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Selected abstracts presented at the Canadian Association of Pharmacy in Oncology (CAPhO) Conference 2018, May 3 to 6, 2018, Ottawa-Gatineau, Canada

#### Abstracts

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Abstracts

Administration

01 Management of Chemotherapy-Related Cardiac Dysfunction in the Cardio-Oncology Clinic at South Health Campus
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Background: The Cardio-Oncology Clinic at South Health Campus (SHC) consists of a multidisciplinary team that provides care for patients experiencing chemotherapy-related cardiac dysfunction.

Objective/purpose: Describe patients referred for chemotherapy-related cardiac dysfunction, identify management strategies, and determine the impact on LVEF and/or heart failure (HF) symptoms during follow up.

Study design/methods: A retrospective chart review was performed on 101 adult patients from Nov 1, 2013 to July 1, 2017. Information was gathered on patient demographics, cancer histories, cardiac risk factors, LVEF reduction and recovery, and heart failure symptoms.

Results/key findings: Chemotherapy regimens contained anthracyclines (53%), trastuzumab (10%) or both (29%). Common cardiac risk factors consisted of tobacco use (40%), hypertension (30%) and dyslipidemia (22%). Over half of the population was managed with evidence-based HF therapy, including angiotensin-converting enzyme inhibitors (53%), angiotensin II receptor blockers (21%) and/or beta-blockers (53%). Additional strategies involved chemotherapy interruption (36%) or close monitoring only (30%). Sixty-nine patients had an LVEF reduction of 5% or more and 58% achieved partial or full recovery.

Conclusion/recommendations: The Cardio-Oncology Clinic at SHC manages a diverse patient population with individualized use of medications and non-pharmacological strategies. Reassuringly, the findings of this study reveal improvements in LVEF and HF symptoms during follow up.

02 Barcode Verification for Medication Preparation, Patient Level Lot and Expiry Traceability, and Exposure Measurement Using In-House Developed Microsoft Access® Database
Mihir Patel, Paul La Vita, Deo Bahadur
Humber River Hospital, Toronto, Canada

Objective/purpose: Retention of medication records for 10 years that are auditable and traceable to the patient as well as a medical surveillance program for staff compounding hazardous products are two of Ontario College of Pharmacists’ (OCP) standards for sterile compounding. The objective was to design a low-cost system to meet both OCP standards.

Study design/methods: Using Microsoft Access®, a database was created by an oncology pharmacist in collaboration with the organization’s informatics system. Rapid Plan-Do-Study-Act Cycles were used to improve functionality and optimize the workflow prior to implementation in April 2017.

Results/key findings: An innovative database was designed in-house and implemented with functionality of barcode verification for both medications and IV fluids as well as storing of lot and expiration date that are auditable and traceable to the patient. The database also records cumulative amount of hazardous drug compounding for each Pharmacy Technician automatically. Minimal user training was required due to intuitive design, frontline involvement during early testing, and on-site support of personnel involved in designing the database.
Conclusion/recommendations: Available tools, such as Microsoft Access®, can be utilized to create a low-to-no cost system to meet and exceed OCP standards. The database can be developed in-house and easily adapted by other organizations.

Medical Assistance in Dying: Guideline Development and 20 Month Experience at the Princess Margaret Cancer Centre

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Objective/purpose: To describe the Medical Assistance in Dying (MAID) program at the Princess Margaret Cancer Centre (PM).

Study design/methods: The PM Psychosocial Oncology department, part of the University Health Network (UHN), helped develop the guidelines and education around MAID for inpatients. The Pharmacy department collaborated on developing the intravenous (IV) medication protocol, reviewing the order set, and operationalizing medication kits for dispensing. A primary kit consisting of prefilled syringes and a secondary kit with vials were dispensed for all cases. Pharmacy education was developed with UHN Bioethics and delivered to all pharmacy staff across the organization. At PM, additional education focused on the process, procedure for the IV medications, indications for the agents, with Bioethics discussions on conscientious objection. Post-intervention debriefs supported continued improvement of the process.

Results/key findings: From March 5, 2016 to Dec 31, 2017, 139 UHN patients inquired about MAID, of which 107 had a cancer diagnosis. Of the 62 patients who completed assessments, 53 fulfilled all eligibility criteria. Thirty-eight completed interventions, with 23 occurring at PM. None of the secondary kits were used. Amendments to the kits included additional identification of the paralytic agent, and removal of an anesthetic.

Conclusion/recommendations: MAID continues to be available for UHN inpatients.

Implementation of a Supportive Biosimilar in Oncology: Challenges and Successes at the Odette Cancer Centre (OCC)

Jordan Stinson, Lisa Ng, Shikha Lawrence, Ivan Tyono, Flay Charbonneau
Sunnybrook Odette Cancer Centre, Toronto, Canada

Objective/purpose: Effective December 22nd, 2016, Grastofil was funded under the Ontario Drug Benefit (ODB) Program as a general benefit, which included prevention of febrile neutropenia in patients receiving anti-neoplastic drugs. The objective of this project was to successfully transition the Odette Cancer Centre from Neupogen to its biosimilar, Grastofil, while navigating through the challenges of implementing in a multidisciplinary setting.

Study design/methods: To implement this change, the Department of Pharmacy first required acceptance from the medical oncologists. Pharmacy then coordinated in-service teaching sessions for nursing staff on safety and appropriate handling of new syringes. Changes to our Computerized Physician Order Entry (CPOE) System were also required, to facilitate ease of prescribing.

Results/key findings: Beginning January 2017, representatives from the Department of Pharmacy met at the monthly Systemic Therapy Committee Meeting and gained approval from Medical Oncology to initiate new patients with Grastofil. Sixty-four active patients received filgrastim in January, of whom 12 (19%) received Grastofil. As of December 2017, the OCC had 80 active patients on filgrastim, of whom 75 (94%) were receiving Grastofil.

Conclusion/recommendations: Pharmacy played a pivotal role in the successful implementation of Grastofil at the OCC. We continue to monitor the incidence of defective syringes and end-user challenges.

Development of an Oncology-Focused General Hospital Pharmacy Residency Program

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04
Objective/purpose: To facilitate the development of oncology pharmacy practitioners, a general hospital pharmacy residency program with a focus on oncology practice was developed at the Princess Margaret Cancer Centre (PM) site of the University Health Network (UHN).

Study design/methods: A 52-week pharmacy residency program based at PM was established at UHN in 2014. The program consists of rotations in a broad range of pharmacy practice including operations, drug information, administration, and pharmaceutical care with content focused in oncology. Residents must also participate in a longitudinal teaching rotation and complete an oncology-focused research project. The program takes one resident per year and was successfully accredited by the Canadian Pharmacy Residency Board in 2015.

Results/key findings: Four residents have enrolled in the program since inception; three have successfully graduated and are working at PM and one resident is in progress. Two completed research projects have affected practice change in the allogeneic blood and marrow transplantation program. Continuous stakeholder feedback has informed quality improvement measures such as continuity of service hours and availability of rotations offered.

Conclusion/recommendations: The oncology-focused general hospital pharmacy residency program has been successfully developed and implemented at UHN and may serve as a model for future programs.

06
Establishment and Assessment of a Novel Simulation Education Training Program for Pharmacy Learners Practicing in an Oral Anticancer Therapy Clinic
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Objective/purpose: Simulation Education Training (SET) in healthcare settings provides an opportunity for professionals to learn and practice clinical skills in a safe and observed environment. A standardized SET program was developed for PharmD students practicing in an oral anticancer therapy program. Continuous stakeholder feedback has informed quality improvement measures such as continuity of service hours and availability of rotations offered.

Study design/methods: The SET program consists of standardized orientation and therapeutic sessions followed by structured clinical patient-care simulations. Volunteer oncology pharmacists also completed the same simulation. Respective candidate simulation responses and performances were de-identified and subsequently assessed independently by three blinded oncology pharmacists. The SET program was completed by six PharmD students and 4 pharmacists.

Results/key findings: 100% of assessments (18/18 and 12/12 for students and pharmacists respectively) confirmed that the candidate appropriately identified and effectively resolved the principle drug therapy problem within the SET case. PharmD students and pharmacists scored similarly on metrics assessing clinical thought process, patient safety, documentation and logistical appropriateness.

Conclusion/recommendations: Upon completion of a standardized SET program, participating PharmD students performed similarly to practicing oncology pharmacists during a patient case-simulation designed to emulate practice within an oral anticancer therapy clinic.

