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LATE BREAKING ORIGINAL RESEARCH

Adult Medicine

1 | Medication access services provided by pharmacists decrease 30-day hospital readmissions

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Introduction: Pharmacists complete prior authorizations (PA), pursue patient assistance programs (PAP), obtain prescription coupons, and check affordability for selected patients.
Research Question or Hypothesis: Medication access interventions by pharmacists decrease hospital length of stay and reduce readmissions.
Study Design: Single center retrospective cohort study of adult patients from January 1, 2014-August 31, 2020.
Methods: One hundred and fifty-four case patients with documented medication access intervention were matched 1:1 with controls by medication, age, Charlson Comorbidity Index, insurance status, and discharging unit. The primary outcome was length of stay (LOS). Secondary outcomes included 7-day, 30-day, 90-day all-cause readmissions. LOS similarity or difference was tested as a continuous variable. Readmissions were tested as either concordant pairs, defined as those with the same discreet outcome (readmitted or not), or discordant pairs. We used applicable Normal or non-parametric tests for paired data.
Results: The median age of cases was 57.0 years and age of controls was 57.5 years. Cases and controls were 50.7% and 47.4% male, respectively. Insurance coverage was in effect for 87.5% and 92.8%, respectively. Length of stay was not statistically different between the groups (cases 9.1 $\pm$ 9.8 days vs. controls 10.7 $\pm$ 12.5 days, Wilcoxon p=0.459). Only the 30-day readmission data showed a significant difference with 17 pairs in which the case was readmitted and the control was not vs. 33 pairs where the control was readmitted and the case was not. McNemar Chi-square significance for the 7-day, 30-day, and 90-day readmission differences were 0.327, 0.034. and 0.057, respectively. For case patients, 52% of interventions included anticoagulants, 29.6% anti-infectives, and 15% diabetes medications.
Conclusion: Pharmacist-provided medication access services were associated with improved patient outcomes, statistically significant for 30-day readmissions.

Ambulatory Care

2 | The impact of COVID-19 on pneumococcal and influenza vaccination rates in the elderly within a primary care physician group

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Introduction: The CDC recommends that all adults 65 and over receive the pneumococcal polysaccharide vaccine (PPSV23) once and the influenza vaccine yearly. These vaccines are often administered during in-office visits with primary care physicians (PCP) however, since many of these visits occurred using telemedicine due to the COVID-19 pandemic, the opportunity to receive these vaccinations may have been impacted.
Research Question or Hypothesis: To compare the rate of yearly influenza and pneumonia vaccine for adults 65-years and older in 2020 to the three years prior (2017, 2018, and 2019).
Study Design: Single-center, retrospective chart review from January 2017 through December 2020.
Methods: PPSV23 and influenza vaccine data was collected via the electronic medical record. All adults > 65-years old with a PCP within the group were included. Adults with a documented allergy to either vaccine were excluded. Descriptive statistics were used to present the rates of these vaccines in each year included.
Results: There were 2,168 PPSV23 administered in 2020, 2,164 administered in 2019, 1,847 administered in 2018, and 1,976 administered in 2017. In 2020, 12.25% of newly eligible patients were vaccinated by the end of the calendar year. In the 3 years prior, an average of 5.51% of newly eligible patients were vaccinated by the end of the calendar year. There were 3,619 influenza vaccines administered in 2020, 3,746 vaccines administered in 2019, 5,898 vaccines administered in 2018, and 5,926 vaccines administered in 2017. There was a total of 1,346 individuals who

received an influenza vaccine in 2020 who did not receive one in the 3 years prior.

Conclusion: When compared to previous years, the rate of PPSV23 increased and the rate of influenza vaccinations decreased. These results may suggest that COVID-19 lead to more patients wanting protection against pneumonia and less patients wanting protection against influenza.

3 | Evaluation of Statin Prescribing Practices and Predictors of Statin Underutilization in Persons with HIV

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Introduction: Persons with HIV (PWH) have a 1.5- to 2-fold higher risk of cardiovascular disease (CVD) than those without HIV. The CVD risk is often exacerbated by the adverse effects of antiretroviral therapy, behavioral factors, and social disparities in healthcare access. Traditional tools used to estimate CVD risk do not account for the added risk associated with HIV and have not been well validated in PWH. Thus, CVD risk in PWH is often grossly underestimated, which further potentiates undertreatment with statins.

Research Question or Hypothesis: What are the statin prescribing practices in PWH and what factors impact the likelihood that a PWH is not prescribed statin therapy when indicated?

Study Design: Retrospective chart review.

Methods: PWH 40 to 79 years old receiving care at a HIV clinic were eligible for inclusion. Key exclusion criteria included end-stage kidney disease and contraindications to statin therapy. Statin eligibility, prescribing practices, and appropriateness of statin therapy were evaluated based on the 2018 American College of Cardiology/American Heart Association guidelines. Logistical regression analyses were conducted to assess for predictors of statin underutilization.

Results: 606 patients met the inclusion criteria. Statin therapy was indicated in 60% of the patients. Among the 362 patients with a statin indication, 60.2% were prescribed appropriate statin therapy, 11.6% were prescribed statin therapy but not at the indicated intensity, and 28.2% were not prescribed statin therapy. Tobacco use was identified as a predictor of statin underutilization (adjusted odds ratio [aOR] 2.23 [1.33-3.73]; P=0.0023). Clinical ASCVD (aOR 0.16 [0.07-0.45]; P=0.004) and hypertension (aOR 0.54 [0.33-0.90]; P=0.017) were associated higher probability of statin therapy being prescribed.

Conclusion: There was a notable underutilization of statin therapy seen; highlighting the need for more robust CVD prevention efforts in PWH. Pharmacists are ideally positioned to screen for statin indication, address drug-drug interactions and counsel patients on statin therapy and lifestyle modifications (e.g. smoking cessation).

Critical Care

4 | Hydroxocobalamin for Refractory Septic Shock

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Introduction: Refractory septic shock is defined as circulatory failure despite high-dose vasopressors and fluid resuscitation. Hydroxocobalamin is a nitric oxide scavenger that has limited use as a rescue therapy for patients with refractory septic shock. This study characterizes the impact of hydroxocobalamin on mean arterial pressure (MAP) and vasopressor requirements.

Research Question or Hypothesis: Does hydroxocobalamin decrease vasopressor requirements in patients with refractory septic shock?

Study Design: Single-center, retrospective cohort

Methods: Adult patients who received hydroxocobalamin for refractory shock between August 2018 to January 2020 were included. Patients were excluded if they received hydroxocobalamin for another indication or were not in the intensive care unit at the time of administration. Primary outcomes were change in MAP and norepinephrine equivalents (NE) from baseline after hydroxocobalamin administration.

Results: Twenty-six patients received hydroxocobalamin for septic shock. Median APACHE IV predicted mortality was 0.70 (range 0.16 - 1). The most common sources of sepsis were respiratory (35%) and abdominal infections (35%) and 69% of patients had bacteremia. The average MAP prior to hydroxocobalamin was 62.5mmHg. Patients who received hydroxocobalamin required a median NE dose of 0.39 mcg/kg/min (range 0.13 – 0.25) delivered via 2 vasopressors (range 2 – 4). Hydroxocobalamin was associated with an increase in MAP at 1, 6, and 24 hours post-administration (+16.3, +14.3, and +16.3mmHg, respectively). The increase in MAP from baseline remained statistically significant when controlling for sex, age, and comorbidities. There was no change in NE patients required 1 hour following hydroxocobalamin administration, but a statistically significant decrease in NE was observed at hours 6 and 24 post-dose ($p < 0.001$). Seven patients survived to discharge while 19 patients died.

Conclusion: Our data suggests that hydroxocobalamin can be used as a rescue therapy in patients receiving high-dose vasopressors for septic shock. Hydroxocobalamin may provide a sustained hemodynamic benefit, providing clinicians time to pursue definitive measures such as source control.

Emergency Medicine

5 | Pharmacist-led implementation of clinical decision support improves delivery of human rabies immune globulin in the emergency department

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Introduction: Human rabies infection can be prevented through appropriate rabies postexposure prophylaxis (PEP) that consists of wound cleansing, human rabies immune globulin (HRIG), and rabies vaccine. We previously identified errors in patient selection and administration of HRIG among emergency department (ED) patients at our health system.

Research Question or Hypothesis: Among ED patients who receive rabies PEP at our health system, full adherence to six quality indicators for HRIG patient selection and administration will increase for patients treated after implementation of a rabies PEP bundle compared to historical controls.

Study Design: This before-and-after study included patients who received HRIG or rabies vaccine in 15 EDs at a multi-hospital health system (NCT04213950).

