BEST ORIGINAL RESEARCH

Prevalence and characteristics of anti-indigenous bias among Albertan physicians: A cross-sectional survey

University of Calgary

Background
Several recent deaths of Indigenous patients in the Canadian healthcare system have been attributed to racism, highlighting the need to identify and mitigate ongoing racism experienced by patients, trainees, and physicians. The aim of this study was to describe the prevalence of explicit and implicit anti-Indigenous bias among Albertan physicians.

Methods
This cross-sectional survey was distributed in September 2020 to all practicing physicians in Alberta. Explicit anti-Indigenous bias was measured by feeling thermometer. Participants slid an indicator on a thermometer to indicate their preference for white people (full preference is scored 100) or Indigenous people (full preference, 0). Participants indicated how favourably they felt toward Indigenous people (100 maximumly favourable, 0 maximally unfavourable). Implicit bias was measured using an Indigenous-European implicit association test (IAT, negative scores suggest preference for European faces). Kruskal-Wallis and Wilcoxon rank-sum tests were used to compare bias across physician demographics, including intersectional identities of race and gender identity. Framework analysis of free text responses was performed.

Results
There were 375 respondents; 8.3% of participants felt unfavourably toward Indigenous people and 25.0% preferred white people to Indigenous people. Median scores did not differ by gender identity, race, or intersectional identities. White cisgender men physicians had the greatest implicit preferences compared with other groups (−0.59 (IQR −0.86, −0.25); p<0.001). Free text responses discussed ‘reverse racism’ and expressed discomfort with survey questions addressing bias and racism.

Interpretation
Explicit anti-Indigenous bias was present among Albertan physicians. Concerns about ‘reverse racism’ targeting white people and discomfort discussing racism may act as barriers to addressing these biases. About two-thirds of respondents had implicit anti-Indigenous bias. These results corroborate the validity of patient reports of anti-Indigenous bias in healthcare and emphasize the need for effective intervention.

BEST QUALITY IMPROVEMENT

Maintenance order set to reduce repetitive laboratory investigations in patients admitted to the clinical teaching unit

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Background
Inappropriate bloodwork on stable inpatients has been associated with anemia, increased blood transfusions, and hospital length of stay (LOS). These investigations rarely change management and present a burden to the healthcare system. Following the Choosing Wisely Canada campaign, we conducted a literature search on bloodwork monitoring. Subsequently, we developed an order set to implement on Day 4 of admission to the Clinical Teaching Unit (CTU) in Saskatoon. We hypothesize that a multi-method approach

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Case description
A previously healthy 46-year-old female presented to hospital with acute onset, severe headache and fever. She had no history of sick contacts or infectious symptoms. Vitals and physical exam were normal. The patient had received the ChAdOx1nCOV-19(Astra-Zeneca) vaccine 10 days prior. Investigations revealed thrombocytopenia (platelets 14/mm$^3$) and coagulopathy (INR 1.5, Fibrinogen 120 mg/dL, D-Dimer >44,000ug/L). CT Head demonstrated a large central venous transverse sinus thrombosis without infarct or hemorrhage. There were no other provoking factors for CVST, family history of thrombosis or thrombophilia. VITT was highly suspected and management was initiated with therapeutic argatroban, IVIG 1 g/kg and prednisone 1 mg/kg. A positive HIT ELISA and serotonin release assay confirmed VITT. On day 3, the patient’s headache worsened after initial improvement while platelets remained <20/mm$^3$. Urgent MRI demonstrated new superior sagittal sinus thrombosis. Therapeutic plasma exchange (TPE) was initiated for aggressive antibody neutralization. Thrombocytopenia improved to 116/mm$^3$ after seven consecutive days of TPE and IVIG. The patient was transitioned to Apixaban 5 mg BID and Prednisone 50 mg daily at discharge. Thrombocytopenia recurred (platelets 108/mm$^3$) 3 weeks post-discharge, coinciding with the half-life of IVIG (21–46 days), and subsequently improved following 2 doses of outpatient IVIG. Three months post-discharge, the patient has fully recovered, duration of anticoagulation has yet to be decided.

Conclusion
This case highlights use of TPE as a possible therapy for refractory thrombosis and thrombocytopenia in patients with VITT. Furthermore, it is an example of successful management of recurrent outpatient thrombocytopenia with IVIG.

BEST VIRTUAL POSTER
A pain in the neck: A rare case of pyomyositis of the foot in a healthy 30-year-old man
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Case summary
A 30-year-old man presented to urgent care with a 5-day history of sore throat, fever, right-sided cervical adenopathy, and malaise. He was discharged home after pharyngeal swabs for

BEST CASE REPORT
An atypical case of headache and fever
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Background
Vaccine induced thrombotic thrombocytopenia (VITT) is a rare disorder following adenoviral vector vaccination, characterized by thrombosis and thrombocytopenia in the presence of heparin-independent platelet factor 4 (PF4) antibodies. International recommendations suggest treatment with intravenous immune globulin (IVIG), glucocorticoids and non-heparin anticoagulation. There is currently limited evidence to guide management of cases refractory to initial therapy.

Methods
We performed a chart review on 337 patients admitted to CTU over 8 weeks, excluding patients admitted for less than three days. We are currently implementing education sessions and the maintenance order set with recommended bloodwork for different categories of clinical status e.g. medically active, inactive, and awaiting disposition. The category under which patients fall will be at the physician’s discretion. Following these interventions, we will assess our primary outcomes of total number of blood draws, average number of blood draws, and investigations per patient-day, number of hematology, chemistry, and coagulation investigations, cost of blood draws and average LOS.

Results
Of the 2787 total blood draws, there were 1827 (66%), 534 (19%) and 426 (15%) hematology, chemistry, and coagulation investigations, respectively. There were 0.9 blood draws and 21.6 investigations per patient-day. The average LOS was 15 days. The total cost of hematology investigations was $46,406, in addition to $134,891 for the cost of the phlebotomy service alone. Analysis of results is still ongoing.

Conclusion
We hypothesize that this multi-method approach will result in a reduction in our primary outcomes.
COVID-19 and Group A Streptococcus were obtained and negative. Two-days later, he re-presented due to acute onset left foot pain with inability to weight bear and persistently high fevers. Physical examination was notable for fever, tachycardia, hypotension, generalized left foot swelling and significant pain to palpation on the dorsum of the foot. Preliminary labs demonstrated leukocytosis (white blood cell count 24.1 x 10^9/L) and elevated C-reactive protein (307 mg/L). He was treated for presumed sepsis with empiric antibiotics, intravenous fluids and admitted to hospital. Peripheral blood cultures obtained at the time of admission were positive for Fusobacterium necrophorum (F. necrophorum). A contrast-enhanced computed tomography scan of the neck revealed venous thrombosis of the right common facial vein with extension to the internal jugular vein. Magnetic resonance imaging of the left foot demonstrated extensive myositis with loculated lesions. The patient underwent a left foot fasciotomy with extensive irrigation and debridement. Intraoperative cultures were obtained but did not yield any growth. The patient completed a total of 4-weeks of metronidazole and 2-weeks of ceftriaxone therapy. The patient was doing well following completion of antimicrobial therapy.

Conclusion
This represents a rare case of Lemierre’s syndrome secondary to F. necrophorum with presumed hematogenous spread resulting in foot pyomyositis. Lemierre’s syndrome, characterized by bacteremia, internal jugular vein thrombosis and metastatic infection, typically affects young adults. The most common causative organism is F. necrophorum, an anaerobic gram-negative bacterium, with the typical site of metastasis being the lungs. The diagnosis of Lemierre’s syndrome requires a high degree of clinical suspicion. In our case, further imaging was pursued following blood culture results, ultimately leading to source identification and appropriate management of the pyomyositis.