07
A Single Institution Cost Evaluation of Fixed vs Regular Dosing of Anti-PD-1 Inhibitors
Gabriel Gazze
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Objective/purpose: Is fixed dosing of anti-PD-1 inhibitors more economic than mg/kg dosing?

Study design/methods: We retrospectively evaluated patients that received nivolumab (N = 61) or pembrolizumab (N = 30) at our institution as of May 1st 2015-June 15 2017. We calculated doses in mg/kg and its cost and compared: fixed dose anti-PD-1 therapy/cost; mg/kg dose ad fixed dose (maximum dose)/cost; the mg/kg dose rounded up to the vial format of the anti-PD-1 therapy/cost (wastage scenario).

Results/key findings: Nivolumab cost of fixed dose 240mg is 4694.51$. The average mg/kg dose is 4017.72$, the average cost/dose in mg/kg up to a maximum fixed dose is 3969.99$ and the average cost/dose in mg/kg up to a maximum fixed dose of 240mg but rounded up to the closest vial formulation is 4175.17$. Pembrolizumab cost of fixed dose
200 mg is 8801.22$. The average mg/kg dose is 6877.51$, the average cost/dose in mg/kg up to a maximum fixed dose is 6905.61$ and the average cost/dose in mg/kg up to a maximum fixed dose of 200 mg rounded up to the closest vial formulation is 7858.36$.

Conclusion/recommendations: Fixed dosing is the most expensive alternative. The most economical alternative is mg/kg dosing ad maximum fixed dose.

08 Canadian Pricing Trends for New Cancer Medicines
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Background: In Canada, new cancer drugs or indications are evaluated by the pan-Canadian Oncology Drug Review (pCODR). Every submission includes a publicly disclosed price. By reviewing pCODR submissions, we evaluated trends in average monthly costs for new cancer drugs and indications over time.

Study design/methods: Manufacturer submissions reviewed by pCODR between 2012 and 2016 were selected. The average 28-day cost/drug was estimated by using the submitted list price, BSA of 1.7 m², body weight of 70 kg and the recommended dose and frequency. Where combination therapy was requested, drug costs were summed to determine the average 28-day cost/submission.

Results/key findings: 72 submissions were reviewed (31% requested combination therapy). Over five years, the average 28-day cost/submission increased by 33%. In 2016, the average 28-day cost/submission was $10,947 ($4,780 - $40,432). In the 72 submissions, there were 39 new drug products. At the time of pCODR review, these drugs were on the Canadian market for an average of 0.4 years (0.1 - 2.7). Over five years, the average 28-day cost for new drug products grew by 22%.

Conclusion/recommendations: Similar to other jurisdictions, the cost of funding new cancer drugs or indications in Canada is rising at a rapid pace. These costs have important implications for drug funding sustainability.

09 An Evaluation of Ontario’s Dispensing Practices for Take-Home Cancer Drugs
Rohini Naipaul, Jaclyn Beca, Scott Gavura

Cancer Care Ontario, Toronto, Canada

Background: Take home cancer drugs (THCD), (e.g., oral chemotherapy), are a standard systemic treatment option for a variety of cancers. In Ontario, the dispensing of intravenous cancer drugs is restricted to specialized centres while any retail pharmacy can dispense THCD. In a previous analysis, we estimated that 88% of publicly funded THCD were dispensed by community pharmacies. In this analysis, we further characterized the extent of THCD distribution by examining average weekly prescription volumes.

Study design/methods: Ontario Drug Benefit claims for 78 THCD were extracted for each pharmacy that had at least one claim in the 2016/17 fiscal year. Weekly prescription volumes were estimated from annual claim volumes.

Results/key findings: In 2016/17, 4,448 pharmacies dispensed 646,962 THCD prescriptions to 103,467 unique patients. Average weekly prescription volumes were distributed as follows: 55% of pharmacies dispensed <1 prescription/week, 42% dispensed 2 to 9 prescriptions/week, and 3% dispensed ≥10 prescriptions/week. The six pharmacies associated with cancer centres dispensed an average of 188 THCD prescriptions/week (range, 78–294).

Conclusion/recommendations: Few Ontario retail pharmacies appear to specialize in oncology services. The majority of prescriptions are provided by pharmacies with low THCD prescription volumes. The impact on quality and efficiency of care should be further explored.

10 Oncology Intravenous Drug Wastage at the Saskatchewan Cancer Agency
Colleen Thurber, Jaya Venkatesh

Saskatchewan Cancer Agency, Saskatoon, Canada

Objective/purpose: To examine strategies to reduce wastage of injectable drugs to bring about savings to the overall cost of drugs and improve sustainability of funding for newer treatment options.
Study design/methods: A formal system of recording the drug wastage was developed. Categories of reasons were developed & separated by avoidable/unavoidable wastage.

Results/key findings: In 2016–17, drug wastage accounted for 1.2% of the total injectable drug spending. Unavoidable wastage comprised 85% of total wastage, and 15% was avoidable.

Conclusion/recommendations: Stewardship of drug resources, by practicing diligent prescribing, preparation and administration functions, as well as implementing a provincial strategy for rounding doses down within set parameters, are key to maximizing the value of spending on oncology drugs.

11 Drug Shortages: Challenges and Opportunities from the Ontario Experience
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Background: The number of drug shortages in Canada continue to rise, which may impact the overall quality of care. Additionally, shortages take health professionals away from patient care activities. In Ontario, the Ministry of Health and Long-Term Care (MOHLTC) and Cancer Care Ontario (CCO) work with provincial health system partners as well as federal, provincial, and territorial stakeholders to understand, communicate and mitigate their impact. We sought to evaluate our experience in managing shortages.

Study design/methods: We reviewed oncology drugs with supply interruptions, in the last three years, that had significant patient impact and required intervention by the MOHLTC and/or CCO. Established frameworks, that consider treatment intent, shortage duration, and availability of other therapies, were used to assess patient impact. Mitigating strategies and actions taken were examined.

Results/key findings: Provincial interventions included developing clinical guidance, patient prioritization or interim funding solutions, and advocating with other stakeholders. Challenges identified included transparency of inventory status, coordinating communications, and unclear accountabilities. Buying agreements had mixed effects. Shortages that were efficiently managed involved proactive measures driven by the manufacturer working with regulators, agencies, and other stakeholders.

Conclusion/recommendations: Overall, early manufacturer engagement, transparency, coordination and consistency were key factors in efficiently mitigating drug shortages.

12 Implementing Automation into an I.V Admixture Program at Hamilton Health Sciences
Kelly-Ann Wakeford, Monika Graham
Juravinski Cancer Centre, Hamilton, Canada

Objective/purpose: to analyze the implementation of automation into an I.V room workflow of checking at the Juravinski Cancer Centre in Hamilton, ON.

Study design/methods: The technicians at the JCC have been preparing and checking chemotherapy for over 20 years. With the use of robotics, the technicians had to incorporate a new way of mixing and checking. Three ways of workflows were analyzed. I.V station ONCO, I.V Soft assist and manual.

Results/key findings: Training sessions were established for new processes for each stream. Some patient orders combine manual and robotic streams of preparation and checking. A six month snapshot shows the i.v.STATION ONCO produces an average of 25% of patient specific and batched products, while the I.V Soft assist and manual stream produces 75%. Excluding Clinical Trials.

Conclusion/recommendations: Preparing, checking and dispensing chemotherapy to our patients safely and accurately is our main focus. With these results, staff are less likely to be exposed to these hazardous drugs. The ability of staff combining all methods, only results in more accurate dosing and better record keeping.

13 Development of a Pharmacy Oncology Certification Program
Michelle Koberinski, Joan Beliveau
BC Cancer, Kelowna, Canada
**Objective/purpose:** To develop a provincial certification program to ensure that pharmacy staff achieves and maintains a high standard of competency in chemotherapy preparation and dispensing to safely and accurately provide cancer medications at BC Cancer, a provincially funded cancer care organization.

**Study design/methods:** A team of a pharmacist and a pharmacy technician developed the certification program based on a review of research on best practices for the safe handling and delivery of oncology medication and input from senior pharmacy staff. Tools were created to evaluate staff’s knowledge and practical application of their knowledge.

**Results/key findings:** The BC Cancer Pharmacy Oncology Certification Program was developed and implemented at all six BC Cancer regional centres. Pharmacy staff responsible for preparing and dispensing parenteral chemotherapy medications must participate in a training program prior to participation in the certification program, and be evaluated through a theoretical and practical test at least annually. The certification team maintains the content of the program and conducts on-site certifications.