Methods: The bundle was implemented in December 2019 and consisted of electronic health record enhancements, ED staff education, and patient education. Patients treated 01/201506/2018 were included in the historical control group. Patients treated from 12/2019-11/2020 were included in the post-implementation group. The primary outcome was full adherence to six HRIG quality indicators: (QI-1) patient selection, (QI-2) dose, (QI-3) timing, (QI-4) infiltration into wounds, (QI-5) administration distant from rabies vaccine site, and (QI-6) administration that avoids the buttock. The study had 80% power to detect an absolute increase of 20% in the primary outcome using a two-sided alpha of 0.05. Pearson's chi-square test was used for the primary analysis. Multivariable logistic regression was used for a sensitivity analysis.

Results: Implementation of the bundle was associated with an increase in full adherence from 37% (95 of 254) in the historical control group to 61% (43 of 70) in the post-implementation group (absolute difference=24%; 95%CI 11%-37%; P<0.01). The rabies PEP bundle was associated with increased adherence (adjusted odds ratio=2.32; 95%CI 1.32-4.07; P<0.01) after adjusting for animal type and exposure.

Conclusion: Implementation of a rabies PEP bundle improved patient selection and delivery of HRIG in the ED.

6 | Intramuscular ketorolac versus oral ibuprofen for acute musculoskeletal back pain in the emergency department: a prospective analysis

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Introduction: Non-steroidal anti-inflammatory drugs (NSAIDs) are effective in treating acute pain in the ED. Many patients tend to believe that intravenous (IV) or intramuscular (IM) pain medications are "stronger" and provide better pain relief than oral (PO) pain medications. Previous studies evaluating ketorolac IV/IM and ibuprofen PO have established that both provide equivalent analgesia. However, these studies use ibuprofen and ketorolac doses above the established ceiling doses which does not reflect current ED practices and can lead to adverse effects.

Research Question or Hypothesis: Ibuprofen 400 mg PO is non-inferior to ketorolac 10 mg IM for management of acute musculoskeletal back pain.

Study Design: This is a prospective, double-blind, double-placebo, controlled randomized study comparing ketorolac 10 mg IM to ibuprofen 400 mg PO in patients presenting to SBH Health System ED experiencing acute musculoskeletal back pain. Subjects were randomized to receive ketorolac 10 mg IM and placebo suspension orally or 0.9% sodium chloride IM and ibuprofen 400 mg suspension orally.

Methods: The primary outcome was reduction in pain score one hour after medication administration measured by the visual analog scale (VAS). The secondary outcome of this study was adverse drug reactions from either ibuprofen or ketorolac. With the α error set at 0.05 and a minimum of 46 subjects per group, the study had a pre-test power of 0.9 to detect a difference of 20% or more between groups. The chi-squared test was used for nominal data and the t-test for continuous data.

Results: Forty-six and 47 patients were enrolled in the ketorolac and ibuprofen groups, respectively. Comparison of the VAS from baseline to one hour in patients treated with ibuprofen or ketorolac resulted in no statistically significant differences in VAS score: 35 vs. 32 ($p = 0.27$).

Conclusion: Ketorolac 10 mg IM and ibuprofen 400 mg PO provide equivalent analgesia for the treatment of acute, atraumatic musculoskeletal back pain.

Infectious Diseases

7 | Tocilizumab Effectiveness in Mechanically Ventilated COVID-19 Patients: A Multicenter Retrospective Study Using Propensity Score-Based Methods.

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Introduction: The use of the interleukin-6 blocker tocilizumab in critically-ill mechanically ventilated patients with coronavirus disease 2019 (COVID-19) is less well studied.

Research Question or Hypothesis: Is tocilizumab effective in mechanically ventilated COVID-19 patients.

Study Design: A multicenter retrospective study conducted in six Saudi Arabian hospitals.

Methods: Patients admitted between March 2020 to January 2021 were screened. Confirmed COVID-19 mechanically ventilated adult patients (≥18 years old) were included. Mortality after mechanical ventilation was the primary outcome and rate of extubation rate was the secondary outcome. To achieve balance in the data, we implemented inverse propensity score weighting (IPSW) and propensity score matching (PSM). In addition to performing survival analysis on the primary outcome, Cox proportional modeling with time dependency covariance was used to account for immortal bias. For the secondary outcome, competing risk analysis was implemented with death while intubated being the competing risk.

Results: A total of 889 patients were screened and 456 patients were eligible for inclusion (tocilizumab, n=193, control, n= 263). The mean age (±SD) for tocilizumab arm was 59.3(±14.2) and 58.5(±13.7) years for the control arm. Adequate balance in covariates of interest was achieved in the IPSW and PSM analyses. In the IPSW analysis, tocilizumab was associated with lower mortality (HR=0.37, 95% CI=0.55-0.69) but not in the PSM analysis with (HR=0.80, 95% CI=0.57-1.12). After accounting for immortal time bias both the IPSW (HR=0.82, 95%CI=0.62-1.10) and the PSM (HR=0.86, 95% CI=0.64-1.16,) analyses showed no difference in overall mortality. Conversely, tocilizumab was associated with a higher rate of extubation (33.6%) versus the control arm (11.9%) with subdistributional hazards (SHR= 3.1, 95%CI=1.86-5.16).

Conclusion: Tocilizumab was not effective in reducing mortality in mechanically ventilated COVID-19 patients. However, a higher extubation rate was observed. A large randomized controlled trial in this population is needed.

8 | Multicenter Real-World Experience with Eravacycline Targeted for Gram-positive Infections

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Introduction: Eravacycline (ERV) is a newly approved tetracycline that has activity against a variety of Gram-negative (GNBI) and Gram-positive bacterial infections (GPBI) including methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococci* spp. (VRE).

Research Question or Hypothesis: What are the clinical/safety outcomes of patients treated with ERV for GPBI?

Study Design: Multicenter, retrospective, observational study conducted from September, 2018 to June, 2021

Methods: We included adults treated with ERV for >72 hours. The primary outcome was 30-day survival. Secondary outcomes were lack of 30-day infection-recurrence, resolution of signs/symptoms of infection, and safety.

Results: Overall, 103 patients were included from 14 geographically-distinct United States medical centers. The median(IQR) age was 59(48-66) years and 53% were male. Intensive care admission occurred in 61% and median(IQR) SOFA scores were 3(1-6) while median(IQR) APACHE II scores were 14(9-18). The two most common infection sources were intra-abdominal (36%) and skin/soft tissue (25%). Positive blood culture occurred in 25%. The majority (69%) of patients had *Enterococcus* spp. (n=71, 61%[43/71] *Enterococcus faecium* and 42%[30/71] *Enterococcus faecalis)* of which many are VRE (45%). *Staphylococcus aureus* comprised (40%) where the majority were MRSA (56%) The remaining were *Streptococcus anginosus* (6%). The majority (68%) had a polymicrobial GNBI, primarily *Klebsiella pneumoniae*. Infectious diseases consultation was obtained in 94% and surgical interventions in 66%. Prior active therapy was common (66%), while combination therapy ³48 hours was less common 44%. Median(IQR) ERV duration was 10(5-20) days. Eighty-percent achieved 30-day survival, 98% had no 30-day infection-recurrence, and 75% resolved infection signs/symptoms. A probable ERV-adverse event occurred in (11%), mainly gastrointestinal and led to

discontinuation in 3 patients. ERV was selected primarily for regimen consolidation (58%).

Conclusion: The majority of patients treated with ERV for GPBI achieved 30-day survival. More studies are needed to assess the use of ERV for specific pathogens particularly compared to conventional agents.

9 | Prescribing Patterns of Fosfomycin in Gram Negative Urinary Tract Infection at Tertiary Care Hospital

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Introduction: Fosfomycin is one of the old antibiotics that became of therapeutic interest in treating infections. Oral Fosfomycin is labeled to treat acute uncomplicated cystitis. However, its use has been studied in complicated urinary tract Infections (UTI) caused by ESBL producing pathogens.

Research Question or Hypothesis: to describe dosing patterns of Fosfomycin in outpatient and inpatients with UTI at a tertiary care hospital.

Study Design: Retrospective

Methods: This is a retrospective chart review study of all patients who presented to tertiary care hospital in Riyadh, Saudi Arabia, with UTI and received Fosfomycin from January 2016 to December 2019. Patients of 18 years or old who have been diagnosed with UTI and prescribed oral Fosfomycin as a treatment or prophylaxis for UTI were included. All continuous variables with normal distribution expressed as mean and SD and compared using t-test. Non-normal distribution continuous variables expressed as median (interquartile ranges) and compared using Wilcoxon rank-sum test.

Results: A total of 35 patients included in this study. The median age was 77 years (range, 19–91), 72% were women. Out of the included patients, 26% were kidney transplant recipients while majority of them were diabetic 71.43%. 44.65% of Fosfomycin prescriptions were received as a treatment, while the other prescriptions were received as a prophylaxis. Different prescribing patterns in dose, interval and duration were noted indicating the need for hospital guideline creation. The most common causative microorganisms were Klebsiella pneumoniae and Escherichia coli which account for 37.5% each. Microbiological response achieved in 80% while clinical response achieved in 12.5%.