BEST VIDEO PRESENTATION
Missed opportunities in diagnosing and treating osteoporosis in inpatient settings
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Background
Fragility fractures are a sign of underlying osteoporosis. 1 in 4 Canadians over 50 years old experiences fragility fractures causing increased risks of morbidity and mortality. Twelve months following hip fracture, 28% of women and 37% of men die, 25% do not regain mobility, 25% re-fracture, and 17% move to long-term care. Over 80% with a history of fragility fractures are never offered assessment or treatment. Osteoporosis Canada assigns patients over 50 years old the highest overall burden of osteoporosis and fragility fractures.

Objective
Identify the extent of treatment gaps in inpatient setting at a Saskatoon hospital, and possible areas for improvement.

Methods
This was a retrospective chart review of patients over the age of 50 admitted to Royal University Hospital Clinical Teaching Unit from January 1 to January 31, 2021. Primary variables analyzed included history of fragility fractures or osteoporotic bone mass density and treatment of osteoporosis.

Results
155 eligible men and women with median age of 73 were identified. 9% had a formal diagnosis of osteoporosis on admission records. Just over 9% were taking osteoporosis medications prior to admission. Overall, 38% had a history of compression fracture or Bone Mass Density showing osteoporosis. 4% were started on osteoporosis medications at discharge. 9% were discharged with a formal diagnosis of osteoporosis.

Conclusion
CTU patients eligible for osteoporosis treatment are being discharged without it. The osteoporosis section in admission order sets is not being used to flag candidates for management. More education, better communication, and services like fracture liaison or a case manager can improve the diagnosis and management of osteoporosis.

PEOPLE’S CHOICE AWARD
COVID19 induced Cardiomyopathy: What do we know so far in 2021?
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University of Alberta

SARS-CoV-2 (COVID-19) has caused a multitude of cardiovascular pathophysiological manifestation such as
cardiac arrhythmia, conduction pathology, myocarditis, and myocardial infarction. In this review, we describe the effect of COVID19 infection on inducing cardiomyopathy, the risk factors for cardiomyopathy and COVID-19 effects on pre-existing cardiomyopathy. The mechanism of injury consists of direct insult to the cardiomyocyte and the non-direct effects of the COVID-19 infection on inducing stress or reserve stress cardiomyopathy (Takotsubo cardiomyopathy). Cardiac dysfunction is unclear but there are three proposed mechanisms, the first one is myocarditis due to direct viral invasion of cardiac myocytes, the second is myocardial suppression due to heightened systemic inflammatory response and cytokine storm and the third is a stress-induced cardiomyopathy. Several researchers have found that Takotsubo cardiomyopathy was a consequence of the emotional stressors of the COVID19 pandemic. Takotsubo cardiomyopathy was found in patients with negative serologies for COVID19. COVID19 induced cardiomyopathy was found to be more prevalent in males, elderly, obese and substance users. The risk factors conferred increased mortality when coupled with an elevated BNP and troponin. The pathophysiology of the cardiomyocytes injury has been proposed to be related to SARS-CoV-2 spike proteins binding to ACE2 receptor Angiotensin-converting enzyme-2 which inhibits the activation of the renin–angiotensin system. Lastly, the long-term effects from COVID-19 infection especially in dilated cardiomyopathy from convalescent infection remains unanswered. Research has found viral genomes in myocardial cells from patients with dilated cardiomyopathy despite that the original infiltrating inflammatory cells were undetectable. In summary, the delayed cardiovascular complications from COVID-19 should be examined in patients presenting with cardiac complaints. The psychological and emotional stressors from COVID-19 pandemic should be recognized when assessing patients presenting with acute heart failure.

ORIGINAL RESEARCH

Rationale, methods, and progress to date of the Co-TELE-SURGE study: Preoperative and postoperative cognitive trajectories in older patients with deferred surgery due to the COVID-19 emergency

McMaster University

Background

COVID-19 contingency plans involved deferring elective surgeries for weeks or months, offering unique research opportunities. Evidence suggests older patients experience significant changes in cognitive performance up to one year postoperatively. However, whether these changes would be different in those patients without undergoing surgery is uncertain. This abstract’s objective is to present the rationale, methods, and current progress of the Co-TELE-SURGE study, a prospective cohort study evaluating perioperative cognitive trajectories in patients aged ≥65 whose elective non-cardiac surgery is deferred ≥6 weeks due to COVID-19.

Methods

In this multicentre, remotely conducted study, potential participants are contacted for verbal consent. Patients are assessed at enrolment and monthly before surgery (≥2 preoperative assessments) and at 1, 3, 6, and 12 months postoperatively, to measure cognitive performance, physical function/mobility, depressive symptoms, and pain. The association of surgery with cognitive changes will be analyzed using an interrupted time-series approach. Baseline patient demographics and compliance to study procedures thus far are presented here using descriptive statistics.

Results:

So far, 100 patients were enrolled of the 203 patients identified through treating surgeons at 2 hospitals, with upcoming involvement of 4 new sites. 5 patients completed the study. 22 and 41 enrolled patients are in the preoperative and postoperative phase, respectively. 37 enrolled patients discontinued
The associations of single nucleotide polymorphisms in the upregulation of inflammatory pathways in COVID-19

McMaster University

Background
COVID-19 severity is associated with increased levels of inflammatory cytokines and chemokines. To study the upregulation of inflammatory pathways, existing genetic data is used to identify single nucleotide polymorphism (SNPs) in COVID-19 related populations.

Hypothesis
Do the SNPs obtained from genomic data correlate with upregulation and/or expression of immune and inflammatory pathways which mechanistically favour severe disease when compared to the normal or less severe host genome? We hypothesize that alleles associated with inflammatory pathways will more frequently be expressed in those with severe COVID-19 when compared to non-infected or less severe COVID-19 hosts.

Methods
Data from COVID-19 host genetic initiative and genome wide association study (GWAS) was used to extract significant SNPs (p-value ≤ 0.05) in COVID-19 related populations. The collected SNPs were identified for susceptible genes and associated protein structures. Using the Kyoto Encyclopedia of Genes and Genomes (KEGG), the related pathways of these protein structures were analyzed to determine if the SNPs upregulate immune and inflammatory pathways.

Results
Significant genes that were identified in critically-ill COVID-19 patients includes chromosome 19p13.2 that encodes the nearby gene tyrosine kinase 2 (TYK), and chromosome 21q22.1 that encodes interferon receptor gene (IFNAR2). Findings from prior studies state that low expression of IFNAR2 and high expression of TYK2 are associated with life-threatening disease. Another association identified is on chromosome 9q34.2 indicating a possible involvement of the ABO blood-group system. Through the extraction of genes and their related proteins, this study will further highlight inflammatory cascades.

Conclusion
This study provides information on genetic polymorphisms that upregulate inflammatory cascades and potentiate the cytokine storm. Moreover, this study uses genomics to unbiasedly identify polymorphisms in severe COVID-19 disease to help elucidate the upregulation of critical inflammatory mediators which enriches our understanding about the pathophysiology of severe COVID-19.

Fecal microbiome differs between patients with systemic sclerosis with and without small intestinal bacterial overgrowth

McMaster University

Background
Gastrointestinal manifestations of systemic sclerosis affect up to 90% of patients, with symptoms including diarrhea and constipation. Small intestinal bacterial overgrowth is a condition associated with increased numbers of pathogenic bacteria in the small bowel. While currently unknown, dysregulation of the fecal microbiota may play a role in the development of systemic sclerosis and small intestinal bacterial overgrowth. Our study aimed to describe the fecal microbiota of patients with systemic sclerosis and compare it between those with and without small intestinal bacterial overgrowth. We also compared systemic sclerosis patients with that of healthy controls to understand the association...
between particular bacterial taxa and clinical gastrointestinal manifestations of systemic sclerosis.