**Conclusion/recommendations:** The BC Cancer Pharmacy Oncology Certification program ensures the safety and accuracy of cancer medications dispensed at its regional cancer centres.

**14**

**Novel Delivery of Systemic Therapy to Enable Oncology Treatment Closer to Home**

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**Background:** The South East Regional Cancer Program services a large geographic catchment area with the highest aging population in Ontario. Systemic treatment volumes are increasing each year and the economic burden of maintaining high quality pharmacy infrastructure compliant with National Association of Pharmacy Regulatory Authorities standards poses a challenge.

**Objective/purpose:** To deliver care as close to home as possible using a centralized pharmacy compounding model based out of the Regional Cancer Centre with daily delivery to satellite sites in a timely and efficient manner.

**Study design/methods:** Satellite clinics at community hospitals were staffed with registered nurses certified in administration of chemotherapy and biotherapy and supervising physicians with oncology training. Regimen selection was based on drug stability and funding status. Process consists of Oncologist visit, chemotherapy order entry and preparation the day prior to the start of treatment cycle and chemotherapy delivery to satellite clinic on treatment day(s) throughout the cycle.

**Results/key findings:** The centralized model of systemic therapy drug preparation has been in place since June 2016 with no significant issues to date.

**Conclusion/recommendations:** The South East Regional Cancer Program has developed an economically sustainable process of centralized pharmacy compounding to allow patients to be treated with systemic therapy closer to home.

**Pharmacy Practice**

15

**Evaluating the Efficacy, Safety, and Practicality of Tacrolimus Monitoring Practice in Bone Marrow Transplant Patients at The Ottawa Hospital: A Change in Practice Assessment**

Jacky Cheung1,2, Tiffany Nguyen1, Jason Wentzell1,3, Melanie Trinacty1, Pierre Giguère1,4

1The Ottawa Hospital, Ottawa, Canada, 2Leslie Dan Faculty of Pharmacy, University of Toronto, Toronto, Canada, 3Ottawa Hospital Research Institute, Ottawa, Canada, 4Clinical Epidemiology Unit, The Ottawa Health Research Institute, Ottawa, Canada

**Objective/purpose:** To assess outcomes associated with efficacy, safety, and practicality post-implementation of a recent practice change pertaining to tacrolimus monitoring for allogeneic hematopoietic stem cell transplant patients at The Ottawa Hospital (TOH).

**Study design/methods:** In this retrospective chart review, outcomes of interest, which include assessment of efficacy, safety, and practicality will be compared between a pre-practice change historical cohort of patients receiving daily tacrolimus levels and a post-practice change cohort who receive tacrolimus levels daily for 7 days and then Monday-Wednesday-Friday thereafter.
Results/key findings: This is an ongoing pharmacy residency project. Results will be provided to the research committee upon collection and analysis of study data. We plan to report the following as a comparison between the two cohorts:

1. Proportion of time in therapeutic range (TTR) of tacrolimus with a target trough level of 5–10 μg/L
2. Incidence of acute graft versus host disease (GVHD) within 30 days and 100 days post HSCT
3. Incidence and severity of renal failure within 30 days
4. Total number of tacrolimus levels drawn overall and per weekend day
5. Number of deviations from the current protocol

Conclusion/recommendations: A combination of clinical, operations, safety and technological knowledge is required to design an effective medication delivery process. Further review is needed to develop strategies to navigate the limitation of technology.

When Good Technology Has Limitations, How Safe Are We Making the System?
Tonya Ng, Victoria Kletas
BC Cancer, Vancouver, Canada

Objective/purpose: Technology helps improve safety in healthcare but design limitations can create different layers of complexity. At BC Cancer, the Dose Error Reduction Software (DERS) infusion pump drug name database has a 20-character limitation. With increasing number of look-alike/sound-alike (LASA) drugs names longer than 20 characters in length, clinicians must design ways within the drug library and develop clinical and operational tools to prevent drug selection errors.

Study design/methods: BC Cancer drug library entries, DERS pump set up design and previous LASA risk management experiences were reviewed. An environmental scan of drug library build in other hospitals was then conducted. Drug library LASA drug management strategy was created and test-piloted with newly marketed medications. Recommendations developed were then reviewed by BC Cancer interdisciplinary infusion pump quality improvement committee.

Results/key findings: Guiding principles and an assessment tool for the management of LASA drug naming in drug library was developed and built into standard work. The process identified areas where further work is required to support safe administration of IV medications.
18 Descriptive Analysis of Filgrastim Use in Four Adult University Teaching Hospitals in Quebec, Canada
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Background: Filgrastim is indicated in the prophylaxis of febrile neutropenia (FN), but is also used for treatment of FN and other indications.

Objective/purpose: Describe the use of filgrastim in our hospitals.

Study design/methods: Retrospectively, 1863 episodes of care in 1213 patients who received filgrastim between 1 August 2014 and 31 July 2015 were identified. Following randomization, records of 808 episodes were reviewed.

Results/key findings: Filgrastim was used in 232 episodes of care for primary prophylaxis (PP), in 44 for secondary prophylaxis (SP) and in 315 for FN. Filgrastim was used in 124 episodes of PP for patients that received high risk chemotherapy, in 72 that received moderate risk chemotherapy (14 of which had no other risk factors) and in 31 that received low risk chemotherapy. In 251 of the 315 episodes for treatment of FN, at least one ASCO-recognized risk factor for poor clinical outcome resulting from FN was identified. Ninety-one patients treated for FN received a total of 123 doses when absolute neutrophil count (ANC) was above 1,9 x 10⁹/L. During hospital stay, median treatment duration was 5 days.

Conclusion/recommendations: Based on published clinical practice guidelines, criteria should be developed and ANC follow-up strengthened to optimize filgrastim use in our hospitals.

19 Implementation of Remote Pharmacist Verification of Cancer Medicine Prescriptions within a Day Oncology Hospital
Miranda King, Courtney King
Icon Cancer Care, Brisbane, Australia

Objective/purpose: Investigate safety, time, and cost-saving benefits of implementing remote pharmacist verification of cancer medicine prescriptions within a day hospital network.

Study design/methods: A pre-implementation risk assessment was conducted, a procedure written and staff were validated for competency. Remote verification occurred when clinical workloads exceeded staffing. Primary and secondary outcomes were 1) safety and viability and 2) cost-saving benefits. Data collection took place over eight weeks and included: number of prescriptions, time, clinical issues for follow-up and medication incidents. Cost-saving benefits were determined by measuring time spent remotely verifying prescriptions, expressed as additional pharmacist hours.

Results/key findings: Median prescriptions remotely verified weekly = 48. Median time taken for remote verification of a chemotherapy prescription was 3.6 minutes versus 3.5 minutes when conducted onsite. The most frequent issues referred to site pharmacists were: outdated patient weight (29%) and chemotherapy supply issues (17%). No medication incidents related to remote verification were recorded. Remote verification saved a median of 2.9 hours (173.5 minutes) of additional pharmacist hours per week.

Conclusion/recommendations: Electronic prescribing technology has enabled remote verification of cancer medicine prescriptions. Implementation of this practice had no adverse impact on medication safety and enables greater support and cost-savings across a hospital network.

20 Clinical PharmD Student Facilitation of an ISMP Recommended Hospital-to-Home Transition Checklist to Promote Medication and Patient Safety upon Discharge from an Oncology Unit
Jason Wentzell¹, Monica Wirz³
¹The Ottawa Hospital, Ottawa, Canada, ²The Ottawa Hospital Research Institute, Ottawa, Canada, ³School of Pharmacy, University of Waterloo, Kitchener/Waterloo, Canada

Objective/purpose: Medication errors can lead to significant adverse events and often occur at critical transitions, including hospital discharge. The Institute for Safe Medication Practices (ISMP) Canada has developed a ‘hospital to home’ checklist for health providers to increase patient safety at
hospital discharge. Our study examines the feasibility of a PharmD student-facilitated hospital discharge process and measures the time required to perform each ISMP recommended component.

**Study design/methods:** Fourth-year PharmD students on clinical inpatient oncology rotations facilitated the implementation of the ISMP discharge checklist. Eligible patients were identified through daily interdisciplinary discharge rounds. Students performed, and recorded the times required to complete the respective checklist components.