Conclusion: Fosfomycin use showed significant microbiological efficacy with the lower clinical response with UTI, although the sample size, lack of MIC data, and being retrospective are considerable limitations in this study. However, it urges the need to work on prescribing guidelines and further studies to review its use and optimal duration in complicated UTI infections.

Medication Safety

10 | The effect of a controlled substance policy on chronic opioid prescribing at an urban academic family health center

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Introduction: In 2017, a large primary care residency site implemented a practice-level controlled substance policy (CSP) based on CDC guidelines to optimize prescribing, assess risk, and reduce harms of opioid therapy. Data-guided revisions to the CSP affecting ordering, referrals, workflow, documentation and monitoring were implemented in 2020.

Research Question or Hypothesis: How did the 2020 CSP revisions affect adherence to national best-practice guidance for chronic opioid therapy?

Study Design: Single center, retrospective chart review

Methods: A system report identified patients receiving controlled medications. Patients were included for review if receiving chronic opioid therapy, defined as continuous opioids for 60+ days. High-dose opioid therapy was defined as 50+ morphine milligram equivalents per day (MMED). Charts were reviewed for adherence to CSP components. Data was analyzed using descriptive statistics and chi-square for between-group comparisons.

Results: Patients on chronic opioid therapy (n=73 vs. n=60), and total opioid prescriptions (n=1,051 vs. n=889) decreased from 2017 to 2020. In 2020, 7 fewer patients were prescribed high-dose opioids (n=27 vs. n=20) with significant reduction in methadone prescribing (6% vs 2.8% of all prescriptions, $p < 0.05$). Benzodiazepine co-prescribing (16.4% vs. 11.6%) decreased and naloxone prescribing (20.5% vs. 25%) increased, but differences were not statistically significant. Only 35% of patients with 50+ MMED had naloxone prescriptions (n=7/20). High dose patients were not more likely to receive naloxone than patients receiving lower doses (7/20 vs. 8/40, p=0.2). Patients with scheduled doses were significantly more likely to receive naloxone vs. as-needed (6/10 vs. 1/10, $p<0.05$). Completed controlled substance agreements (CSAs) (53.4% vs. 86%, $p< 0.05$) and prescriptions linked to an ICD-10 code (53.2% vs. 68.1%, $p <0.05$) increased significantly, however urine drug monitoring rates decreased (65.8% vs. 61%, p=0.6).

Conclusion: CSP revisions were associated with reduced methadone prescribing and increased adherence to some safe prescribing practices, but naloxone remains underutilized. Planned interventions include electronic alerts and on-site naloxone.

Pharmacoepidemiology

11 | Opioid Overdose in Association with Concomitant Use of Oxycodone and Selective Serotonin Reuptake Inhibitors: A Cohort Study

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Introduction: Some selective serotonin reuptake inhibitors (SSRIs) inhibit the enzymes responsible for the metabolism of oxycodone, a potent prescription opioid. The clinical impact of this interaction on the risk of opioid overdose has not been elucidated.

Research Question or Hypothesis: Is concomitant use of oxycodone with SSRIs that are potent inhibitors of oxycodone metabolism via cytochrome-P450 (CYP) 2D6 enzyme (fluoxetine and paroxetine) associated with opioid overdose?

Study Design: Retrospective cohort study.

Methods: Using three US databases (Optum Clinformatics, IBM Truven MarketScan, and Medicaid Analytic eXtract; 2000-2020), we examined opioid overdose outcomes in adults who initiated oxycodone while on SSRIs that are potent inhibitors of CYP2D6 (inhibiting-SSRIs) versus other SSRIs (non-inhibiting SSRIs [citalopram, escitalopram, fluvoxamine, and sertraline]). We used propensity score matching weights to adjust for confounding. We followed patients for as long as they were exposed to both oxycodone and index SSRI group (maximum 1 year). Using cox regression modeling, we estimated crude and weighted (adjusted) hazard ratios (aHR) separately within each database and in the combined dataset, stratifying on the database.

Results: A total of 2,037,490 individuals initiated oxycodone while on SSRIs (72.4% women; mean [SD] age, 50.1 [15.3] years; 30.4% on inhibiting SSRIs)). In the primary analysis, we identified 1,035 overdose events (0.05 % of study cohort). The adjusted incidence rate of opioid overdose was higher in individuals on inhibiting SSRIs (9.47 per 1000 person-years) than in individuals on non-inhibiting SSRIs (7.66 per 1000 person-years), resulting in an adjusted HR of 1.23 (95% CI, 1.06-1.31). Results were consistent across multiple subgroups and sensitivity analyses.

Conclusion: Concomitant use of oxycodone with paroxetine or fluoxetine was associated with an increased risk of opioid overdose. Clinicians should be cautious about this potential interaction.

Psychiatry

12 | Pharmacists' Impact on Psychotropic Use in a Veterans Affairs Community Living Center

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Introduction: There is a vast population of elderly patients, including those in long-term care facilities, that are prescribed unnecessary psychotropics. They are already prone to reduced cognitive function and the addition of psychotropics can be detrimental. In the Community Living Center (CLC), an on-site long-term care unit at the VA Loma Linda Healthcare System (VALLHS), there has been interprofessional geropsychiatric rounds on patients within the secured neighborhood in the CLC. Pharmacists officially joined these rounds in January 2020.

Research Question or Hypothesis: Does pharmacist participation positively impact psychotropic prescribing patterns in the CLC?

Study Design: Retrospective Chart Review

Methods: Adult veterans in the CLC at the VALLHS who were initiated on a psychotropic for at least 14 days at any point during their stay from 11/28/2017 to 12/01/2020. Veterans were excluded if they were in the CLC for less than 14 consecutive days or if they were enrolled in palliative care. Two groups were analyzed [pharmacist group (PG) from 01/01/2020 to 12/01/2020 and no pharmacist group (NPG) from 11/28/2017 to 12/31/2019]. Data was analyzed descriptively, with a one-sample t-test, paired t-test, sign test, chi-square test, Wilcoxon Signed-Rank test, and Mann-Whitney U test. P-value was set at <0.05 for statistical significance.

Results: 183 veterans were included (46 PG and 137 NPG). Mean age was 70.6±12.3 years and 97.3% were male. Veterans in the PG group compared to the NPG group were less likely to be on an as needed psychotropic for more than 14 days (71.7% vs 88.3%, p=0.014), were on an as needed psychotropic for a shorter duration (68±36.8 days vs 100.8 ±81.2 days, p=0.009), were less likely to be on a scheduled psychotropic (80.4% vs 94.2%, p=0.038), and were on a scheduled psychotropic for a shorter duration (74.2±34.5 days vs 102±87.4 days, p=0.038).

Conclusion: Pharmacist participation in geropsychiatric rounds showed a positive impact on psychotropic use in the CLC.

ORIGINAL RESEARCH

ADR/Drug Interactions

13 | Methods for detecting pediatric adverse drug reactions from the electronic medical record

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Introduction: Adverse drug reactions (ADRs) are common, yet underreported. Pharmacovigilance programs as described by Tillman et al. J Clin Pharmacol 61.181-6.2021, significantly increase detection and reporting of ADRs.

Research Question or Hypothesis: Appling triggers used by a prospective pharmacovigilance program at a children's hospital (Tillman et al.) will result in detection of ADRs when retrospectively applied at Riley Children's Hospital (RCH).

Study Design: Following institutional review board approval, triggers cited by Tillman et al. were applied retrospectively at RCH from January 1- December 31, 2019 to identify potential ADRs. These triggers included new additions or modifications to a patient's allergy profile, International Classification of Disease (ICD) codes, and any

voluntary reported ADRs in the hospital electronic medication safety tracking system (EMSTS).

Methods: All potential ADRs were verified by manual electronic medical record (EMR) review. Once validated, data were recorded for the implicated drug, reaction, severity, place where drug was administered and treated, the addition or absence of the drug on the patient allergy profile, and any ICD codes associated with that date or admission that were used to describe the ADR.

Results: In 2019, RCH only had 21 ADRs voluntarily reported in the EMSTS. An additional 754 unique patients with changes to allergy profile and 5,719 ICD codes in 3,966 unique patients were identified and evaluated. After validating by EMR review, we identified 280 ADRs occurring in 2019. Eight (2.8%) were identified solely by the EMSTS, 64 (23%) were identified by the allergy list, 110 (39%) were identified only by ICD coding, and the remaining 98 (35%) were identified by multiple methods.

Conclusion: The use of triggers followed by EMR validation identified thirteen-fold more ADRs than were voluntarily reported, illustrating the need for active pharmacovigilance and the successful use of multi-modal methods to detect ADRs.

14 | A Review of Anaphylaxis Reactions Following COVID-19 Vaccination, as Reported in the VAERS Database.

