazole

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Background: Mucormycosis is a fungal infection with high morbidity and mortality and few therapeutic options. Patients most often affected include those with poorly controlled diabetes, hematological malignancies and transplant recipients. The most common pathogens are *Rhizopus* spp, *Mucor* spp, and *Lichtheimia* spp. The hallmark of disease is tissue necrosis and black, necrotic eschars. Successful treatment is dependent on timely diagnosis and involves a combination of surgical debridement and systemic antifungal therapy. Intravenous (IV) liposomal amphotericin B is considered the drug of choice but is limited by the administration route and nephrotoxicity in long-term therapy.

Case Description: Fifty-nine-year-old female with multiple comorbidities including schizophrenia (stable on quetiapine) and poorly controlled type II diabetes mellitus was admitted with right forearm cellulitis that developed a black eschar. The wound was debrided and tissue cultures grew *Rhizopus oryzae*. Intravenous liposomal amphotericin B was initiated. After 2 weeks of IV therapy and good clinical response, the patient was transitioned to oral treatment and discharged. Posaconazole is specifically covered by the Ontario Drug Benefit Exceptional Access Program (EAP) for this indication. A drug interaction between posaconazole and quetiapine excluded its use. Oral isavuconazole was initiated as an alternative and outpatient coverage obtained through the EAP.

Assessment of Causality: Posaconazole is a strong inhibitor of CYP3A4 and can prolong the QT interval. Co-administration with CYP3A4 substrates that also prolong the QT interval (i.e., quetiapine) is contraindicated due to increased risk of proarrhythmic effects. Isavuconazole is a moderate inhibitor of CYP3A4 and in clinical trials resulted in dose-related shortening of QTc intervals.

Literature Review: A 2019 guideline by the European Confederation of Medical Mycology and other publications support the use of isavuconazole as an oral step-down option for stable mucormycosis infections.

Importance to Practitioners: Isavuconazole is an oral-stepdown option for patients with mucormycosis and drug interactions with posaconazole.

Lamotrigine Dosing with Competing Drug Interactions: A Case Report

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Background: In refractory epilepsy, seizure control necessitates multiple anti-epileptic drugs (AEDs), for which drug interactions must be considered. Little is known regarding lamotrigine dosing in the presence of competing interactions. In general, enzyme inhibition occurs faster than induction making dosing of lamotrigine with AED polytherapy challenging.

Case Description: Seven-year-old admitted for refractory status epilepticus. After failing loading doses of levetiracetam, valproic acid, and continuous midazolam infusion, the patient was loaded with phenobarbital and maintenance valproic acid was started. Home medications included lamotrigine, which was held for 2 days and re-started at a 50% dose reduction given the risk of increased levels with valproic acid. Lamotrigine levels ranged from 13.7 to 20.8 µmol/L (reference range of 9 to 60 µmol/L) for the 5-day period after resumption of therapy and no adverse drug effects were reported.

Assessment of Causality: Lamotrigine clearance can be largely influenced by drug interactions. Valproic acid is an enzyme inhibitor that can increase levels by approximately twofold, whereas phenobarbital can decrease levels through enzyme induction. In this case, even with a dose reduction and holding lamotrigine, levels were within therapeutic range.

Literature Review: One study concluded that lamotrigine clearance decreased with the addition of valproic acid, however phenobarbital did not result in a statistically significant increase in clearance. The combination of lamotrigine plus an inhibitor and inducer resulted in decreased clearance, but to a lesser extent than an inhibitor alone. Another study noted combination of lamotrigine with valproic acid and phenobarbital resulted in decreased clearance, however only 4.9% of patients had elevated levels outside of the therapeutic range.

Importance to Practitioners: Drug interactions between lamotrigine and other AEDs can significantly impact the efficacy and safety profile of lamotrigine. Risk of lamotrigine toxicity increases above 60 µmol/L as well as being dependent on the rate of titration.