**Results/key findings:** During 47 evaluable days, PharmD students facilitated 56 out of a possible 143 eligible discharges (39%). An average of 42.6 minutes per discharge was required to complete the recommended components of the ISMP check-list. Identified barriers include lack of communication pertaining to discharge and insufficient notification to implement the discharge process.

**Conclusion/recommendations:** Completion of the ISMP recommended discharge process requires time, resources and efficient communication to optimize the safety of discharges in practice. Clinical PharmD students possess the required knowledge and skillset to assist in the facilitation of this checklist in a hospital setting.

### 21 Practice Essentials for Anticancer Therapy-Induced Oral Mucositis and Stomatitis

**Lana Dean, Azure English**

**Allan Blair Cancer Centre, Regina, Canada**

**Objective/purpose:** On June 15, 2017, ABCC launched one new mouth care handout and five new preprints for the prevention and treatment of oral mucositis and stomatitis in cancer patients. The purpose of this poster is to communicate to oncology colleagues why the handout and preprints were developed, the content of the preprints, and the means to evaluate the effectiveness of the interventions.

**Background:** The incidence of oral mucositis and stomatitis in patients undergoing anticancer therapy ranges from 10 to 100%. Magic Mouthwash is equivalent to normal saline for pain relief, is ineffective for shortening healing time, and can cost upwards of $50 per prescription. ABCC reviewed the evidence-based medicine to find cost-effective alternatives.

**Study design/methods:**
- Mouth care handout
- Mouthwash preprints: Benzydamine 0.15%, Dexamethasone 0.5%, Doxepin 0.5%, and Morphine 0.2%
- Topical anesthetics preprint: Lidocaine viscous 2%, Tetracaine 5% lollipop/troche, and Tetracaine 5% with Triamcinolone 0.05% lollipop/troche
- Treatment algorithms for oral conditions
- ABCC In-service
- September 2017: all four mouthwashes submitted to Saskatchewan Formulary for coverage

**Results/key findings:**
- January 2018 Saskatchewan Formulary Bulletin: all four mouthwashes covered for our cancer patients

**Future endeavours:**
- Retrospective chart review to determine uptake and effectiveness of new preprints

### 22 Evaluation of Tacrolimus Dosing and Levels in Bone Marrow Transplant Patients at the Ottawa Hospital

**Tiffany Nguyen, Jason Wentzell, Melanie Trinacty**

**The Ottawa Hospital, Ottawa, Canada**

**Background:** Data are lacking on the frequency of monitoring of tacrolimus for prevention of graft versus host disease (GVHD) in hematopoietic stem cell transplant (HSCT) patients. Current practice at The Ottawa Hospital (TOH) involves targeting tacrolimus levels between 5 and 10 µg/L through monitoring levels daily for two to four weeks.

**Objective/purpose:** To identify number of interventions within the first 48 hours and the first five days of tacrolimus therapy, to describe how many tacrolimus measurements over a series of 21 levels resulted in an intervention, and to determine time in therapeutic range (TTR).

**Study design/methods:** Retrospective case series of 69 patients who received oral tacrolimus for GVHD
prophylaxis post HSCT at TOH, over a one year period.

Results/key findings: Intervention was made in 39% and 61% of patients within the first 48 hours and 5 days of initiation of tacrolimus therapy, respectively. Mean of 3 levels resulted in an intervention. Proportion of TTR was 64% during the second week of therapy and 67% thereafter.

Conclusion/recommendations: Results suggest that obtaining daily tacrolimus levels for 7 days, followed by 3 times weekly thereafter may allow for a reduced monitoring frequency without a significant impact on the number of dosing interventions or TTR.

23
Symptom Management in the Pediatric Oncology Setting at St Mary’s Lacor Hospital in Gulu, Uganda
Shellyza Moledina Sajwani
University of Toronto, Toronto, Canada

Background: The writer is an oncology pharmacist who travelled to St Mary’s Lacor Hospital in Gulu, Uganda as part of PharmD program rotations. The writer implemented a successful four phase pediatric oncology symptom management project between October and December 2017.

Objective/purpose: To impact the safety of chemotherapy delivery, as well as improve the prevention and management of chemotherapy side effects in the pediatric oncology ward.

Study design/methods: Phase 1 was an intrathecal/intravenous separation system, created as a response to intrathecal methotrexate overdoses occurring in the pediatric ward. This changed overdose frequency from three in one month to zero in the next month. Phase 2 was a creation of drug monographs, to improve side effect symptom management. Each monograph was created to be simple and practical to allow for quick use in treating side effects on the ward. Phase 3 was an adaptation of all chemotherapy pre-printed standardized orders to insert antiemetic prophylaxis, as chemotherapy had generally not been given with prophylaxis previously in the pediatric ward. The final phase involved the development and implementation of an SOP and training checklist for aseptic preparation.

Conclusion/recommendations: All phases successfully impacted safety of chemotherapy delivery, as well as prevention and management of side effects.

24
Development of a Provincial Oncology Recommendation during a Sodium Bicarbonate Shortage
Anne Dar Santos, Mario de Lemos
BC Cancer, Vancouver, Canada

Objective/purpose: Parenteral sodium bicarbonate (NaHCO₃) is used for urine alkalinization during high dose methotrexate (HDMTX) treatments at BC Cancer centres. During a nationwide shortage of parenteral NaHCO₃, we needed to develop alternatives to achieve this goal. Alkalinizing regimens in our HDMTX protocols utilize a combination of parenteral and oral NaHCO₃. We sought to find an alternative while minimizing deviation from our existing nursing practice.

Study design/methods: Nationwide survey of existing practice and possible alternatives was carried out. A literature search was conducted for data and experiences in previous parenteral NaHCO₃ shortages.

Results/key findings: Nationwide survey and literature search revealed a large variance in urine alkalinization protocols, both in routine practice and during NaHCO₃ shortages. Alternatives included oral NaHCO₃, parenteral sodium acetate, and oral/parenteral acetazolamide. Based on the NaHCO₃ dosing in our protocols and the anticipated NaHCO₃ dosage required to adequately alkalinize the urine, we developed a provincial recommendation to use oral NaHCO₃ for routine urine alkalinization while reserving parenteral sodium acetate for urine pH less than 7.

Conclusion/recommendations: Qualitatively, our recommendation was successful, with most patients achieving urine pH 7 with oral NaHCO₃ alone, and receiving HDMTX on time.
The «CEPSP», a Networking Model in Oncology: Oncology Pharmacists Involvement in Quebec’s Health Care System

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Background: Established in 2013, CEPSP, meaning “committee for the evolution of pharmaceutical care in oncology”, brings together oncology pharmacists from all the health care institutions in Quebec, (one representative per hospital), and representatives from the Quebec Board of pharmacists, the provincial profession association of health system pharmacists and from Québec’s Ministry of Health.

Objective/purpose: To explain the objectives, membership, processes and achievements of CEPSP.

Study design/methods: CEPSP has established its objectives and priorities following a survey sent to all the oncology pharmacists in Québec province.

Results/key findings: Various clinical tools have been developed and published: chemotherapy administration guidelines, patient counseling leaflets, standardized chemotherapy prescription models are all examples aimed at improving efficacy and safe use of antineoplastic drugs. Care transition plans were also created to improve coordination and communication with community care pharmacists. In 2016, CEPSP published official recommendations on the standards of practice for oncology pharmacists. This guide details the pharmaceutical care to be provided to oncology patients and recommended manpower to achieve this goal. CEPSP organized educational activities on the safe use of antineoplastic agents for oncology pharmacists and pharmacy technicians.

Conclusion/recommendations: Four years after its creation, a lot of work has been accomplished by CEPSP.

First Steps towards Quality Measurements of Antimicrobial Stewardship Data at the BC Cancer Agency

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Objective/purpose: Accurate measurements of antimicrobial utilization are essential to antimicrobial stewardship as these data are closely linked to quality indicators. The Antimicrobial Stewardship Program at the BC Cancer Agency describes these trends using data derived from pharmacy dispensing records. Although dispensing records provide easy access to these data, they have yet to be validated.

Study design/methods: A random sample of inpatient antimicrobial dispensing records from the 2016/2017 fiscal year were compared to the corresponding MARs to assess the accuracy of the dispensing data. The accuracy of the dispensing record compared to the MAR is defined as the difference in antimicrobial Days Of Therapy (DOT) per 1000 patient bed-days.