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Introduction: The development and approval of COVID-19 vaccines occurred relatively quickly, leading many members of the U.S. population to question their legitimacy and safety. This study aims to evaluate the likelihood of experiencing anaphylaxis after the administration of a COVID-19 in the U.S by considering spontaneous reports of adverse events from the Vaccine Adverse Event Reporting System (VAERS) database.

Research Question or Hypothesis: How many patients who received the vaccine suffered anaphylaxis?

Study Design: Observational descriptive study.

Methods: Our study reviewed the VAERS database's reports of Pfizer/BioNTech, Moderna, and Janssen vaccinations from the date each vaccine was approved through May 2021. The VAERS database systemizes up to five symptoms for each report using the Medical Dictionary for Regulatory Activities (MedDRA). We extracted and analyzed symptoms of anaphylaxis.

Results: Out of the of 248,271 reports, 827 individuals, or 0.39%, experienced anaphylaxis. 52.6% of anaphylaxis cases occurred after administration of the Pfizer/BioNTech vaccine, 39.3% occurred after administration of the Moderna vaccine, and 7.9% occurred after administration of the Janssen Vaccine. 66.6% of the reactions occurred after the first dose, while 17.53% occurred after the second dose. The majority of patients who suffered anaphylaxis were female (70.1%). 56.2% of anaphylaxis reactions occurred before or on the third day following administration; 1.7% of reactions occurred between 4 and 14 days following administration; and 2.1% of reactions occurred after 14 days following administration. 60.2% of the patients who experienced anaphylaxis were hospitalized and six died.

Conclusion: The COVID-19 vaccines were developed in less than a year. The U.S. medical community and population at large have expressed concerns with potential side-effects. The results of this observational study of vaccine-related adverse events, specifically anaphylaxis, resembles those reported in clinical trials.

15 | Evaluation of Adverse Drug Reaction Framing in Drug Information Mobile Phone Applications

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Introduction: The presentation of medication-related information can affect clinical judgement depending on how the information is framed. Previous research suggests that drug information (DI) resources present adverse drug reaction (ADR) information differently and that these differences influence the clinical judgement of pharmacists. There are no studies evaluate ADR farming in DI mobile applications.

Research Question or Hypothesis: There are significant differences in framing of ADR information within drug monographs in commonly used DI mobile applications.

Study Design: Cross-sectional study.

Methods: A cross-sectional analysis of ADR formatting of twenty commonly prescribed oral medications within seven DI mobile applications was performed. Databases were assessed for ADR information including: presence of placebo comparisons, severity of ADR, onset of ADR, formatting of ADRs in percentile (quantitative) format or qualitative format, whether references were used to cite information, and whether ADRs are grouped by organ system. Data was collected by two study investigators and discrepancies were resolved via consensus. Differences between databases were analyzed using the chi-square test.

Results: The seven DI mobile applications varied significantly on every analyzed ADR variable ($p<0.05$) with the exception of ADR onset, which was absent in all databases. Significant differences were found for variables known to impact clinical judgement such as placebo comparisons and qualitative versus quantitative formatting. Placebo comparisons were most common among monographs in Lexicomp (30%), but were absent among monographs within other applications. Quantitative information was commonly used in most databases but was absent in Epocrates. Qualitative formatting was present in all Epocrates and Micromedex applications, but absent in the majority of

other applications. Substantial variations were also found in severity and grouping information.

Conclusion: Substantial variation in ADR formatting exists among the most common DI mobile phone applications. These differences may translate into alternative interpretations of medical information and thus impact clinical judgement. Further studies assessing whether these differences impact clinical practice.

16 | Association of Demographic and Socioeconomic Variables with Corrected QT Interval Lengthening in a Clinical Trial Cohort

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Introduction: Drug-induced QT interval prolongation increases the risk for potentially fatal arrhythmias. Demographic factors, including female sex and advancing age, predict both increased prevalence of prescriptions for QT-prolonging drugs and QT interval lengthening. Limited evidence also demonstrates racial and ethnic disparities in QT lengthening. It is unknown whether socioeconomic factors, which predict susceptibility and outcomes in other cardiovascular diseases, affect the prevalence of prescriptions for QT-prolonging drugs or QT lengthening.

Research Question or Hypothesis: Do demographic or socioeconomic variables, including race, ethnicity, and whether medically underserved, predict increased prescriptions for QT-prolonging drugs or QT interval lengthening?

Study Design: These analyses included n=4,380 patients enrolled in the INGENIOUS trial (NCT02297126).

Methods: Collected data included demographic and socioeconomic information as well as inpatient and outpatient prescriptions and Bazett's corrected QT (QTc) intervals from the electronic health record. Socioeconomic data included whether subjects were in medically underserved areas (MUA) or populations (MUP), as defined by the U.S. Health Resources and Services Administration. QT-related outcomes included the maximum QTc (max QTc) and the maximum change in QTc from baseline (delta QTc). QT-prolonging drugs were defined as those with known or possible risk of Torsades de Pointes by CredibleMeds (crediblemeds.org).

Results: Female sex, Black race, and non-Hispanic ethnicity were associated with increased prescriptions for QT-prolonging drugs ($p<0.01$ for each). Age (continuous variable) was positively associated with max QTc and delta QTc ($p<0.01$ for both). Black race, non-Hispanic ethnicity, and MUA/MUP status were associated with increased max QTc ($p<0.01$ for each). Male sex, non-Hispanic ethnicity, and MUA/MUP status were associated with increased delta QTc ($p<0.01$ for each). When adjusting for collinearity among predictors, the strongest predictors of increased max QTc and delta QTc were MUA/MUP status ($p=0.01$) and non-Hispanic ethnicity ($p<0.01$), respectively.

Conclusion: Black race, non-Hispanic ethnicity, and MUA/MUP status were identified as novel predictors of increased prescriptions for QT-prolonging drugs or QT interval lengthening.

17 | Medication use amongst xerostomic patients of an academic dental clinic

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Introduction: Global prevalence of xerostomia has been reported at 22% (range 0.01% - 45%). Xerostomia or hyposalivation negatively impacts patients' oral health, nutrition intake, and quality of life. The causal relationship between xerostomia and medications remains uncertain. Greater knowledge of any correlation could guide interventions.

Research Question or Hypothesis: Describe the prevalence of medications amongst xerostomic patients of an academic dental clinic.

Study Design: Retrospective academic dental clinic record review from 7/1/2018 – 10/27/2020

Methods: Records of patients (≥18yo and non-pregnant) were obtained from the University at Buffalo School of Dental Medicine. Xerostomia status was determined via free text search of keywords associated with xerostomia and validated by manual review. Pharmacologic class and xerostomic potential of medications were identified by the VA Drug Classification System and drug compendia, respectively. SAS 9.4v quantified data and measured medication prevalence. Predictors of medication use amongst our sample was assessed using a multiple logistic regression model.

Results: Of 37,403 examined records, 366 (0.98%) were identified as xerostomic. Most patients (312, 85%) received at least one xerostomic medication. A majority were female (240, 66%) versus male (126, 34%). Mean age (years) was 64.9. Total of 208 (57%) patients were age ≥ 65. Median number of total and xerostomic medications were 8 (IQR, 4-12) and 4 (IQR, 2-7), respectively. Top 5 most prevalent xerostomic pharmacologic classes were antidepressants (131, 35%), gastric medications (101, 28%), vitamin D (87, 24%), beta-blockers (82, 22%), and opioids (82, 22%). Upon regression analysis, antidepressant use was higher in age group ≥ 65 years (Odds Ratio 1.755 95% CI 1.135 - 2.714, $p=0.0115$)

Conclusion: The prevalence (0.98%) of xerostomia observed is lower than global prevalence of 22%. The high exposure to xerostomic

medications observed may warrant pharmacist-led interprofessional collaborations to reduce patient xerostomic burden.

Adult Medicine

18 | Thrice-Daily versus Twice-Daily Subcutaneous Heparin for Venous Thromboembolism Prophylaxis at a Large Academic Medical Center

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Introduction: Variation in dosing strategies exists for subcutaneous unfractionated heparin (UFH) use for venous thromboembolism prophylaxis (VTEP). During an international heparin shortage in 2019, our institution implemented a protocol to utilize twice-daily (BID) UFH for patients rather than thrice-daily (TID) to conserve supply.

Research Question or Hypothesis: The purpose of this study was to compare the safety and effectiveness of TID versus BID subcutaneous administration of UFH during an international heparin shortage for VTEP.

Study Design: This was a single-center, retrospective cohort study.

Methods: Patients with orders for BID subcutaneous UFH during a heparin shortage from September 1, 2019 to February 4, 2020 were included. These patients were matched to patients with TID subcutaneous UFH orders from January 1, 2019 to May 31, 2019. The primary outcome was the incidence of deep vein thrombosis (DVT) or pulmonary embolism (PE) confirmed by imaging during hospitalization. The secondary outcome was the incidence of major or clinically relevant non-major bleeding events as defined by International Society on Thrombosis and Haemostasis (ISTH) definitions.