**Methods**
29 patients with systemic sclerosis underwent breath testing to assess for small intestinal bacterial overgrowth, provided stool samples to determine taxonomic assignments, and completed questionnaires assessing symptoms and quality-of-life factors. Stool samples were compared between systemic sclerosis patients with and without small intestinal bacterial overgrowth, and between patients with systemic sclerosis and a healthy control cohort (n=20), aged 18–80 years.

**Results**
Fecal microbiome analyses demonstrated differences between systemic sclerosis patients with and without small intestinal bacterial overgrowth and differences in the diversity of species between healthy controls and patients with systemic sclerosis. In systemic sclerosis patients with positive anticentromere antibodies, trends observed included higher Alistipies indistincus spp. levels associated with increased methane levels of breath gas testing and higher Slakia spp. levels associated with increased rates of fecal soiling.

**Conclusions**
Our results suggest that changes to the fecal microbiome occur in patients with small intestinal bacterial overgrowth and systemic sclerosis when compared to healthy controls. As a cross-sectional study, the potential pathophysiologic role of an altered microbiome in the development of systemic sclerosis was not considered and hence needs to be further investigated.

**Sub-clinical disease activity in the feet of patients with early rheumatoid arthritis: a comparison of disease activity scores vs. ultrasound and magnetic resonance imaging evidence of inflammation**

McMaster University

**Background**
Defining rheumatoid arthritis (RA) remission using composite disease activity scores (DAS-28, DAS-44) that rely heavily on clinical exam may miss subclinical inflammation present on imaging. This is especially true in the feet where clinical exam is challenging. Patients with early RA were followed over 2 years to i) compare changes in DAS with changes in imaging findings in feet and ii) assess disease activity in feet of patients in clinical remission.

**Method**
Treatment naïve patients with RA underwent DAS assessments and ultrasounds of the metatarsophalangeal joints (MTPJs) of the most symptomatic foot at baseline, 3-, 6-, 12- and ≥24-months. MTPJs were semi-quantitatively graded for synovial thickening (ST) and power doppler (PD) on ultrasound. Bone marrow edema (BME) and synovitis were assessed on magnetic resonance imaging (MRI) at baseline, 12- and ≥24-months. Paired t-tests compared changes in outcomes over time. Pearson’s correlation tests compared changes in clinical scores to changes in imaging scores. Chi-square tests were completed for binary groupings of patients (remission/no remission) and imaging findings (pathological/non-pathological).

**Results**
Thirty-four patients were included. By 3-months, DAS-28 and DAS-44 scores and ST significantly improved. At 6- and 12-months, PD and BME significantly improved, respectively. By 12- and 24-months, DAS-28 and DAS-44 improvements were correlated with each other, while changes in ultrasound and MRI correlated with each other. However, changes in DAS were not correlated with changes on imaging. Over 40% and 65% of patients in remission by DAS-28 and DAS-44, respectively, had persistent ST and synovitis.

**Conclusions**
Remission defined by DAS does not equate to absence of inflammation on imaging. Improvements in DAS do not correlate with changes in imaging findings suggesting there may be need for imaging as an adjunct to defining remission in RA. Subclinical disease activity should be considered and/or assessed prior to considering changes in treatment.
The Association between Cardiac Intensive Care Unit Mechanical Ventilation Volumes and In-Hospital Mortality

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Background
The incidence of respiratory failure and use of invasive or non-invasive mechanical ventilation (MV) in the cardiac intensive care units (CICU) is increasing. While institutional MV volumes are associated with reduced mortality in medical and surgical ICUs, this volume-mortality relationship has not been characterized in the CICU.

Methods
National population-based data was used to identify patients admitted to CICUs (2005–2015) requiring MV in Canada. CICUs were categorized into low (≤100), intermediate (101–300), and high (≥300) volume centers based on spline knots identified in the association between annual MV volume and mortality. Outcomes of interest included all-cause in-hospital mortality, the proportion of patients requiring prolonged MV and CICU length of stay (LOS).

Results
Among 47,173 CICU admissions requiring MV, 89.5% (42,200) required invasive MV. The median annual CICU MV volume was 127 (inter-hospital range 1–490). Compared to low volume centers (35.9%), in-hospital mortality was lower in intermediate (29.2%, adjusted odds ratio [aOR] 0.84, 95%CI 0.72–0.97, p = 0.019) and high-volume (18.2%; aOR 0.82, 95%CI 0.66–1.02, p = 0.076) centers. Prolonged MV was higher in low volume (29.2%) compared to high (14.8%, aOR 0.70, 95%CI 0.55–0.91, p = 0.003) and intermediate volume (23.0%, aOR 0.85, 95%CI 0.68–1.06, p = 0.14) centers. Mortality and prolonged MV were lower in PCI-capable and academic centers, but a shorter CICU LOS was observed only in subgroup of PCI-capable intermediate- and high-volume hospitals.

Conclusions
In a national dataset, we observed that higher CICU MV volumes were associated with lower incidence of in-hospital mortality, prolonged MV, and CICU LOS. Our data highlights the need for minimum MV volume benchmarks for CICUs caring for patients with respiratory failure.

Perimortem Arrhythmias in Non-Cardiac Intensive Care Unit Patients

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Background
Although cardiovascular failure represents a final common pathway at the end of life, abnormal heart rhythms occurring immediately prior to death are not well described. The aim of this study was to describe arrhythmias that were recorded in the perimortem period in a group of critically ill patients admitted to two tertiary Canadian intensive care units (ICUs).

Methods
The population consisted of patients enrolled in the Atrial Fibrillation Occurring Transiently with Stress (APOTS) Incidence Study. Participants were between the ages of 50 and 64 with one CHA2DS2-VASc risk factor or ≥65 years of age, had no prior history of atrial fibrillation and were admitted for non-cardiac diagnoses. All 249 eligible patients wore a 14-day continuous ECG patch-monitor. ECG rhythms in the perimortem period (final hour of life) were collected and analyzed.

Results
Out of 249 patients, 39 (15.7%) were wearing the ECG monitor at the time of death.

Among these 39 patients, the baseline characteristics included: mean age 76.3 years, 13.0% female, mean CHA2DS2-VASc score 3.4 and mean APACHE II score 21.3. Of these patients, 79.5% were admitted for medical illnesses while 12.8% and 7.7% were admitted for surgery and trauma, respectively. The mean time from ICU admission until death was 4.5 days. All participants had at least one arrhythmia within the perimortem period: 87.2% had sinoatrial pauses, 12.8% had type II second-degree atrioventricular (AV) block, 17.9% had third-degree AV block, 23.1% went into ventricular fibrillation and 2.6% had ventricular tachycardia for more than 30 seconds.
Conclusions
Arrhythmias are common in dying critically ill patients. Sinoatrial node dysfunction occurs in most patients, while atrioventricular block and ventricular arrhythmias occur in a minority of patients.

Assessing the ordering patterns of urine cultures without proper clinical indication

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Background
Unnecessary urine cultures increase the treatment of asymptomatic bacteriuria and add to the economic burden of a health system. We investigated the proportion of urine cultures being ordered with and without clinical indications among patients admitted to Greater Niagara General Hospital (GNGH).

Methods
Our study is a single center retrospective analysis of patients 18 years and older admitted to GNGH from January 1 to June 30th with urine cultures ordered. Information regarding presenting symptoms, rationale for ordering the urine culture, culture results of and the patient’s past medical history was collected. Descriptive statistics were calculated using SPSS software.