Results/key findings: Data analysis is underway. The utilization data calculated from dispensing records is expected to differ in antimicrobial days of therapy by 15–35% based on the literature. Certain trends were observed during data collection such as discrepancies due to the use of ward stock antimicrobials.

Conclusion/recommendations: The results of this study will be used to establish a baseline accuracy of antimicrobial utilization datasets at the BC Cancer Agency, which is the first step in ensuring quality antimicrobial stewardship interventions. This study may also provide a framework for other antimicrobial stewardship programs who wish to validate their data.

Integration of a Pediatric Antineoplastic-Induced Nausea and Vomiting Assessment Tool into Clinical Practice

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Abstracts
Objective/purpose: Assessment and management of antineoplastic-induced nausea in children presents a challenge. Tools such as the Pediatric Nausea Assessment Tool (PeNAT) have been developed but are not widely used. We developed an antineoplastic-induced nausea and vomiting (AINV) tool that integrated the PeNAT for routine assessment of pediatric oncology patients. Our primary objective was to describe the proportion of patients receiving highly- or moderately-emetogenic chemotherapy who utilized the AINV tool. We also report on AINV interventions provided by pharmacists, patient and caregiver satisfaction, severity of nausea, and AINV control.

Study design/methods: A retrospective chart review of 74 pediatric oncology patients receiving their second or greater cycle of antineoplastic therapy at the Alberta Children’s Hospital between February and September 2017 was performed.

Results/key findings: Uptake of the AINV tool was low, 28% of patients used the tool in 21% of chemotherapy cycles. Pharmacists performed a mean of 1.56 AINV interventions per day. Patient and caregiver satisfaction with AINV management was high, however the tool itself was considered less valuable.

Conclusion/recommendations: Satisfaction of clinical pharmacist management of AINV was high, although uptake and usefulness of the AINV tool was low.

28 Pharmacists’ Attitudes and Perceptions Regarding Natural Health Product Use in Oncology: A Cross-Sectional National Survey
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Objective/purpose: To provide a descriptive analysis of pharmacist attitudes and perceptions toward use of NHPs in oncology patients, report current data on the most commonly seen NHPs in practice, and to provide an accurate background on current approaches to NHP use in practice.

Study design/methods: A qualitative survey was designed and distributed to the mailing list of CAPhO to assess specific practice approaches to NHP use and to determine the most common NHPs encountered by practitioners. The survey included demographic questions and several Likert scale questions to investigate attitudes, perceptions, and approach.

Results/key findings: There were 18 responses to the survey from multiple jurisdictions in Canada. 100% of respondents ask patients about NHP use when gathering medication history at least most of the time, and the majority (61%) always include NHPs when constructing a BPMH. However, 65% of respondents either only sometimes or never develop a monitoring plan for adverse effects or toxicity from NHPs, despite the fact that the majority of respondents (78%) are concerned about interaction of NHPs with chemotherapy and radiation.

Conclusion/recommendations: Despite the fact that pharmacists are asking about NHPs and have concern about them in oncology, a standardized approach to dealing with these agents is still lacking.

29 Chemotherapy in the Intensive Care Unit: An Evaluation of Context and Outcomes
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Objective/purpose: Chemotherapy administration to highly vulnerable critically ill patients in the intensive care unit (ICU) is becoming more common but requires an increase in resources compared to specialized oncology settings. The objectives of this project are to describe the prevalence, complexity and outcomes of critically ill adults receiving systemic chemotherapy in the ICU.

Study design/methods: In this retrospective observational study, consecutive patients receiving parenteral chemotherapy in the ICU at the General Campus of The Ottawa Hospital between June 30, 2014 and July 1, 2017 will be identified. Data pertaining to the indications for chemotherapy, complexity of care and long term patient outcomes will be collected. Specific research questions include: 1) What are the indications for systemic chemotherapy in the ICU and what types of chemotherapy are administered? 2) What is the severity of illness of patients getting chemotherapy in the ICU? 3) What are the short- and long-term outcomes of patients getting chemotherapy in the ICU? 4) What are the frequencies and severity of chemotherapy related
complications? 5) How often are modifications and dose adjustments to chemotherapeutic regimens required in ICU patients?

**Results/key findings:** This project is currently underway and results will be presented.

### 30
**Assessing the Impact of a Layered Learning Practice Model on the Delivery of Clinical Pharmacy Key Performance Indicators within an Oncology Unit of a Tertiary Care Centre**

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**Objective/purpose:** Determine if the collaborative practice environment with pharmacists precepting pharmacy learners in a 'pyramid-style', layered-learning practice model (LLPM) promotes clinical productivity, as assessed by proportion of patients receiving evidence-based clinical pharmacy Key Performance Indicators (cpKPIs) compared to standard practice, on an inpatient oncology unit. Through describing evidence-based cpKPI metrics across a LLPM, we aim to provide clinicians, managers and educators with insight on optimizing the role of pharmacy learners in the delivery of patient care to oncology inpatients.

**Study design/methods:** In this retrospective observational study, final-year PharmD students, pharmacy residents and pharmacists recorded completion of 7 cpKPIs on patient care rosters for oncology inpatients over a 6-month period. Completed cpKPIs will be compared between scenarios when the following three compositions of pharmacy professionals are present: i) pharmacist(s) with student(s) and a resident; ii) pharmacist(s) with student(s); iii) pharmacist(s) alone.

**Results/key findings:** Ongoing pharmacy residency project: Results will be provided to the research committee when available. We plan to report the following:

i) Proportion of eligible patients who receive cpKPIs 1,2,4,5,6,7, and describe contributions from each respective pharmacy professional.

ii) Weighted number of cpKPIs performed per day per pharmacy professional, normalized to the number of respective pharmacy professional work days.

### 31
**Interprofessional Development of a Pathway for Patients Initiating Treatment with Palbociclib: Optimization of Toxicity Monitoring**

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**Objective/purpose:** To improve the percentage of patients started on palbociclib who had biweekly blood work and toxicity assessment until a stable palbociclib dose was established.

**Study design/methods:** An interprofessional focus group, led by the institution’s oral anticancer medication pharmacist, was struck to identify key milestones for patients initiated on palbociclib. A patient pathway was created that identified responsibilities of each care provider to achieve these milestones, with feedback from members of the breast disease site. Standardized blood work parameters for dose reduction were established by the team. A retrospective chart audit of patients on palbociclib with a hormonal agent, before and after the dissemination of the algorithm, was conducted to assess adherence to biweekly blood work and toxicity follow-up.

**Results/key findings:** The audit was conducted from June 2016 to August 2017. Twenty-five patients were identified prior to the implementation of the pathway and 24 post implementation. Prior to the standardized algorithm, 63% and 58% of patients had day 15 blood work and clinic assessment respectively, compared to 88% and 83% after the pathway was disseminated.

**Conclusion:** Development of a treatment pathway for a new class of drugs by identifying champions to provide guidance is feasible and reduces practitioner variability in patient management.
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Background: Tumour lysis syndrome (TLS) guidelines recommend risk-stratified prophylaxis based on malignancy and laboratory parameters.

Objective/purpose: To characterize utilization of preventive strategies for patients with newly-diagnosed hematologic malignancies at intermediate- (IR) or high-risk (HR).

Study design/methods: Retrospective chart review of patients admitted to an oncology centre and/or affiliated intensive care unit over 12 months.

Results/key findings: Of 313 patients screened, 58 were eligible for inclusion (29 IR; 29 HR). Prophylaxis included allopurinol (90% IR vs. 92% HR), rasburicase (3% IR vs. 36% HR, p = 0.003), sodium bicarbonate (83% IR vs. 84% HR), and furosemide (14% IR vs. 12% HR). Fourteen percent and 8% of IR and HR subjects respectively developed TLS. Among all subjects, preventive rasburicase was not associated with lower TLS incidence (10% of subjects who received rasburicase developed TLS vs. 11% who did not, p = NS), nor was use of bicarbonate (9% of subjects who received bicarbonate developed TLS vs. 25% who did not, p = NS). Treatment for subjects who presented with or developed TLS included rasburicase (100% and 17%), bicarbonate (100% and 67%), furosemide (50% and 33%), and dialysis (0 and 50%).

Conclusion/recommendations: Preventive rasburicase was more commonly used in HR, though not universal. Use of other agents was similar between groups.