Results: A total of 277 patients who received BID UFH and meeting inclusion criteria were matched to patients that received TID UFH. After excluding those with venous thromoboembolism or bleeding events on admission, 510 patients remained in the TID group. The primary outcome occurred in 4% (11 patients) in the BID group and 3% (17 patients) in the TID group (P=0.645). In both groups, the majority of these events were PEs. Major bleeding or clinically relevant non-major bleeding events occurred in 10% (27 patients) in the BID group and 8% (39 patients) in the TID group (P=0.310).

Conclusion: There was no difference in effectiveness or safety of TID versus BID subcutaneous UFH for VTEP. If a heparin shortage were to occur, transitioning patients to BID UFH for VTEP to conserve supply may be considered.

19 | Evaluation of a Prior to Admission Medication List Risk Scoring Tool

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Introduction: Medication reconciliation is vital in preventing medication errors during transitions of care. Implementation of effective medication reconciliation, however, remains a challenge for healthcare systems due to cost and resource constraints. The objective of this study was to evaluate a risk scoring tool for identifying patients at high risk for medication discrepancies (MDs) and therefore prioritized for pharmacy intervention with obtaining an admission medication history.

Research Question or Hypothesis: As a patient's risk score increases, the number of changes to the prior to admission medication (PTA) list will increase.

Study Design: Single-center, retrospective study

Methods: Adult patients admitted between December 2019 and December 2020 with a medication history note written by a pharmacy staff member were included. The primary outcome was number of changes made to the PTA medication list. Secondary outcomes included changes in risk score after medication history was completed, number of changes based on disease state and number of clinically relevant changes for a randomized subgroup of patients.

Results: The study included 10,713 patient encounters. Median PTA risk score was 24 (low risk) and 41% of patients were age 40 to 65 years. Pairwise comparisons of MDs between patient risk severity groups demonstrated statistically significant changes from low to moderate (3 vs 6, respectively, $p<0.05$) and low to high-risk groups (3 vs 6, respectively, $p<0.05$). There was weak correlation (R^2 0.09) between patient risk severity scores prior to obtaining a medication history and the number of identified MDs. Parkinsonism, diabetes mellitus, chronic obstructive pulmonary disease, and cystic fibrosis were associated with a higher median count of MDs.

Conclusion: This study demonstrated that this PTA medication risk scoring tool did not effectively identify patients at high risk of medication discrepancies. Therefore, subgroup analyses and further studies are needed to determine the optimal medication list risk scoring tools.

20 | Characterization of inpatient gabapentin prescribing and utilization patterns

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Introduction: Gabapentin is widely prescribed and commonly used off-label. Inappropriate gabapentin prescribing may lead to unnecessary chronic use as well as potential misuse. Previous studies have

characterized the widespread use of gabapentin in the outpatient setting, but minimal data exists for inpatient initiation.

Research Question or Hypothesis: What are the prescribing/utilization patterns of gabapentin initiated in the inpatient setting?

Study Design: Retrospective cohort (2018-2020)

Methods: Patients ≥18 years old who received new-start gabapentin during an admission to an urban teaching hospital were included. Patients prescribed gabapentin at home, with one-time/on-call/as-needed orders, or who died during admission were excluded. The primary outcome was characterization of gabapentin initiation indication; secondary outcomes included starting dose, continuation of therapy upon discharge, and follow-up/referral to pain providers upon discharge. Patients were stratified based on if they had surgery during their admission. Data was analyzed using descriptive/inferential statistics using Microsoft Excel and Chi-square/t-tests.

Results: A total of 464 patients were included: 283 (61.0%) surgical and 181 (39.0%) non-surgical patients. The overall cohort was 60% male with a mean ± SD age of 56 ± 18 years; surgical patients were younger and included more women. The most common indications (surgical) were multimodal analgesia (173; 61.1%), post-operative pain (53; 18.7%), and neuropathic pain (27; 9.5%), or (non-surgical) neuropathic pain (73; 40.3%) and multimodal analgesia (54; 37.0%). The mean gabapentin starting dose was similar (613 vs 560mg; p=0.196) for surgical vs non-surgical patients. A total of 51.6% vs 81.8% surgical and non-surgical patients received gabapentin at discharge (p<0.0001), while referral/follow-up to pain clinic was minimal and similar between subgroups (1.1% vs 3.9%; p=0.210).

Conclusion: Inpatients were almost exclusively initiated on gabapentin off-label, with more than half discharged on gabapentin. Further study is needed to assess what impact this prescribing may have upon inappropriate chronic use or misuse in the outpatient setting.

21 | Factors Associated with Inappropriate Acid Suppressive Therapy for Stress Ulcer Prophylaxis in the Medical Wards

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Introduction: The inappropriate use of Acid-suppressive therapy (AST) for stress ulcer prophylaxis (SUP) in medical wards remains a common problem worldwide. Previous reports showed that between 22-79% of the AST prescriptions in the hospitals' non-ICU wards have inappropriate indications. However, few studies looked into the factors associated with AST's inappropriate use and whether these factors were related to the patient, institution, or prescribers.

Research Question or Hypothesis: To identify the patients, institutions, and prescribers' related factors associated with the inappropriate use of ASP in hospitalized medical ward patients.

Study Design: A combined retrospective cohort study with [prospective survey

Methods: We reviewed patients electronic records between January 2018 to July 2019 of medical wards in a Secondary University Hospital, followed by surveys about prescribers' knowledge. Statistical analyses included descriptive statistics and logistic regression

Results: A total of 335 patients were included. Most of the patients were female (66.6%), with a mean age of 42.3 ±17.7. Seventy six percent (n=256) of the study subjects were prescribed AST for inappropriate indication. Based on the multivariable regression, Patients with no medications prior to admission or admitted for gastroenterology (GI) reasons were associated with significantly higher odds of inappropriate AST prescribing (OR 3.92; 95%CI 1.01-14.2), (OR 6.19; 95% CI 2.52-17.8), respectively. Twenty-seven physicians filled the prescribers survey, and the average prescriber's knowledge score out of 13 was 6.8 ± 2.0. This score did not differ by education level, years of experience, or specialty.

Conclusion: This study showed that the patient's factors, including medication free patients and the admission for GI reasons are associated with an increased risk of inappropriate AST prescribing in the medical wards. This issue may also be attributed to prescribers' awareness about AST indications and adverse effects. Thus, improving the providers' awareness about AST, and implementing an AST stewardship program in the institutions is necessary to limit this long-lasting issue.

22 | Assessment of supplemental insulin use for hospitalized patients with type 2 diabetes mellitus receiving systemic corticosteroids

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Introduction: In 2020, the American Diabetes Association (ADA) recommended Neutral Protamine Hagedorn (NPH) insulin to manage hyperglycemia induced by once daily short-acting corticosteroids and insulin glargine for long-acting corticosteroids or multiple-daily dose corticosteroids. There is a paucity of data evaluating the appropriateness of this guideline. Moreover, no studies have evaluated the effect of this guideline on hospital length of stay (LOS) as the primary outcome in patients with type 2 diabetes mellitus (T2DM) who received systemic corticosteroids for management of exacerbations of chronic obstructive pulmonary disease (COPD) or asthma.

Research Question or Hypothesis: What difference in hospital LOS exists between appropriate and inappropriate supplemental insulin for hospitalized, non-critically ill patients with T2DM receiving systemic corticosteroids?

Study Design: Non-interventional, quasi-experimental, retrospective cohort

Methods: Patients with T2DM prescribed systemic corticosteroids for COPD or asthma exacerbation were eligible for inclusion. Patients were included in the appropriate group if the 2020 ADA guideline recommendations were followed. If there was any deviation, patients were included in the inappropriate group. The primary outcome was difference in hospital LOS. Secondary outcomes were difference in point of care (POC) blood glucose (BG) values and supplemental insulin doses between the two groups. Outcomes were analyzed using Mann-Whitney U (non-parametric continuous) in SPSS Version 26.0.

Results: Sixty-five patients were in each group. There was no difference in median hospital LOS (4.5 [3.75, 5.7] vs. 4 [3.3, 6] days between appropriate and inappropriate groups, respectively; P = 0.477). The median daily POC BG level was significantly higher in the appropriate group (288 [245, 334] vs. 231 [194, 294] mg/dL, P < 0.001) requiring higher supplemental insulin doses (66 [49, 105] vs. 12 [6, 32] units, P = 0.004).

Conclusion: No difference in hospital LOS was observed between appropriate and inappropriate supplemental insulin use groups. Systemic corticosteroid-induced hyperglycemia was poorly controlled in both cohorts.