Results and Conclusion
Study results are currently being analyzed and preliminary results highlight the disparity between indications and inappropriately ordered urine cultures. Additionally, most of the urine cultures ordered were negative, further substantiating the need to order urine cultures based on appropriate indications and then providing a set of appropriate indications, which physicians can refer to while ordering urine cultures.

Prognostic value of inflammatory markers in hospitalized COVID-19 patients: A cohort study

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Background
The risk factors associated with poorer outcomes in COVID-19 patients have been investigated for prognostication and decision-making. Past research has focused on D-dimer, a sensitive but non-specific biomarker for thrombosis and pro-inflammatory states. COVID infection is thought to induce both thrombosis and inflammation and therefore differentiation is required. Several models have analyzed both D-dimer and C-reactive protein (CRP) levels in COVID-19 patients to predict disease outcomes. Although they are both prognostic, it is not entirely clear if they are collinear or portend separate risks.

Methods
All hospitalized patients (n = 1175) from four centres using the McMaster Multi-Regional Hospital Coronavirus Registry (COREG) were analyzed for the following variables: age, sex, hemoglobin, white cell count, lymphocytes, neutrophils, platelets, CRP, D-dimer, INR, PTT, ferritin, and creatinine. Patients were stratified by ICU admission or in-hospital mortality and outcomes by level of D-dimer elevation. For each outcome, multivariable logistic regression using CRP, D-dimer, INR, platelets, and age were performed.

Results
Those who either were admitted to ICU or died had higher D-dimer, CRP, white cell count, and creatinine. Those admitted to ICU were younger and more often male. Those who died had lower platelet counts. When stratified by degree of elevation, progressive elevation in D-dimer was associated with higher rates of ICU admission. In the multivariable analysis, increased CRP was found to predict both ICU admission and mortality. D-dimer was not predictive of either outcome.

Conclusions
Our results show that D-dimer elevation in COVID-19 was not an independent predictor for ICU admission or mortality. The positivity seen in the univariate analysis was lost in the multivariate regression. CRP, however, was a good predictor for adverse events in both the univariate and multivariate analyses. Our results suggest that D-dimer levels rise with critical illness, however, D-dimer may not be the strongest prognostic marker of COVID-19.
Pregnancy, birth, neonatal, and fertility outcomes in women exposed to physician-related occupational hazards: A scoping review

University of Calgary

Background
Physician pregnancy is increasingly common. Questions arise regarding the pregnancy risks related to the unique occupational demands of the medical profession. Thus, this scoping review was centered around the question: ‘What are the pregnancy and fertility outcomes in women exposed to physician and medical trainee related occupational hazards?’

Methods
The study population was defined as employed pregnant and conceiving women exposed to occupational hazards similar to that of a physician. Available literature on pregnancy and fertility outcomes in this population was systematically reviewed. Five electronic databases (Pubmed, EMBASE, CINAHL, SciVerse, and Web of Science), and grey literature were searched. Two independent authors reviewed each abstract for inclusion and extracted data from included full text articles regarding specific employment related exposures and pregnancy outcomes.

Results
After screening 6,039 abstracts, 348 articles were included in this scoping review consisting of 216 original research articles, 14 meta-analysis, 10 systematic reviews, 75 non-systematic reviews, 21 opinion articles and 12 abstracts. Almost half of the original research papers were published prior to 2000. There is conflicting data amongst the body of original research. Meta-analysis data suggests there are occupational exposures in the medical profession linked to adverse pregnancy and infertility outcomes.

Conclusions
Despite conflicting data, the available literature suggests that long work hours and night shifts may be associated with an increased risk of miscarriage and preterm birth. Similarly, there may be an association between increased standing and preterm birth. There is likely no association with work as a physician and gestational hypertension or pre-eclampsia. Infertility may be more common among physicians, however studies in this area are at high risk of bias and confounding. More original research is needed to inform gender equitable workplace policy in order to address modifiable occupational factors that may be associated with adverse pregnancy outcomes.

Persistent immune-related adverse events after treatment with immune checkpoint inhibitors: a systematic review

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Background
Immune checkpoint inhibitors (ICI) have revolutionized treatment for many cancers. Immune-related adverse events (irAE) unique to these agents can cause significant morbidity and mortality. We performed a systematic review to characterize persistent irAEs reported in the literature.

Methods
Ovid MEDLINE and Embase databases were searched for reports of adult patients with solid cancers treated with ICIs who experienced persistent (>12 weeks) non-endocrine irAEs. Patient, treatment and toxicity data was collected. Two independent authors reviewed each abstract for inclusion and extracted data from included full text articles regarding specific employment related exposures and pregnancy outcomes.

Results
Of 4872 articles identified, 2436 advanced by title screen and 89 have been included thus far. 136 patients were included (mean age = 62), of which 37% (n = 50) were female, and 63% (n = 85) had metastatic disease. ICIs were delivered as single agent in 73% (n = 99) of patients, dual agent in 21% (n = 28), and with chemo- or targeted-therapy in 5% (n = 7). ICIs delivered were anti-PD-1 antibodies in 62% (n = 98) of patients, while 36% (n = 57) and 3% (n = 4) received anti-CTLA-4 and anti-PD-L1 antibodies, respectively. The irAE were low grade in 42% (n = 30) and severe (grade 3+) in 58% (n = 42) of patients. irAEs included: dermatological (n = 18), gastrointestinal (n = 28), respiratory (n = 8), ocular (n = 8), neurological (n = 26), hematological (n = 26), rheumatological (n = 32), cardiac (n = 3) and renal (n = 3). irAE persisted for a median of 165 days (range 73-1443) and steroids were used for treatment in 77% (n = 105).
Conclusion
We identified a significant number of patients with prolonged irAEs in the literature. Persistent irAEs have potential to impact the quality of life of patients and may be under-recognized by physicians. Further characterization of this population and identification of potential risk factors is needed.

Desired yet deficient: The chronic absence of nutrition in internal medicine residency training

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Background
The provision of nutrition care is a key contributor to positive medical and surgical outcomes in acute care. In Canada, 45% of hospitalized patients are at risk of malnutrition. Malnutrition in patients is associated with increased length of stay, readmission rates, mortality, and cost 31–55% more compared to well-nourished patients. Physicians are an integral part of identifying malnutrition and initiating nutrition support. There is a longstanding nutrition deficit in medical education, which impacts physician effectiveness in managing their patients’ nutrition-related concerns. This study explored residents’ and preceptors’ attitudes, perceptions, and experiences of the family medicine and internal medicine (IM) residency programs at the University of Calgary to better understand the program’s barriers to nutrition education. We report here on the IM-related findings.

Methods
We used realist inquiry as a methodological framework for this study. We explored the IM residents’ and preceptors’ attitudes, perceptions, and experiences with nutrition education and nutrition care by conducting eight semi-structured interviews in 2020.

Results
Participants believed nutrition care was relevant to their clinical practices, yet most were unequipped to address nutrition concerns. Participants reported low confidence in their nutrition knowledge stemming from a lack of education and desired clarity around their role in nutrition care. The barriers to nutrition education in this IM residency program included the absence of explicit nutrition content in formal curricula, time pressures, availability of dietitians, low awareness of credible nutrition resources, and lack of preceptor role modeling.

Conclusion
This study highlighted the deficit in nutrition education in the IM residency training program at one institution despite its perceived importance to participants’ education and relevance to their practices. Mandating explicit nutrition education and defining physicians’ roles in nutrition care may help address this deficiency in IM residency programs but a more comprehensive and multifactorial solution is required to effect meaningful change.