33 Pain Descriptors of Docetaxel-Associated Pain Syndrome in Breast Cancer Patients
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Objective/purpose: Taxane Acute Pain Syndrome (TAPS) is a clinically significant side-effect of taxane chemotherapy, often described as arthralgia and myalgia that occurs 2–3 days after infusion. The study aim was to assess pain descriptors used by patients during TAPS.

Study design/methods: A clinical prospective cohort study was conducted on chemotherapy-naïve breast cancer patients who completed questionnaires on 3 consecutive docetaxel treatment cycles. Questionnaires to assess pain severity, descriptors of pain, and the interference in activities due to pain were adapted from the Brief Pain Inventory and the McGill Pain Questionnaire.

Results/key findings: The most commonly used descriptor for acute and chronic pain was “aching” (90–96%). However, in the delayed phase of the study, “burning” (32–50%), “radiating” (39–48%), and “sharp” (40–69%) were used more frequently. In both acute and chronic pain phases, patients experienced moderate/severe pain (p < 0.0001) regardless of the location. Pain in cycle 1 was predictive of pain in subsequent cycles (p < 0.0001). Pain in cycle 3 was predictive of chronic pain (p < 0.002).

Conclusion/recommendations: Based on the descriptors used during various phases of chemotherapy-induced pain (ChIP), it could be hypothesized that TAPS starts off as an acute inflammatory pain, which over time develops into neuropathic pain. The descriptors used by patients experiencing ChIP may reflect TAPS pathophysiology.
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Capecitabine-Induced Myopericarditis: A Case Report and Review of Literature
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Objective/purpose: To describe a possible case of capecitabine-induced myopericarditis in a patient at the Cardio-Oncology Clinic in Calgary, AB.

Study design/methods: A literature search and adverse drug reaction assessment with the Naranjo tool was conducted.

Results/key findings: A 39-year-old male with recurrent locally advanced rectal adenocarcinoma presented two days after adjuvant treatment with capecitabine and oxaliplatin complaining of intermittent, severe interscapular pain. Based on symptoms, laboratory investigations, and imaging, the patient was diagnosed with acute myopericarditis. Management included ASA 650 mg PO qid x 2 weeks then tapered off, colchicine 0.6 mg PO bid x 3 months, and discontinuation of adjuvant chemotherapy. A literature review revealed one case report of capecitabine-induced myopericarditis; however, more data was found regarding the cardiotoxicity of fluorouracil, for which capecitabine is a pro-drug. No case reports were found for oxaliplatin.

Conclusion/recommendations: Previous reports, timing of capecitabine administration, symptom onset, and the patient’s improvement upon medication discontinuation resulted in a Naranjo score of 5 and capecitabine was determined to be the probable cause myopericarditis. By presenting this case, clinicians will become more aware of the possibility of this adverse reaction, screen for risk factors, and consider myopericarditis when assessing patients presenting with suspected cardiotoxicity.

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Development of Best Practice Recommendations for Immune Checkpoint Inhibitor Toxicity Management
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Objective/purpose: Immune checkpoint inhibitors (ICIs) are a relatively new class of medications that have demonstrated clinical efficacy in a growing number of cancer types, and are increasingly being used to treat many cancer patients. ICIs are associated with unique immune-related adverse effects (irAEs) that may be life-threatening. There is a lack of published practical guidance related to the management of these irAEs. The objective of this work was to develop best practice recommendations for ICI toxicity management.

Study design/methods: A multidisciplinary working group of oncology clinicians with experience in the use of ICIs reviewed the available literature to draft evidence-informed, practical recommendations. These were then circulated to an external expert review panel for clinical verification, feedback, and acceptability.

Results/key findings: Best practice recommendations for ICI toxicity management were created and include detailed algorithms describing the grading and management of ten specific irAEs. Rare irAEs are also discussed. A general patient information sheet and a wallet card were developed to supplement the report, and ensure that patients understand these toxicities and the need for urgent management.

Conclusion/recommendations: Careful analysis of the available literature and application of oncology professionals’ expertise resulted in evidence-informed, consensus-based recommendations to help facilitate safe, standardized ICI toxicity management.
Treatment beyond Progression with Nivolumab in Patients with Recurrent or Metastatic Squamous Cell Carcinoma of the Head and Neck in the Phase 3 Checkmate 141 Study

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Background: Treatment responses to immune checkpoint inhibitors may occur after initial radiologic evidence of progression. The goal of this analysis is to examine such findings in CheckMate 141 (NCT02105636), a randomized phase 3 study in patients (pts) with R/M SCCHN comparing nivolumab (nivo) vs investigator’s choice chemotherapy.

Study design/methods: Treatment beyond first progression was permitted in the nivo arm for pts who met protocol defined criteria. Pts without progression or tumor assessment to determine progression were excluded. Of 240 pts randomized to nivo, 146 (61%) experienced progression. Among them, 62 (42%) received 1 dose of nivo after progression (TBP group), and 84 (58%) were not treated beyond progression (NTBP group). Median OS was 12.7 mo (95% CI: 9.7, 14.6) in the TBP group. After initial progression, 15 (24%) pts in the TBP group had a reduction in target lesion size, with >30% reduction in 3 pts. Frequencies of grade 3/4 treatment-related adverse events were similar in the TBP and NTBP groups.

Conclusion/recommendations: Nivolumab treatment beyond progression in some pts with R/M SCCHN was tolerable and associated with tumor size reductions.

A Model Based Exposure-Response (ER) Assessment of a Nivolumab (NIVO) 4 Weekly (Q4W) Dosing Schedule across Multiple Tumor Types

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Background: The feasibility of extending the dosing interval of nivo from Q2W to Q4W as well as flat based versus weight based dosing was investigated using a combination of quantitative clinical pharmacology analyses and safety assessments. The predicted benefit risk profile of nivo 480 mgQ4W relative to 3 mg/kgQ2W was assessed in melanoma, RCC, Urethral, Head&Neck and cHL cancer patients.

Study design/methods: Steady state peak, time averaged, and trough nivo concentrations predicted with 480 mg Q4W were approximately 44% higher, 4% higher, and 18% lower, respectively, compared with 3 mg/kgQ2W. The aggregate of safety data accumulated for nivo up to a dose level of 10 mg/kgQ2W in multiple tumor types provides a wide safety margin for the maximum concentration values expected with 480 mgQ4W. The predicted probabilities of achieving an objective response with nivo 480 mgQ4W were similar to those with 3 mg/kgQ2W (<1% difference) across tumor types. Predicted 1&2 year survival probabilities were also similar across tumor types independent of dosing.

Conclusion/recommendations: With a well-established understanding of nivo clinical pharmacology, the differences in exposures produced by a nivo schedule of 480 mgQ4W relative to 3 mg/kgQ2W dosing schedule are not expected to result in clinically meaningful differences in the safety & efficacy. The proposed 480 mgQ4W schedule has been incorporated into newer nivo clinical trials across multiple tumor-types.
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Real World Evidence of Abiraterone Use Post-Docetaxel in Metastatic Castrate Resistant Prostate Cancer
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Objective/purpose: The COU-AA-301 trial demonstrated that in men with metastatic castrate-resistant prostate cancer, using abiraterone post-docetaxel increased overall survival. This study assessed abiraterone’s performance in a real world context.

Study design/methods: Retrospective chart review using a provincial pharmacy BDM database and a provincial electronic chart (ARIA). Dispensing data and information on the disease state before and after abiraterone were gathered.

Results/key findings: 226 patients were included with a median follow up of 58 months from abiraterone initiation. Median survival from the start of abiraterone was 17 months [95% CI, 15, 19] for this cohort which was comparable to the findings of COU-AA-301 [14.8 months] and a real world study done by Clayton et al. [11 months]. Patients with clinically documented adverse effects (44%) had an increased overall survival by 24% compared those who didn’t [HR 0.76, p = 0.048]. There was no statistically significant difference in overall survival when patients were stratified by comorbidities of hypertension and diabetes, PSAdt (prostate specific antigen doubling time), and age.

Conclusion/recommendations: In a real world setting, abiraterone demonstrated comparable overall survival to what was seen in a clinical trial. Patients dosed to a level from which they experienced adverse effects showed a better response to the drug.

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Nivolumab + Ipilimumab (N+I) vs Sunitinib (S) for Treatment-Naïve Advanced or Metastatic Renal Cell Carcinoma (aRCC): Results from CheckMate 214, Including Overall Survival by Subgroups
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Background: Study compared NIVO + IPI versus SUN in treatment-naïve aRCC.