23 | Evaluation of Direct-Acting Oral Anticoagulant Prescribing Habits for Venous Thromboembolism in Obesity

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Introduction: Obesity is increasing worldwide with over 42% of Americans classified as obese. Significantly more overweight and obese patients develop a recurrent venous thromboembolism (VTE) when compared to those of normal weight. While the International Society on Thrombosis and Haemostasis recommends cutoffs of BMI > 40 kg/m^2 and/or weight > 120 kg for direct oral anticoagulants (DOACs), there is limited data on the efficacy and safety of these medications in the obese population.

Research Question or Hypothesis: Are there differences in DOAC prescribing habits, efficacy, and safety outcomes in obese versus non-obese patients?

Study Design: This study was a single center, retrospective, chart review performed August 2013 to May 2020.

Methods: Patients were ≥ 18 years of age, admitted or seen at a clinic visit at the University of Chicago, and prescribed a DOAC for VTE. Patients were divided into obese and non-obese arms. The primary objective was to describe prescribing practices for VTE in obese versus non-obese patients. Secondary outcomes included recurrent VTE within 12 months and bleeding event within 3 months. Chi-squared or Fischer's exact were performed when appropriate using Stata (version 16.1).

Results: We included 312 obese and 374 non-obese patients. Only 86 patients (28%) in the obese arm had a BMI > 40 kg/m^2. Percentage of obese patients prescribed rivaroxaban, apixaban, and dabigatran were 57.1%, 42.3%, and 0.6% respectively, comparable to the non-obese arm (P=0.07). Recurrent VTE occurred in a similar percentage of obese and non-obese patients (2.9% vs 3.7%, p 0.534). Bleeding events were similar in both groups (5.8% vs 7.5%, p=0.366).

Conclusion: Our results suggest that DOACs can be used in obese patients with similar efficacy and safety as when used in non-obese patients. Given our study population, these results are most applicable in patients with a BMI < 40 kg/m^2, as only 28% of obese patients had a BMI > 40 kg/m^2.

24 | Impact of Internal Medicine Pharmacists on Antimicrobial Stewardship

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Introduction: Despite known benefits, antimicrobial stewardship (AS) teams may not have the capacity to evaluate all inpatients receiving antimicrobials. Internal medicine (IM) pharmacists on multidisciplinary teams adjust doses of antimicrobials and facilitate de-escalation, however, little is published about their impact on AS.

Research Question or Hypothesis: The goal of this study is to describe and characterize AS interventions made by IM pharmacists to identify how stewardship coverage could be expanded.

Study Design: This study is a prospective, observational, multicenter, descriptive study conducted at two academic institutions within the same health-system.

Methods: IM pharmacists utilized an Excel spreadsheet to document pre-defined stewardship interventions made during patient care activities. The primary objective was to identify, describe, and characterize the types of AS interventions made by IM pharmacists for their patients. Secondary objectives include describing interventions by drug, infection source, intervention type, whether or not recommendations were accepted, and barriers to implementing interventions. Descriptive statistics were used to summarize the data.

Results: Four IM pharmacists documented 335 interventions from February 2021 through May 2021. Interventions were accepted 95.5% of the time. The most common interventions were for respiratory (n=71, 21.6%), skin and soft tissue (n=61, 18.3%), and genitourinary infections (n=60, 18.0%). The antimicrobials that IM pharmacists most frequently intervened on were vancomycin (n=87, 26.0%) and ceftriaxone (n=53, 15.9%). The most common interventions made were dose adjustment (n=105, 31.4%), shortened duration of therapy (n=86, 26.6%), and intravenous (IV) to oral (PO) conversions (n=38,

11.4%). Of the 16 interventions not accepted, the most common barrier to implementation was physician concerns (n=10, 50.0%) and this was primarily associated with IV to PO recommendations (n=6, 60.0%).

Conclusion: IM pharmacists are involved in AS for their patients and intervene frequently to adjust dosing for antimicrobials, shorten duration of therapy, and facilitate IV to PO conversions. IM pharmacists could serve as AS extenders where additional AS coverage is needed.

25 | Restarting Chronic Anticoagulation in Patients with Gastrointestinal Bleeding

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Introduction: Patients on chronic anticoagulation are at a higher risk of gastrointestinal bleeding. Guidelines provide recommendations on how to reverse anticoagulation in the event of major bleeding, but do not provide clear recommendations regarding when to restart a patient's anticoagulation after a bleeding episode.

Research Question or Hypothesis: To help identify the impact of the timing of anticoagulation restart (prior to vs. after hospital discharge) on bleeding or clotting events.

Study Design: This was a retrospective cohort study evaluating the incidence of recurrent gastrointestinal bleeding in patients who resumed chronic anticoagulation after a gastrointestinal bleeding event.

Methods: Patients were included if admitted for major gastrointestinal bleeding. Oral anticoagulants evaluated were warfarin, apixaban, edoxaban, rivaroxaban, and dabigatran. Indications for chronic anticoagulation included venous thromboembolism, non-valvular atrial fibrillation, mechanical heart valve replacement, and ventricular assist device. Patients were excluded from analysis if anticoagulant use was not determined to be for chronic use > 3 months or if the cause of bleeding was esophageal varices. The primary outcome was recurrent major gastrointestinal bleeding within 90 days of hospital discharge. Secondary outcomes were venous thromboembolism, ischemic stroke, or death of any cause within 90 days of hospital discharge.

Results: There were 127 patients in the study, 86 restarted anticoagulation prior to or at discharge and 41 after discharge. There was no difference in recurrent gastrointestinal bleeding within 90 days of discharge between patients who resumed anticoagulation prior to discharge and those who restarted after discharge (12.2% vs. 5.8%, p=0.918). Similarly, there was no difference found in venous thromboembolism within 90 days of discharge (4.4% vs. 1.6%, p=0.549) or 90-day all-cause mortality (12.2% vs. 5.8%, p=0.659).

Conclusion: There was no difference in recurrent major gastrointestinal bleeding events within 90 days of hospital discharge between patients who restarted chronic oral anticoagulation prior to or at discharge and patients who restarted anticoagulation after discharge in this population.

Ambulatory Care

28 | Developing an interprofessional team to reduce daily morphine milligram equivalents in patients taking chronic high-dose opioid therapy

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Introduction: Despite decreasing U.S. opioid prescribing rates, daily morphine milligram equivalents (MME) prescribed per person remains three times higher than in 1999. Greater opioid dosages increase the risk of overdose, falls, and opioid use disorder. The CDC recommends avoiding daily doses greater than 90 MME and evaluating the risks and benefits when daily doses exceed 50 MME. Evidence supports multidisciplinary teams' effectiveness in reducing pain scores and healthcare utilization, but their effect on daily MME has not been explored. In 2017, an interprofessional team (IPT) utilizing a pharmacist, addiction nurse, medical director, and clinician was developed to manage patients taking chronic high-dose opioids (exceeding 50 daily MME) at a community health center.

Research Question or Hypothesis: We hypothesize that the patients who engaged with the IPT will exhibit a decrease in daily MME.

Study Design: Retrospective cohort study

Methods: Using the prescription monitoring program and chart review, average daily MME was recorded monthly for 6 months following the first IPT visit. Secondary outcomes included number of IPT visits, non-opioid pain medications (NOPM), and non-pharmacological therapy (NPT). Differences in daily MME pre- and post-IPT intervention were evaluated with a paired t-test (SPSS v26).

Results: Baseline average daily MME (n=19) was 104.24 ± 77.74 with 29% exceeding 90 daily MME. Average percentage change in daily MME was -18% ± 24.86. Two patients' doses were increased by 11.25 and 90.00 daily MME due to fall and hospitalization, respectively. Excluding these patients, the average change in daily MME after 6 months was -12.96 ± 17.23 (p=0.007). The most recommended NOPM were acetaminophen (58%), non-steroidal anti-inflammatory drugs (32%), and pregabalin (16%). The most recommended NPT were physical therapy (37%), behavioral health (32%), and aqua therapy (32%).

Conclusion: Patients taking chronic high-dose opioids may benefit from management by an IPT including pharmacists and addiction nurses to reduce daily MME.

29 | The Impact of a Pharmacist-driven, Interdisciplinary Weight Loss Service: A Follow-Up Study

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Introduction: Obesity is a common, serious and costly chronic disease. Our outpatient, internal medicine clinic offers a pharmacist and dietician managed weight loss service to assist overweight and obese patients; however, literature is limited regarding the benefit of a pharmacist-driven, interdisciplinary weight loss service in an ambulatory care setting.

Research Question or Hypothesis: How does the percent weight loss from baseline in patients managed by a pharmacist-driven, interdisciplinary weight loss service (intervention) compare to those receiving standard weight loss care (control)?