Unnecessary in-hospital laboratory test ordering: Vancouver Coastal Health and Providence Health Care

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Background
Physicians heavily rely on diagnostic testing to decide on clinical courses of action. Unnecessary test ordering (UTO) may lead to higher health care costs and patient harm.

Methods
This retrospective study included hospital in-patients and emergency room patients who had HbA1c, TSH, ferritin, lipid profiles or HIV serology ordered during a 4-year interval between April 1, 2017 and March 31, 2021. Study sites included 11 hospitals in BC. A test was defined as UTO if it occurred within a specified duration from the previous order in the same patient. These intervals were chosen a priori and based on contemporary guidelines: HbA1c (3 months), TSH (4 weeks), HDL/lipid profile (12 months), ferritin (3 months) and HIV serology (6 months). A cost analysis was performed using publicly available data from the BC Schedule of Fees.

Results
A total of 565,470 of these tests were ordered during the 4-year study period. The overall rates of UTO ranged from 16.3% (TSH) to 26.1% (ferritin). Of these orders, 2.9% occurred within 1 calendar day of the previous test. The cost of UTO is estimated to be $524,998 per year. Introduction of a computer order entry system at St. Paul’s Hospital was associated with a reduction in UTO by up to 30% (p < 0.05). Rates of UTO for ferritin increased by 77% during a 3-month
interval at the beginning of the COVID-19 pandemic when compared to an identical period the year prior (March 1 to June 30, 2020; p < 0.05).

**Conclusion**
A large proportion of in-patient laboratory testing is unnecessary and costly. The results of this study prompt physicians to evaluate the rates of unnecessary testing in their own practice.

**Lung point-of-care ultrasound: A comparison between the curvilinear and phased array transducers**


University of Calgary

**Background**
Lung ultrasound (LUS) is increasingly used to assess medical patients. A low-frequency transducer is needed to perform LUS, but it is unknown which of the two commonly available low-frequency transducers is optimal for detecting pathology. This study seeks to compare novice and non-novice clinician’s accuracy and confidence in detecting pathology when images were generated with the curvilinear (CL) transducer with those generated by a phased array (PA) transducer.

**Methods**
LUS images were obtained from consenting medical patients with diagnoses of pneumothorax, pleural effusion, consolidation, pleural abnormalities, and B-lines with both the CL and PA. 16 anonymized LUS cineloops were then presented in a random order on an online survey. Participants with any prior training in LUS were invited and asked to identify the pathology and rate their confidence in interpretation.

**Results**
Of the 166 participants invited to complete the survey, 134 (81%) responded, and 112 (67%) completed the survey. Of the 108 (96%) who responded to the question on prior POCUS training, 50 were considered novices and 58 were non-novices. Median accuracy scores for novice participants were lower than non-novices (71.9%, IQR 62.5 – 75.0% vs. 81.3%, IQR 71.9 – 87.5%; p < 0.0001). Accuracy for novices were higher on CL than PA (75.0%, IQR 62.5 – 87.5% vs. 68.8, IQR 62.5-75.0%, p=0.005, respectively). For pleural-based clips, accuracy was higher for the CL generated images than the PA generated images (66.7% IQR 50.0-83.3 vs. 50.0% IQR 50.0-83.3, respectively, p=0.03). Participants were more confident in CL-generated images (median confidence score of 4.3/5 (IQR 3.8 – 4.5) versus 3.9/5 (IQR 3.1 – 4.1) for the PA (p<0.0001).

**Conclusions**
Diagnostic accuracy and confidence are higher for novices when images were generated using the CL. If a CL transducer is not available, educators should pay close attention to pleural based findings as these may be missed by novices.

**The cost-effectiveness of mammography-based breast cancer screening in Canada: a systematic review**

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**Background**
The current literature on female breast cancer screening is largely focused on the health outcomes that result from screening. There is comparatively little data on the cost-effectiveness of the screening. Therefore, this systematic review sought to identify all studies published within the last 10 years that analyzed the cost-effectiveness of mammography-based female breast cancer screening policies in Canada.

**Methods**
Searches were performed within the PubMed, MEDLINE, Embase, Canadian Agency for Drugs and Technologies in Health (CADTH), EconLit, National Health Service Economic Evaluation Database (NHSEED) and Web of Science databases according to the PRISMA guidelines for reporting.

**Results**
Of the 673 papers that were identified in our search, seven studies were included, four of which were applicable to average-risk Canadian women. Triennial screening for average-risk women aged 50-69 years was the most cost-effective in terms of cost per QALY. The use of MRI with mammography for women with the BRCA1/2 mutation was found to be cost-effective, while annual mammography-based screening for women with dense breasts was
found to be cost-ineffective. Lastly, in survivors of thoracic radiation-treated adolescent Hodgkin Lymphoma patients, annual mammography was found to be the most cost-effective method of breast cancer surveillance with little difference in life expectancy to annual MRI.

**Conclusion**

Analyses of the cost-effectiveness of mammography-based screening within Canadian populations are scarcely reported and have heterogeneous methodologies. The existing data suggests that Canada’s current screening policy to screen average-risk women aged 50-74, biennially or triennially is cost-effective.

**Perioperative glycemic management program (PGMP) pilot in a Canadian tertiary centre**

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**Background**

Postoperative hyperglycemia occurs in two-thirds of non-cardiac surgery patients with diabetes in our institution and is associated with worse outcomes, including longer length-of-stay and higher 30-day mortality. We implemented a multi-disciplinary shared-care perioperative glycemic management pathway with the aim of reducing postoperative hyperglycemia and improving patient outcomes.

**Methods**

This quality improvement study evaluated the implementation of the perioperative glycemic management program (PGMP) in gynecologic oncology patients. The design accounted for pre-existing and secular trends in measures. Adult patients admitted for >24 hours after a gynecologic oncology surgery from April 1, 2018 to March 31, 2021 were included.

The intervention was a multidisciplinary pathway based on guidelines and best practices to identify patients at-risk of postoperative hyperglycemia and incorporate monitoring and treatment of blood glucose into existing postoperative workflows. The PGMP was implemented on October 1, 2019. We report change in process measures (blood glucose measurement), outcomes measures (hyperglycemia), balancing measures (hypoglycemia) and clinical measures (length-of-stay) pre- and post-implementation. Data were collected from electronic health records. Single-cohort interrupted time-series analysis (ITSA) was used to compare pre- (April 1, 2018, to September 30, 2019) and post- (October 1, 2019, to March 31, 2021) intervention means and trends.

**Results**

After implementation of the PGMP the proportion of patients who were screened with a HbA1c increased by 11.3% (95% CI: 5.0, 17.7%; p = 0.02). The proportion of patients with diabetes who had at least one blood glucose measurement in the first 24-hours after surgery increased by 15.3% post-implementation (95% CI: –3.2, 33.8%; p = 0.10). The median proportion of patients with moderate and severe hyperglycemia decreased post-implementation, however, these differences were not statistically significant. Median length-of-stay for all postoperative patients decreased by 0.42 days post-implementation, though not statistically significant (95% CI: –0.91, 0.07 days; p = 0.09). There was no change in 30-day readmissions, regardless of diabetes diagnosis.