Study design/methods: Adults with clear-cell aRCC, measurable disease, Karnofsky performance status ≥70 were randomized to NIVO (3 mg/kg) + IPI (1 mg/kg) Q3W for 4 doses followed by NIVO (3 mg/kg) – Q2W, or to SUN (50 mg QD p.o) for 4 weeks (6-week cycles). Co-primary endpoints: ORR, PFS and OS, all in intermediate/poor-risk patients. 1,096 patients were randomized (NIVO + IPI: n = 550; SUN: n = 546). In intermediate/poor risk patients (NIVO + IPI: n = 425; SUN: n = 422,~17.5 months minimum follow-up) confirmed ORR was 41.6% vs 26.5% for N+I vs S (P < 0.0001); median duration of response was not reached (NR; 95% CI, 21.82-NR) vs 18.2 months (95% CI, 14.82-NR).
Median PFS with N+I vs S was 11.6 vs 8.4 months (hazard ratio [HR] 0.82, P = 0.0331). At 1st interim OS analysis, study was stopped early for statistically significant OS superiority with N+I vs S (median not reached vs 26.0 months [HR 0.63], P < 0.0001). OS favored N+I over S across all subgroups. In all treated patients, drug-related AEs occurred in 509/547 (46%) grade 3-4 with N+I vs 521/535 (63%) grade 3-5 with S, including 22% vs 12% with AEs leading to discontinuation.

**Conclusion/recommendations: **Study showed statistically significant OS benefit, irrespective of baseline PD-L1 status, significantly higher ORR, and longer PFS for N+I vs S with manageable safety profile in intermediate & poor-risk patients, supporting N+I as a new first-line standard-of-care treatment option for these patients.

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### CheckMate 169: Safety/efficacy of Nivolumab in Canadian Pretreated Advanced NSCLC (Including Elderly and PS 2) Patients

**Charmy Vyas**, **Rosalyn Juergens**, **Quincy Chu**.


**Background:** Nivolumab demonstrated efficacy and safety in patients with previously treated advanced/metastatic NSCLC in two phase 3 trials, CheckMate-017 and 057. CheckMate-169 (NCT02475382) is an expanded access program (EAP) of nivolumab in patients with relapsed stage IIIb/IV NSCLC and disease progression after ≥1 prior systemic therapy. 161 patients were treated in Canada.

**Study design/methods:** Nivolumab was administered until disease progression or unacceptable toxicity. In addition to providing nivolumab to patients, primary objectives were to assess safety and OS. Outcomes in elderly patients (aged ≥70 years) and those with poor performance status (PS 2) were assessed in post hoc analyses.

**Results/key findings:** Nivolumab was well tolerated and the safety profile of nivolumab in patient subgroups (elderly and PS 2) was similar to the overall population. The median OS (95% CI) in the overall population was 9.1 months (7.5, 14.4); 1-year OS rate 44%. The median OS was 8.0 months (5.3, 12.9) for elderly patients and 5.9 months (3.6, 7.9) for those with PS 2.

**Conclusion/recommendations:** In this EAP of nivolumab in Canadian patients with previously treated NSCLC, safety and OS were consistent with observations from prior controlled trials. Safety in elderly patients and those with PS 2 was consistent with the overall population.

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### The Incidence of Febrile Neutropenia in Breast and Lymphoma Cancer Patients Receiving Grastofil as Primary Prophylaxis: Early Experience at the Sunnybrook Odette Cancer Centre (SOCC)

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**Objective/purpose:** The objective of this study was to determine the incidence of febrile neutropenia (FN) among breast and lymphoma cancer patients receiving Grastofil (filgrastim) for the primary prophylaxis (PPx) of FN, during treatment with neoadjuvant/adjuvant chemotherapy (breast cancer) or curative intent (lymphoma patients) at the SOCC. Secondary endpoints included dose-delays and dose-reductions.

**Study design/methods:** A retrospective chart-review of all eligible breast and lymphoma cancer patients receiving PPx with Grastofil during January to December 2017 was conducted. Patient, disease and treatment characteristics were collected along with
Grastofil usage, incidence of FN, dose-delays and dose-reductions.

**Results/key findings:** Fifty-eight Grastofil patients met the inclusion criteria and were analyzed, of whom 47 (81.0%) were breast cancer patients. Overall, six (10.3%) patients experienced FN during chemotherapy treatment, six (10.3%) experienced a dose-delay, and 18 (31.0%) received a dose-reduction.

**Conclusion/recommendations:** The incidence of FN for breast and lymphoma cancer patients receiving PPx with Grastofil was comparable to reported real-world data from a European study that evaluated the incidence of FN (12.0%) in a similar patient population receiving Neupogen.

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42 **Incorporation of a Pharmacist in a GI/Endocrine Oncology Clinic**

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**Objective/purpose:** We set out to assess the impact of having a pharmacist in an ambulatory clinic where patients with GI and endocrine cancers are seen.

**Study design/methods:** A pharmacist started in the weekly, full day GI/Endocrine clinic in October 2015. Primary focus was oral anticancer therapy monitoring with callbacks, BPMHs, and identifying DTPs. Standardized callback sheets for oral agents were used.

**Results/key findings:** From October 2015 to October 2017, 844 patient-pharmacist interactions and 117 BPMHs completed (average time 10 minutes). 297 callbacks were made, average time 13 minutes. 173 DI questions from the team. From May 2016 to October 2017, 261 DTPs were identified, the most common being “causing an adverse reaction” (23%), followed by “additional therapy required for clinical indication” (21%). A 6 month survey of the clinic team resulted in a RR of 50% and while the pharmacist role as a medication expert was appreciated, the need for pharmacists in other GI clinics was noted, as well as the challenge of space and seeing all clinic patients.

**Conclusion/recommendations:** This ambulatory care model generated data that demonstrates that the presence of a clinic pharmacist is beneficial for obtaining BPMHs, monitoring through callbacks, identifying DTPs, DI questions and supporting the clinic team.

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43 **N-acetylcysteine as Secondary Prophylaxis for Ifosfamide Induced Renal Tubulopathy in Children with Solid Tumors: Case Series**

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**Background:** A known side effect of ifosfamide (IFO) is renal tubulopathy (RT). There is limited data suggesting that N-acetylcysteine (NAC) can prevent IFO-induced nephropathy. We aim to report a cohort of children with RT secondary to IFO successfully treated with NAC.

**Study design/methods:** Case series of children between ages 0–17 years and RT secondary to IFO treated with NAC.

**Results/key findings:** Two patients fulfilled the criteria. Patient one had relapsed rhabdomyosarcoma and received IFO with etoposide and carboplatin for eight courses. Patient two had osteosarcoma previously treated with high-dose methotrexate, cisplatin and doxorubicin, followed by two courses of IFO with etoposide. Patient one developed RT after course 5 and patient two after course 1. Both had significant electrolyte depletion and acidosis requiring intravenous electrolyte replacement, followed by two weeks of oral replacement. Patient one received NAC post IFO on courses 6, 7 and 8 and patient two on course 1. Both had significant electrolyte depletion and acidosis requiring intravenous electrolyte replacement, followed by two weeks of oral replacement. Patient one received NAC post IFO on courses 6, 7 and 8 and patient two on course 2. After one course, electrolyte depletion improved, requiring oral replacement only. Patient one did not require any electrolyte replacement with courses 7 and 8.

**Conclusion/recommendations:** We report two patients with RT secondary to IFO who responded to treatment with NAC. Prospective studies are required to further confirm this therapeutic approach.
Evaluation of the Quality of Mobile Health Applications Promoted to Support Medication Adherence and Symptom Management in Oncology Patients: A Scoping Review
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Objective/purpose: Medication non-adherence in the pediatric oncology population has been reported as 10-50%, with higher rates among adolescents and young adults. Mobile health applications (apps) may support patients with medication and disease management. App quality and functionality vary despite their vast availability. This scoping review identified and evaluated the quality and functionality of apps designed for cancer patients.

Study design/methods: We conducted a systematic literature search and performed a manual search of the iTunes App Store and Google Play Store to identify apps for quality evaluation using the Mobile Application Rating Scale (MARS).

Results/key findings: Our search yielded 28 apps with MARS mean scores ranging from 2.8-4.3 for app functionality and quality. Pain Squad®, exclusive to iTunes, scored the highest overall, featuring an intuitive and visually appealing user interface with gamification elements. Overall, most apps received low scores in the MARS Engagement domain and offered minimal medication and symptom management functionalities.