Study Design: A single-center, retrospective, observational follow-up study

Methods: Following IRB approval, patients ≥18 years of age with BMI ≥30 or BMI ≥27 with ≥1 weight-related comorbidity such as hypertension, dyslipidemia or type 2 diabetes mellitus, and referred to our weight loss service from September 1, 2017 – September 30, 2020 or managed by their primary care physician were included. The primary outcome was percent weight loss from baseline. Key secondary outcomes included number of patients who had >5% weight loss in 6 months, number of patients who received liraglutide after 6 months, and percent weight loss in patients prescribed liraglutide. Statistical analysis included descriptive statistics, t-test for continuous outcomes, and chi square test for between group differences.

Results: A total of 86 patients met inclusion criteria with 43 patients in the weight loss service group and 43 patients in the primary care group. The percent change in weight from baseline in the intervention group was a decrease of 3% compared to a decrease of 0.35% in the control group (p=0.03).

Conclusion: Patients managed by the pharmacist-driven weight loss service had significantly higher percent weight loss from baseline compared to those receiving standard weight loss care. Pharmacists may play a valuable role in the interdisciplinary approach to weight management; prospective, randomized trials are warranted to further assess the benefit of a pharmacist-driven, interdisciplinary weight loss service.

30 | Telepharmacy Knowledge, Attitude and Practice among Egyptian Pharmacists amid the COVID-19 Pandemic.

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Introduction: Telepharmacy has garnered increased global attention due to the COVID-19 pandemic's impact on direct access to pharmacy services. There is little information available in Egypt about pharmacists' knowledge, attitudes, and scope of telepharmacy practice.

Research Question or Hypothesis: What is the existing telepharmacy knowledge, and what are pharmacists' attitudes and current practices in this area?

Study Design: Cross-sectional quantitative survey study.

Methods: A 21-item survey was developed, validated by a panel of five experts (S-CVI/Ave = 0.93). The survey has four sections to collect data on participants' demographics, knowledge, attitude, and practice of telepharmacy. The data were collected between March and June 2021 through online survey distribution to Egyptian pharmacists in ambulatory care settings. SPSS version 27 was used for descriptive and inferential statistics (univariate and multivariate logistic regression). A p-value of < 0.05 was considered statistically significant.

Results: A total of 190 complete responses were received (50% response rate). Participants were 70% females, 93 % public university graduates, 50% in the age between 31-40, and 64% have over ten years of experience. Approximately 40% were unfamiliar with the term telepharmacy. However, the majority of participants (72%) expressed an interest in the telepharmacy certification program if offered in Egypt. Regarding practice, consultation and counseling were the most reported services (76%), and 70% of participants used a smartphone as their main tool. Female gender (OR=3.5, p=0.003) and prior knowledge of telepharmacy (OR=1.9, p=0.045) were significantly associated with the expansion of telepharmacy in response to the pandemic. Lack of professional training, ethical concerns, and a formal practice framework were reported as major barriers to telepharmacy practice.

Conclusion: While a considerable proportion of the participants were unfamiliar with telepharmacy as a term, they had a positive attitude towards the potential opportunities of telepharmacy amid the COVID-19 pandemic. Addressing the reported barriers will be critical to telepharmacy services being fully integrated in Egypt.

31 | Impact of a Pharmacist-led Pneumococcal Vaccination Program in an Ambulatory Care Setting

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Introduction: *Streptococcus pneumoniae* is a leading cause of bacterial infections and leads to 1.5 million hospitalizations annually. Vaccinations are one of the most important and cost-effective tools available in healthcare to prevent infectious diseases. However, gaps still exist between what is recommended and actual vaccination rates in the United States.

Research Question or Hypothesis: A pharmacist-led pneumococcal vaccine outreach program will significantly increase pneumococcal polysaccharide vaccine (PPSV23) rates at two primary care clinics.

Study Design: Retrospective, quasi-experimental study

Methods: This study was conducted following the implementation of a newly developed, pharmacist-led, vaccination outreach program as part of a novel standard of care practice implemented in two primary care offices. Pharmacists provided direct patient outreach through telephone call to all patients deemed eligible for PPSV23 that met inclusion criteria. Pharmacists provided counseling on PPSV23 and action steps to receive the vaccine at the office through appointment. The primary outcome of change in vaccination rates was assessed 90 days after patient outreach. Secondary outcomes assessed feasibility, barriers to vaccination, co-administration with influenza vaccine, and revenue changes.

Results: A total of 762 patients were contacted under the outreach program. Overall PPSV23 vaccination rate significantly increased following the implementation of the pharmacist-led vaccination outreach program (54.1% vs 60.5%, p<0.001). Of the 398 patients reached, 38.9% accepted the recommendation for PPSV23, and 66.5% of those patients had confirmed administration. Approximate revenue generation secondary to the program was calculated as $5,568.85.

Conclusion: A pharmacist-led PPSV23 vaccination outreach program significantly increased the rate of PPSV23 vaccination in two primary care offices, leading to improved compliance with national vaccination recommendations and revenue generation.

32 | Characterization of Statin Prescribing in a Medically Underserved Patient Population

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Introduction: Guidelines have established populations in which statin therapy is strongly recommended, however, gaps in care have been previously identified in medically underserved and black patients. To identify where to focus potential interventions within this setting, current statin prescribing patterns need to be assessed.

Research Question or Hypothesis: What characteristics are associated with statin prescribing?

Study Design: Retrospective chart review

Methods: Statin prescribing was assessed among patients in a statin benefit group: clinical atherosclerotic cardiovascular disease (ASCVD) (group 1), LDL-C ≥ 190 mg/dL (group 2), diabetes (group 3), or ASCVD risk estimate > 20% (group 4). A Chi-squared or Fisher's exact test was used to determine characteristics associated with statin prescribing. Those who didn't meet statin benefit group criteria, had a contraindication, or allergy to a statin were excluded.

Results: Of 686 patients included, 45.3% were male, 66.8% were black, and 35.6% had no insurance. The combined statin prescribing rate was 74.3%; and 78.4%, 76.8%, 77.4% and 35.5% for groups 1, 2, 3 and 4 respectively. There were 175 patients who did not receive a statin or non-statin medication, this was due to provider decision (n=19), patient decision (n=19), or a reason wasn't documented (n=137). In the overall population, a visit with a pharmacist increased the odds of a statin being prescribed (OR 2.345, 95% CI 1.577-3.488) and race, gender, age and insurance status were not significant. Male gender increased the odds of a statin being prescribed in group 2 and group 3, and non-black patients received a statin more often in group 3 (p<0.05 for each).

Conclusion: Within this medically underserved population, patient characteristics did not influence overall statin prescribing. Clinical interventions such as a visit with a pharmacist, may be a more significant focus for improvement. Rationale for statin underutilization was not well documented and may represent either a gap in care or need for improved documentation.

33 | Clinical Impact of Home Blood Pressure Monitoring on Hypertension Management

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Introduction: White-coat hypertension, masked hypertension, and poor technique may produce inaccurate office-based blood pressure (BP) readings leading to inappropriate diagnosis and treatment of hypertension (HTN). Implementation of a home blood pressure monitoring (HBPM) program provides multiple daily BP readings to capture a patient's true BP.

Research Question or Hypothesis: To evaluate the impact of using HBPM to aid clinical decisions regarding HTN diagnosis and BP medication treatment.

Study Design: A retrospective study analyzing electronic medical records from patients who were referred to a HBPM program at Dothouse Community Health Center to confirm a HTN diagnosis or to evaluate BP medication management. Data was gathered from 2016-2018.

Methods: Patients measured their blood pressure in the clinic prior to initiation of the HBPM and then were provided instructions and counseling on how to measure their BP at home. Patients were provided with fully automatic, upper arm oscillometric BP monitors and were instructed to record 3 consecutive BP readings in the morning and evening for a period of 5 days.

Results: Among 248 patients who completed the HBPM program, 113 of the patients completed the program to confirm a HTN diagnosis, and 135 completed it to evaluate BP medication management. In those patients evaluated to confirm a HTN diagnosis, 30 patients (26.5%) had their HTN diagnosis confirmed and 83 patients (73.5%) were confirmed to not have a HTN diagnosis. In those patients evaluated for their BP medication management, 38 (28.1%) had their

medication adjusted and 97 (71.9%) did not have their medication adjusted.

Conclusion: The data demonstrated that implementation of a HBPM program provided further insight into a patient's condition of HTN beyond just using office-based BP measurements. Incorporating the use of a HBPM program can provide clinicians a more comprehensive view of a patient's BP to prevent unnecessary HTN diagnosis and treatment.

34 | Statin prescribing patterns for primary prevention based on ASCVD risk in a medically underserved patient population

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Introduction: In 2013, the guidelines for the management of cholesterol were updated, which resulted in more patients meeting criteria for statin use based on risk assessment with a 10-year atherosclerotic cardiovascular disease (ASCVD) risk estimator. Decreased statin prescribing in black patients and underserved populations has been identified in previous studies.