**Conclusion**

Implementation of PGMP increased the identification of patients at high-risk for hyperglycemia. However, we did not find evidence of a statistically significant, sustained reduction in hyperglycemia. Therefore, the associated reduction in length of stay may be attributable to better monitoring and detection of patients with postoperative hyperglycemia, rather than improved glycemic control. The results from our PGMP pilot highlight challenges experienced in evaluating perioperative glycemic management. Our study highlights the need to measure both process and outcome measures and the need to perform robust statistical

**Patient and provider perspectives and satisfaction on virtual care in the COVID-19 pandemic**

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**Background**

The COVID-19 pandemic has prompted the rapid uptake of Virtual Care as it provides access to healthcare while maintaining social distancing. Adoption of virtual care prior to the pandemic was limited by several barriers such as inadequate compensation mechanisms, licensure restrictions, and internet connectivity. Positive patient experiences and outcomes with virtual care have been previously reported but little is known about the qualitative experiences of the patients and providers who engaged in virtual care during
the pandemic whether by choice or necessity. We aimed to describe and explore patient and provider engagement, satisfaction, perspectives, and attitudes to primary virtual care during the COVID-19 pandemic and identify ways to optimize virtual care in the future.

**Methods**
Following approval of the University of Saskatchewan Research Ethics Board, we conducted a sequential explanatory mixed methods study in three multidisciplinary primary care clinics in Saskatchewan (2 urban, 1 rural) between July-December 2020 consisting of online surveys and semi-structured virtual interviews. Eligible participants included patients and providers engaging in virtual care during COVID-19. Survey responses were analyzed in aggregate using descriptive statistics, and interviews were analyzed using thematic analysis. Overall patient and provider satisfaction was compared with the Mann-Whitney U test.

**Results**
Eighty-eight patients and 105 providers responded to the surveys. Patients reported higher overall satisfaction with VC than providers (median [interquartile range]: 4.4 [4.0–4.7] and 3.7 [3.4–3.9] respectively \( p < 0.001 \)). Ten patients and 11 providers participated in interviews. Increased convenience and access were strongly appreciated by patients and providers. Both groups reported the lack of compensation as a pre-pandemic barrier to provide VC and are willingness to continue to use virtual care after the pandemic.

**Conclusion**
The COVID-19 pandemic provided an opportunity for patients, providers, and the healthcare system to overcome barriers and engage virtual care with high satisfaction. Patients and providers view virtual care positively due to its convenience and accessibility and both patients and providers intend to continue utilizing virtual care post-pandemic.

**A community medicine mentorship program: Increasing student exposure to community internal medicine**

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**Background**
The majority of learning opportunities available to University of Ottawa medical students are based in academic centres. Unless independently sought by students, no opportunities currently exist to network with community-based internal medicine (IM) physicians. A student survey we conducted in July 2020 demonstrated significant interest from students wanting to learn more about community IM. Moreover, there was interest from physicians desiring to showcase their community practice.

**Methods**
We designed a novel “Community Medicine Mentorship Program” pairing 13 second-to-fourth year University of Ottawa medical students with community-based IM physicians for one-on-one mentorship alongside hosted group sessions from September 2020 to May 2021. Using surveys and structured phone interviews, we assessed whether our program influenced interest in community IM and effectively addressed students’ knowledge gaps. We also aimed to identify areas of program improvement.

**Results**
Overall student interest in community IM increased post-program. Students were most interested in learning about the lifestyle of community physicians and the general pros/cons of community medicine. All mentees reported opportunities to explore these topics during one-on-one meetings. Mentees most commonly identified the work environment, practice independence, lifestyle and the fewer non-clinical obligations as strengths of community medicine. Student-identified disadvantages of community medicine included fewer supports and research/teaching opportunities. 84.6% of mentees reported a favourable mentorship relationship. Student-identified strengths of the program included being paired one-on-one with a mentor with opportunities to seek career advice and gain exposure to community medicine. Many mentees reported challenges with scheduling conflicts. Mentees most commonly recommended increasing the number of hosted group sessions as an area of program improvement.

**Conclusion**
This one-on-one mentorship program was effective at providing students with an unprecedented structured opportunity to network with community-based IM physicians. Implementing similar programs in other Canadian medical schools can improve community IM exposure for medical students.
Single-centre retrospective observational study evaluating the incidence, appropriateness, and cost effectiveness of heparin induced thrombocytopenia (HIT) assay use in adult patients admitted to tertiary care hospitals in Calgary

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Background
Diagnosing heparin induced thrombocytopenia (HIT), a prothrombotic adverse drug reaction to heparins, requires screening assays and confirmatory functional serotonin release assays (SRA). Due to the high morbidity and mortality associated with HIT, patients with suspected HIT require empiric treatment with therapeutic non-heparin anticoagulants. Guidelines recommend using the 4Ts score for estimating the pre-test probability of HIT, whereby a low score safely excludes HIT and avoids costly testing and potentially harmful anticoagulation. Despite this, studies have demonstrated trends of over-testing for HIT thereby increasing costs and posing risks to patients. In Calgary, Alberta, high-sensitivity but low-specificity HIT assays can be ordered, but positive results require a time- and cost-intensive confirmatory SRA. Inappropriate use of HIT assays may therefore result in longer, costly admissions, and risk patient harm.

Objective
Determine Calgary’s incidence of HIT assay testing with associated 4Ts scores to identify areas for quality improvement. Secondary outcomes include associations between 4Ts score and HIT assay and SRA results with major bleeding events, length of hospital stay, and 30-day mortality rates. Cost analysis will also be performed.

Design and Methods
This multi-centre retrospective chart review includes patients ≥ 18 years-old admitted to tertiary care hospitals in Calgary with a HIT assay ordered in 2018. Electronic records were used to calculate each patient’s 4Ts score. Additional data will include demographics, HIT assay and SRA results, bleeding events, and 30-day mortality. Descriptive, statistical, and cost analysis will be performed.

Results
Thus far we have identified 310 patients with HIT assay orders. Of the included 237 patients, 148 had low risk and 77 had intermediate to high risk 4Ts scores. Eighteen patients had a positive HIT assay and 12 had a positive SRA.

Conclusions
Preliminary data suggest that the use of HIT assays may be an area for quality improvement. Data analysis is underway.

Osteoporosis treatment among hip fracture patients at time of discharge: A retrospective quality improvement study from Regina General Hospital

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Introduction
A hip fracture sustained from a standing height or less is a fragility fracture, a serious manifestation of osteoporosis (OP). Fragility hip fracture increases the risk of further fracture and mortality. Therefore, fragility hip fracture is an indication for OP pharmacotherapy in patients aged 50 or older.

Objective
To evaluate the administration of OP pharmacotherapy for fragility hip fracture patients upon hospital discharge.

Methods
We conducted a retrospective chart review on patients admitted to Regina General Hospital from January 1 to December 31, 2019 with the diagnosis of fragility hip fracture. Primary outcome included the proportion of patients with appropriate administration of OP pharmacotherapy. Factors associated with OP pharmacotherapy use were identified using logistic regression.

Results
148 patients were admitted for fragility hip fractures during the study period. Median age was 82.5 years (IQR 73.3-88.0), with 73.6% females, 95.3% were admitted under the Orthopedics service. Only 24 (16.2%) of patients were provided with OP pharmacotherapy at discharge, with 91.7% consisted of bisphosphonates. Being admitted under an Internal Medicine or Hospitalist service was associated with a 50% and 40% respective increase in the rates of OP pharmacotherapy use compared to an Orthopedics service (p=0.04).
Conclusion
Only a small proportion of patients admitted to hospital with fragility hip fractures were discharged with appropriate OP pharmacotherapy. As the majority of patients were admitted under a surgical service, improving the delivery of OP treatment will require education, multidisciplinary collaboration, and implementation of standardized discharge order sets for this specific population.

Evaluation of a student-older adult telephone befriending program to reduce social isolation during the COVID-19 pandemic: Preliminary results
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Background
Social isolation is associated with many adverse health outcomes, especially for older adults living alone and with limited supports. This has been exacerbated by the COVID-19 pandemic. McMaster Phone-a-Friend Program (PFP) grew from the University of Toronto Student-Senior Isolation Prevention Partnership to reduce social isolation via telephone befriending. Our goal was to evaluate the program’s effectiveness in reducing feelings of isolation for older adults and its long-term feasibility.