Conclusion/recommendations: We assessed the quality of oncology apps and identified gaps in design and function. These results will inform the conceptualization and design of an innovative app for pediatric cancer patients.

Bevacizumab Therapy Effectiveness in Previously Treated Metastatic Colorectal Cancer
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Objective/purpose: Early colorectal cancer may be curable but patients are often diagnosed with metastatic disease associated with a five-year survival of 11%. Pivotal trial data reports improved overall survival (OS) with bevacizumab and chemotherapy. This retrospective chart review was designed to measure OS to assess bevacizumab therapy effectiveness in treating metastatic colorectal cancer (mCRC) in bevacizumab-naive patients.

Study design/methods: Adult patients were included if they initiated bevacizumab with chemotherapy between March 1, 2006 and March 1, 2016. Patients were excluded if data was missing or for treatment of other malignancies. Patient demographics, diagnosis and vital status were extracted from the Alberta Cancer Registry, while treatment regimens, safety and tolerability were extracted from electronic medical records. Kaplan-Meier survival analyses were used to determine OS and TTF.

Results/key findings: In Alberta, 487 patients initiated bevacizumab with chemotherapy for mCRC treatment during the study timeline. OS of 20.1 months (95%CI, 17.9-21.9) described the sample population but a statistically significant (p = 0.004) improved OS of 28.1 months (95% CI, 21.0-46.9) was associated with the FOLFOX(85) regimen specifically.

Conclusion/recommendations: OS associated with bevacizumab and chemotherapy is similar to survival results from the pivotal trials. FOLFOX(85) appears to have the greatest survival benefit compared to other regimens.
Research – Non-Clinical

46 Microbiologic Evaluation of Single Dose Vial Extension Using PhaSeal in a Non-NAPRA Compliant Environment
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Objective/purpose: To determine the rate of microbial contamination of partial single use vials of cancer drugs punctured using PhaSeal closed system transfer devices in a non-NAPRA compliant environment at intervals up to 7 days after initial puncture.

Study design/methods: Partial single use vials of cancer drugs that had been used in preparation of patient-specific compounded sterile products using PhaSeal were segregated and tested for microbial contamination by withdrawing samples at 24, 48, 72, 96, 120, 144, and 168 hours after initial puncture.

Results/key findings: 121 single use vials were tested yielding 765 samples. Standard plate counts determined 99.35% of samples had no evidence of contamination up to 168 hours after initial puncture while 5 samples (0.65%) taken from 5 different vials demonstrated contamination at 24 (n = 1) and 48 (n = 4) hours after initial puncture.

Conclusion/recommendations: PhaSeal prevents microbial contamination of partial single use vials of cancer drugs for 7 days after initial puncture in a non-NAPRA compliant environment. Partial single use vials punctured using PhaSeal maintain sterility and can be retained for use in compounded sterile product preparation for up to 7 days.

47 Concomitant Use of Capecitabine and Proton Pump Inhibitors (PPIs) – Is It Safe?
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Objective/purpose: Capecitabine is a commonly used oral chemotherapy agent. Drug interactions databases have recently identified that proton pump inhibitors (PPIs) may reduce capecitabine absorption and efficacy. Since PPIs are widely used, we evaluated the supportive evidence for the probability of occurrence and potential seriousness to develop a management strategy.

Study design/methods: The Drug Interaction Probability Scale (DIPS) was used to assess the clinical, pharmacokinetic and in vitro evidence. The capecitabine treatment intention was used to guide the potential seriousness of the interaction.

Results/key findings: The probability of occurrence is doubtful. Post-hoc analyses of two cancer trials suggest that concurrent use may inconsistently reduce disease control and survival. However, significant confounding factors were not accounted for, including comorbidities, concurrent gastric acid suppression, and relying on prescription refill data. Pharmacokinetic and in vitro data do not support reduced capecitabine absorption due to increased gastric pH. The most and least serious outcome would be reduced survival and symptom control, respectively. Management includes routinely ascertaining the need for PPI use, and considering alternate acid suppressing agents based on the treatment intention.

Conclusion/recommendations: Probability of interaction between capecitabine and PPIs is doubtful. Minimal routine intervention is needed. Further intervention may be considered depending on the treatment intent.

48 Stability of Azacitidine Solutions in Sterile Water for Injection
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Background: Previous publications indicate the relative instability of azacitidine. Availability of generic azacitidine (Dr. Reddy’s) raised questions of equivalent stability.

Study design/methods: Solutions of 10 and 25 mg/mL of azacitidine in syringes and vials were stored at –20°C, 4°C or 25°C for 21-days, 96-hours or 24 hours, respectively. Azacitidine concentrations were determined by a validated, stability-indicating liquid chromatographic method. The recommended BUD was determined based on the time to achieve 90% of
the initial concentration using the fastest or lower limit of the 95% confidence interval of the observed degradation rate.

Results/key findings: Azacitidine degradation was observed to be very sensitive to temperature but not concentration (10 or 25 mg/mL). Cold reconstitution reduces azacitidine loss. At 25°C, 9% of initial concentration is lost after 2 hours when reconstituted with 25°C SWFI, but only 4% is lost when cold SWFI is used. Less than 10% is lost after 1 day at 4°C and less than 1% loss was observed at −20°C after 21 days.

Conclusion/recommendations: More than 90% of initial azacitidine concentration will be retained, with 97.5% confidence, if storage at 25°C does not exceed 2 hours, storage at 4°C does not exceed 8 hours and storage at −20°C does not exceed 4 days.

Results/key findings: Three focus groups were conducted and four major themes were identified: Preparing for what lies ahead, Bridging the information gaps, Understanding the education needs of the patients, and Experience within the health care system. The patient questionnaire to quantify these findings is currently open and qualitative interviews with HCPs are underway.

Conclusion/recommendations: Focus groups with patients identified previously unknown patient education needs, and supported ideas that have been reported in the literature. This data, along with the results of the patient questionnaire and the HCP interviews, will guide the strategies that will be used to optimize the delivery of oncology medication education to patients.

49 Optimizing Patient Education of Oncology Medications
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Objective/purpose: To explore patients’ and health care professionals’ (HCPs) perspectives of optimal oncology medication education that should be provided to patients at the Nova Scotia Health Authority (NSHA).

Study design/methods: Adult outpatients receiving intravenous chemotherapy in medical, gynaecology and hematology oncology at NSHA, Central Zone, were invited to participate in focus groups, which were analyzed thematically. Using these qualitative findings, a patient questionnaire was designed and patients receiving intravenous chemotherapy at hospitals across Nova Scotia were invited to participate. Additionally, physicians, nurses and pharmacists practicing in oncology at NSHA were invited to participate in one-on-one interviews.

Results/key findings: Three focus groups were conducted and four major themes were identified: Preparing for what lies ahead, Bridging the information gaps, Understanding the education needs of the patients, and Experience within the health care system. The patient questionnaire to quantify these findings is currently open and qualitative interviews with HCPs are underway.

Conclusion/recommendations: Focus groups with patients identified previously unknown patient education needs, and supported ideas that have been reported in the literature. This data, along with the results of the patient questionnaire and the HCP interviews, will guide the strategies that will be used to optimize the delivery of oncology medication education to patients.

50 Determining Patient Values and Experiences with Oncology Services in an Outpatient Oral Anticancer Therapy Program: A Qualitative Needs Assessment
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Background: Anticancer treatment is increasingly shifting to oral medications and moving from cancer centres into the community. Health authorities have recommended that education programs be established to ensure safety, efficacy, and improved patient support is provided with respect to managing anticancer medications. A comprehensive understanding of patient needs is warranted to inform foundational components of an oral anticancer therapy program.

Objective/purpose: To determine patient values and experiences from the oral anticancer therapy program at an urban outpatient cancer centre.

Study design/methods: Patients who have participated in an existing oral anticancer therapy program at a large, outpatient cancer centre will be asked to reflect and describe their experiences using one-on-one semi-structured patient interviews. A target of 12 patients receiving oral anticancer therapy will be
enrolled to capture a variety of anticancer agents and to meet data saturation. Interviews will be audio-recorded and transcribed. Using conventional content analysis, codes will be generated from the transcribed interviews to establish prominent themes that reflect the needs of patients receiving oral anticancer therapy in the outpatient setting.

Results/key findings: This is an ongoing pharmacy residency project with an anticipated short term completion. Study results and conclusions will be provided in advance of the conference.