Methods
Older adults at risk for social isolation in the Hamilton, Waterloo, and Niagara regions of Canada were identified by primary care providers and matched to trained student volunteers. Social interaction was provided through weekly phone calls. Participating older adults were contacted after completing at least 4 calls with their student volunteer in order to complete a phone questionnaire to determine the program’s impact.

Results
A total of 28 older adults were contacted, the mean age being 74.3. The majority of older adults contacted were female (71.4%), Caucasian (100%), lived alone (75.0%), and were single (82.1%). The majority of contacted older adults felt less lonely after participation in the program (78.6%), and 67.9% felt that this program improved their quality of life. In addition, 75.0% indicated that they would continue to participate in the program after the pandemic resolves. Older adults indicated that what they enjoyed most about the program was having someone to speak to on a regular basis, which helped them to feel less isolated. Areas of improvement that older adults identified included increased call schedule flexibility and more interactive communication options (e.g. videoconferencing).

Conclusion
The McMaster Phone-a-Friend Program is an effective method of reducing participant-reported social isolation and loneliness, especially in the setting of the recent COVID-19 pandemic. Future directions include surveying older adults longitudinally over time and surveying volunteers to assess their satisfaction with the program.

Are there more code blues afterhours
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Background
‘Code blue’ (cardiac arrest) is activated by a health care provider at the time of sudden cardiopulmonary arrest in the hospital. Code blue is always devastating to patients’ families and remains the most stressful event for health care providers. There is a lack of data in medical patients considering outcomes of a code blue (cardiac arrest) event in relation to the time of day or day of the week.

Methods
This retrospective cohort study aims to compare the difference in the number and outcome of code blue events during regular hours (0800-1700) and after hours (1700-0800). The study was conducted in medical patients who had a code blue event at the two tertiary care hospital in Saskatoon from 2014 – 2020 by individual chart review. Data was analyzed using SPSS 25.

Results
160 eligible patients were included in the study. 54 (22.8%) were females, and 106 (66.2%) were males. The median age was 67. The most common rhythm at arrival was ventricular tachycardia or fibrillation. 111 (69.4%) code blue events occurred afterhours. Overall 79 (71.2%) patients were deceased when the code blue events occurred between
1700-0800 hrs, as compared to 32 (28.8%) during the day time (p=0.46). Code blue events were dispersed throughout the days of the week, with Monday being more common (n=31, 19.4%) followed by Tuesday (n=17.5%). Odds ratios for death were 1.3 (p=0.45) and 1.3 (0.54) when code blue event occurred after hours and on weekends respectively, however they were not statistically significant.

Conclusion
In patients admitted to general internal medicine, most code blue events occurred after hours and following the weekend. We did not find a difference in death if code blue events occurred after hours or weekends.

Development of a standardized digital medical interpretation services toolkit: A quality improvement initiative to advance health equity during the COVID-19 pandemic

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Background
Medical Interpretation Services (MIS) is the gold-standard recommended for use during clinical assessments with patients who have language discordance with clinicians. The COVID-19 pandemic has made it crucial for these services to be delivered remotely to promote public health and safety. Although the cost of MIS is covered by Alberta Health Services it is not consistently utilized. Previously, we applied an intervention of digital MIS technology and education for 6 months in a tertiary center Emergency Department which vastly increased use and streamlined communication with patients.

Aim
To create a standardized digital medical interpretation toolkit to facilitate ease of adoption and dissemination thereby improving digital MIS usage, piloting in Medicine inpatient units in a Canadian teaching hospital.

Methods
Utilizing past learning from the previous MIS project, clinician and stakeholder feedback, an intervention toolkit was created. Applying the Model of Improvement, the toolkit was trialed among five Medicine units. To assess intervention effect, hospital MIS minutes were measured monthly, and a questionnaire was administered to determine healthcare provider awareness and perception of MIS.

Results
The toolkit comprised of digital MIS technology, educational resources, and personalized programming services. Hospital usage increased over the intervention timeframe, however this cannot be isolated to the 5 Medicine units as a general hospital MIS access code is utilized. While most respondents (63.1%) believed that digital MIS enhances patient care, further education is required to continually improve MIS awareness and accessibility to sustain use.

Conclusion
Effective communication between patients and clinicians is critical, and the COVID-19 pandemic has highlighted the urgent need to facilitate accurate medical communication remotely. Providing digital MIS access, education and training is a means to advance patient-centered and equitable healthcare while maintaining public health and safely.

The QuEST Program: Building a novel experiential program in quality improvement for medical students

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Background
Medical students at the University of Toronto are exposed to Quality Improvement and Patient Safety (QIPS) in the core program curriculum. However, there are no formal opportunities for students to gain hands-on QI experience.

Methods
A team of medical students interested in QIPS was assembled in March 2020, where the idea of a certificate program offering enhanced theoretical and project-based opportunities in QIPS emerged. A survey was sent to students to gauge interest, where 93% of 84/520 eligible respondents indicated interest in enrolling. We conducted a one-year pilot prior to formally launching this certificate program.

Results
The certificate program was titled the Quality Improvement Experiential Student Training (QuEST) Program, comprised
of the following requisites: five online modules from the Institute of Healthcare Improvement, monthly didactic seminars and a supervised QIPS project.

**Conclusion**
Over the past year, we learned the importance of adaptability. Although we were unable to fully implement our envisioned program, we offered a virtual seminar series that provided value to students. We also learned the importance of student-faculty collaborations in designing educational interventions. Students identified the need for experiential QIPS opportunities through organic peer-peer interactions and obtained student input to inform development of the program. Faculty collaborators subsequently provided mentorship and aided with implementation.

**Cloxacillin-induced acute vanishing bile duct syndrome: A case study and literature review.**
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**Background**
Ductopenia is a chronic process where ≥50% of portal tracts lack bile ducts, which is also known as vanishing bile duct syndrome (VBDS). One etiology is drug-induced liver injury. Cloxacillin, an anti-staphylococcal penicillin, typically causes “bland” cholestasis. We present the first case of cloxacillin-induced acute ductopenia or VBDS and a review of published cloxacillin-induced liver injuries.

**Methods**
Clinical information was obtained from hospital records and two authors examined liver biopsy slides. Google Scholar was used for the literature review.

**Case Summary**
A 66-year-old woman with no prior liver disease, but known penicillin allergy, was treated for a post-carotid angioplasty staphylococcal infection with 6 weeks of cloxacillin. She presented with a two-week history of weakness and jaundice. Bloodwork showed AST 822, ALT 877, ALP 4275, bilirubin 752, and eosinophilia. She required ICU transfer for hypotension and was started empirically on prednisone. Liver biopsy revealed severe zone 3 and focal zone 2 cholestasis, patchy feathering degeneration, mild lobular and portal inflammation, and ductopenia with epithelial injury, but no ductular reaction. The findings were compatible with acute cholestatic liver injury with bile duct injury and loss secondary to cloxacillin. Two-months later, she was discharged on hydrocortisone and ursodiol with persistently elevated ALP 1807 and total-bilirubin 304. She was considered for liver transplantation but died of liver failure about six months after initial diagnosis. Four additional articles were found with histopathologic descriptions of cloxacillin-related liver injury. These included portal inflammation, cholestasis and mild necroinflammation. Clinical features were reported in two cases; both had mild symptoms with cholestatic liver enzymes and hyperbilirubinemia. Both patients recovered completely within 10-60 days.

**Conclusion**
Cloxacillin-induced cholestasis can be secondary to acute ductopenia, which can result in worse clinical outcomes than previously described “bland” cholestasis. Liver biopsy is recommended to identify cases with acute VBDS.

**Acute myopericarditis following COVID-19 mRNA vaccine in a young, healthy male**
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**Background**
Myocarditis, inflammation of the myocardium, has infectious and non-infectious etiologies. Recently, there have been several published cases of myopericarditis following administration of the COVID-19 mRNA vaccines. Many of these cases involve otherwise healthy, young males who developed symptoms a few days after receiving the second vaccine dose.

**Case description**
A 29-year-old previously healthy male received his second dose of the mRNA-1273 vaccine. The next day, he became fatigued and by the evening, he developed dull retrosternal chest pain and associated shortness of breath. In the emergency room, he had a fever of 38.2 but was otherwise vitally stable. Initial workup revealed an electrocardiogram demonstrating sinus tachycardia, diffuse ST elevation, and PR depression. The peak high-sensitivity troponin was 9,992. Chest x-ray was normal. An echocardiogram showed preserved left ventricular function. The patient’s presentation was suggestive of myopericarditis and he was started on colchicine and ibuprofen treatment. A full autoimmune
and inflammatory workup was conducted to rule out rheumatologic etiologies. An autoimmune cause was unlikely given the absence of other organ manifestations and negative autoimmune serology. Of note, creatine kinase and c-reactive protein were elevated at 431 and 37, respectively. He was discharged after a two-day admission with complete resolution of symptoms and subsequently underwent outpatient cardiac magnetic resonance imaging which demonstrated focal myocardial edema in keeping with myocarditis.

**Discussion**

Without convincing evidence of ischemic, autoimmune, or infectious etiologies and given the temporal association, the most likely diagnosis in this patient is COVID-19 mRNA vaccine-induced myocarditis. It is important to continue reporting on cases of myocarditis associated with the mRNA COVID-19 vaccine to definitively establish a causative relation and be recognized as an adverse event. Future studies are needed to evaluate the incidence, risk factors, underlying mechanisms, and potential long-term cardiovascular injury of myocarditis following the COVID-19 mRNA vaccine.

**Fool Me Twice. A Curious Case of Peri-operative Atrial Fibrillation**

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**McMaster University**

**Background**

New-onset atrial fibrillation (AF) is often recognized in patients hospitalized for another concern. In this setting, the optimal management of AF is unclear.

**Case description**

A 67-year-old man was admitted following five days of weakness and fever. Past medical history included type II diabetes mellitus, Charcot foot, hypertension and hyperlipidemia. Working diagnoses were diabetic foot infection and *Pasteurella multocida* bacteremia. He underwent incision and drainage. Overnight, an ECG revealed new-onset AF at 100 bpm, managed with beta-blockers. His high-sensitivity troponin-I peaked at 725 ng/l (ULN = 14 ng/l). Echocardiography showed regional wall motion abnormalities. Coronary angiography showed multivessel disease. He was scheduled for surgical revascularization after antibiotic treatment and was discharged in sinus rhythm taking a beta-blocker but not taking oral anticoagulation. Nine weeks later, he underwent coronary artery bypass grafting (CABG). On the second post-operative day, he developed AF and was cardioverted with amiodarone. He was discharged on amiodarone for 3 weeks and warfarin (target INR 2.0-3.0) for 3 months. Six weeks post-CABG, he wore a 14-day continuous ambulatory ECG monitor. His rhythm was AF for approximately 1% of the monitoring period with the longest episode lasting 23 minutes. At 12-week post-CABG follow-up, he was diagnosed with paroxysmal AF, switched from warfarin to edoxaban and referred for ablation.

**The brain-heart connection: Ischemic stroke complicated by biventricular cardiac dysfunction in an elderly patient**

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**University of Saskatchewan**

**Background**

Neurogenic Stress Cardiomyopathy is the designation given to Takotsubo Syndrome following a neurologic event. Typically, left ventricular function is impacted secondary to norepinephrine pathway disruption associated with subarachnoid hemorrhages, traumatic brain injuries, or ischemic strokes involving the insular cortex. It holds an acute, in-hospital mortality estimated at 4-5%, but is a transient pathology that typically sees full recovery of myocardial function months after onset. Patients are often post-menopausal women who present with features suggestive of acute coronary syndrome. There are often serological changes with increases in cardiac biomarkers as well as ST-T wave inversions on the electrocardiogram. Plaque rupture is not a hallmark of this syndrome.

**Case description**

We present the atypical case of an elderly patient with acute biventricular dysfunction associated with a right cerebellar
ischemic stroke. She presented with nausea, vomiting, gait impairment, and a mild occipital headache of 18-hour duration. She had elevated cardiac enzymes, mild ST elevations across the precordial leads, and an emergency room ECHO showing globally reduced biventricular systolic function. Additionally, an MRI brain was consistent with an ischemic cerebellar event. A diagnostic dilemma was encountered, ultimately favoring a neurocardiac syndrome rather than a primary myocardial cause of her presentation. Conservative management ensued, and in 6-month follow-up, full neurologic and cardiac recovery was obtained. Outpatient CTA ruled out critical coronary disease.

Conclusion
Through this case presentation, we highlight the utility of diagnostic criteria to differentiate neurocardiac syndromes and acute coronary syndromes at time of admission to direct their care optimally. We promote the investigation and reporting of right and biventricular involvement to improve patient and system outcomes. Lastly, we discuss the risks and benefits of anticoagulation in this complex scenario.

When it rains it pours: A case of severe, refractory hypokalemia and polyuria in a patient with medullary thyroid cancer

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Background
Medullary thyroid cancer (MTC) is a rare neuroendocrine tumor originating in the parafollicular cells of the thyroid gland. Rarely, MTC has been associated with ectopic ACTH production, manifesting predominately with signs of hypercortisolism. We report an intriguing case of ectopic ACTH production from metastatic MTC in a 36-year-old female with severe, refractory hypokalemia and secondary nephrogenic diabetes insipidus (DI).

Case description
A 36-year old female with a history of metastatic MTC (treated with thyroidectomy/adjuvant radiation in 2012), and hypothyroidism presented with a history of polyuria (~8 L/24hr), polydipsia, weakness, hypertension and marked weight loss. Initial laboratory investigations revealed a potassium <1.5 mmol/L and severe metabolic alkalosis. Urine studies and a DDAVP trial were consistent with renal potassium wasting and nephrogenic DI, respectively. Hypokalemia and polyuria persisted despite aggressive intravenous replacement and initiation of amiloride. Given the constellation of hypertension, hypokalemia, and metabolic alkalosis, workup for aldosterone excess was initiated. CT imaging revealed new pulmonary and liver metastasis and bilateral adrenal hyperplasia. A biochemical profile revealed normal 24-hour urine metanephrines and low-normal renin and aldosterone levels. An ACTH level was significantly elevated at 62 pmol/L [normal ≤ 18 pmol/L] indicating excessive ACTH production and pseudohyperaldosteronism. Cortisol excess was confirmed with a 24-hour urine cortisol. An 8 mg dexamethasone suppression test demonstrated lack of cortisol suppression, consistent with ectopic ACTH production. The patient was started on a trial of ketoconazole which did not correct the hypokalemia, DI or cortisol excess. She subsequently underwent bilateral adrenalectomy which resulted in gradual resolution of hypokalemia and polyuria.

Discussion
Ectopic ACTH production occurs in less than 1% of patients with MTC. Patients typically present first with clinical findings of cortisol excess, however findings of aldosterone excess may also occur first, as reported in this case. Recognition of this entity may help prevent delays in diagnosis and appropriate treatment.