Research Question or Hypothesis: What characteristics are associated with increased statin prescribing?

Study Design: Retrospective chart review

Methods: Adults 40-75 years of age with an LDL between 70-189 mg/dL and without clinical ASCVD or diabetes were included in this analysis if they had lipid levels drawn in 2019 and were not already prescribed a statin. The primary outcome was the percentage of patients with a 10-year ASCVD risk estimate ≥7.5% who were prescribed a new high- or moderate-intensity statin. Patient characteristics associated with prescribing were analyzed using logistic regression or Fisher's exact tests. Prescribing rates in each risk category were also quantified.

Results: 519 patients were included in this analysis. 47% were black, 62% were female, and 57% were without insurance. 210 subjects had an ASCVD risk estimate ≥7.5%, and 33% were newly prescribed a moderate- or high-intensity statin. Of the 32 patients with an ASCVD risk estimate ≥20%, 38% were prescribed a statin. In those with an ASCVD risk estimate ≥ 7.5%, there was a significant increase in prescribing rates as total cholesterol (p=0.0002), LDL (p<0.0001), and triglycerides (p=0.0037) increased. A significant difference in statin prescribing was not associated with insurance status, sex, race, age, smoking status, hypertension, and ASCVD risk estimate.

Conclusion: Statin prescribing in patients with an ASCVD risk ≥7.5% was low in this underserved patient population. Higher lipid levels were the only patient characteristics associated with increased statin prescribing rates. Potential areas for intervention include education of providers on using ASCVD risk estimates and enhancing documentation of clinical rationale regarding risk assessment.

Cardiovascular

35 | Interruption of Renin-Angiotensin System Inhibitors in Acute Decompensated Heart Failure

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Introduction: Evidence suggests that interruption of beta blockers during acute decompensated heart failure (ADHF) in the absence of contraindications leads to poorer long-term outcomes. This study will assess whether similar effects occur when interrupting renin-angiotensin system inhibitor (RASi) therapy in ADHF.

Research Question or Hypothesis: In the absence of contraindications, is continuation of RASi therapy during ADHF associated with better outcomes?

Study Design: Retrospective cohort study

Methods: Data were retrospectively analyzed from patients admitted from 2015-2020 with ADHF and left ventricular ejection fraction (LVEF) </= 40% taking RASi therapy prior to admission. Patients were excluded if they required acute inotropic therapy or mechanical circulatory support, had worsening renal function (WRF), hyperkalemia, or symptomatic hypotension on admission. The primary endpoint was rehospitalization for heart failure, which was analyzed using Cox regression analysis. Secondary endpoints were analyzed using t-test or Chi-square/Fisher's exact test as appropriate.

Results: This study analyzed 100 patients with RASi therapy continued in 78 and interrupted in 22. Baseline characteristics for each group were similar except for older age (67.4 vs 58.9 years; p=0.14) and lower systolic blood pressure (120.5 vs 132.3mmHg p=0.037) in the RASi interruption group. Interrupting RASi therapy was associated with a nonsignificant increase in the primary outcome (13.6% vs 5.1%; p=0.177). Patients continuing RASi therapy were discharged on higher doses (10.1 vs 17.9mg lisinopril equivalents, p=0.044). Additionally, patients with interrupted RASi therapy were more likely to be re-admitted for WRF at 30, 60, and 90-day increments and at anytime after discharge (p<0.05 for all). Adverse effects were similar except for more frequent hypotension in the interruption group at 72 hours (40.9% vs 14.1% p=0.013) and at any time (50% vs 19.2% p=0.004).

Conclusion: Although continuation of RASi therapy in ADHF did not reduce the risk of rehospitalization for heart failure, RASi continuation appears safe and was associated with more optimal guideline-directed medication therapy at discharge.

36 | Barrier Assessment and Intervention Design Using Implementation Science to Enhance Atrial Fibrillation Care

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Introduction: Patients with non-valvular atrial fibrillation (NVAF) are five times more likely to have a stroke compared to patients without NVAF. NVAF care has evolved considerably with greater use of direct oral anticoagulants (DOACs) and updated practice guidelines recommending DOACs over warfarin in appropriate patients. Despite these changes, real-world data show that many patients at higher risk for stroke are not treated with anticoagulation. The purpose of this implementation science project was to assess the barriers to evidence-based treatment in NVAF and develop interventions to overcome those barriers.

Research Question or Hypothesis: What barriers limit adherence to updated atrial fibrillation practice guidelines and how can these be overcome?

Study Design: Qualitative study with semi-structured interviews with providers using the Theoretical Domains Framework (TDF).

Methods: Nine focused interviews were conducted with stakeholders involved with NVAF care. Interview questions were based on TDF and designed to determine behavior changes necessary to enhance implementation of an evidence-based treatment pathway for NVAF. The interviews were transcribed and coded using NVivo®. Themes were documented, and interventions were then piloted to address the barriers.

Results: Barriers identified were lack of an institution-wide standardized treatment plan, cost of anticoagulation, patient refusal to take anticoagulation, and determinants of social health. To overcome the lack of an institution-wide treatment plan, a standardized electronic treatment pathway and order set was operationalized for the healthcare system. To overcome the cost of anticoagulation, patient refusal to take anticoagulation, and the social determinants of health barriers, a thirty-day supply of medications will be provided to each patient at discharge with focused education and a post-discharge follow-up phone call.

Conclusion: The TDF framework helped identify behaviors changes needed for adherence to evidence-based practice guidelines. Interventions were then developed and will be piloted for feasibility in increasing adherence to guidelines.

37 | Direct oral anticoagulants as compared to warfarin in very elderly atrial fibrillation veteran patients with low body weight

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Introduction: Limited data exists on the use of direct oral anticoagulants (DOACs) in elderly patients age 80 years or more with concomitant low body weight defined as 60 kg or less in the setting of atrial fibrillation. This calls for further investigation.

Research Question or Hypothesis: We aim to evaluate the safety and effectiveness of using DOACs in this patient population as compared to warfarin.

Study Design: A nationwide retrospective observational cohort study

Methods: This study was conducted in veteran patients with atrial fibrillation who were newly initiated on oral anticoagulants with either warfarin or DOACs between January 1st,2015 and January 1st,2021. Data was aggregated from the VA Corporate Data Warehouse (CDW) and extracted using sequel query language. Patients <18 year of age, pregnant women, and those with mechanical valve or mitral valve stenosis were excluded. The primary outcome was incidence of major bleeding and ischemic stroke defined using ICD codes from validated studies. All outcomes were compared between the two treatment groups after propensity-score (PS) matching. Cox proportional hazard models used to estimate adjusted hazard ratios (aHR) and corresponding 95% confidence intervals (CI) of the outcomes.

Results: A total of 2155 patients on DOAC and 493 on warfarin were included in the study. After PS- matching, 493 patients were included in each arm. Baseline characteristics were similar after PS-matching. Patients included were mostly males with average age of 87 years and weight of 55 kg. DOAC treatment was associated with lower incidence (per 1000-person-days) of major bleeding as compared to warfarin in matched cohort (2.99 vs 4.39; aHR 0.63, 95% CI 0.47-0.87; p=0.005) and lower incidence (per 1000-person-days) of ischemic stroke (DOAC vs. Warfarin: 0.3 vs. 0.5; aHR 0.62, 95% CI 0.45-0.84; p=0.003).

Conclusion: Overall, as compared to warfarin, DOAC use was associated with lower risk of major bleeding and ischemic stroke.

38 | Safety Outcomes of Concurrent Use of Sodium-Glucose Cotransporter-2 Inhibitors and Loop Diuretics among Diabetic Patients: A Retrospective Cohort Study Using Real World Data

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Introduction: Sodium-glucose cotransporter-2 inhibitors (SGLT2-i) and loop diuretics can cause volume depletion. However, the long-term safety of the concurrent use of both agents has not been widely evaluated, especially in a real-world context.

Research Question or Hypothesis: Does the concurrent use of SGLT2-i and loop diuretics increase the risk of volume-depletion among diabetic patients?

Study Design: A retrospective observational cohort study was conducted to compare the safety of SGLT2-i with loop diuretics versus SGLT2-i without loop diuretics among diabetic patients.

Methods: We included diabetic patients seen at Heart Hospital in Qatar between January 1, 2017 and September 30, 2020 and newly prescribed SGLT2-i with or without a loop diuretic. The study included 2 groups: (1) patients newly started on SGLT2-i and a loop diuretic; (2) patients newly started on SGLT2-i without a loop diuretic. The primary endpoint was a composite of volume-depletion adverse events: symptomatic hypotension, acute kidney injury, postural dizziness, and syncope at 1 month and 12 months. Chi square test was used to compare between the study groups.

Results: Of the 400 patients included, 98 received SGLT2-i with a loop diuretic and 302 received SGLT2-i alone. The majority of patients included were Asian (58%), male (88%) with a median age of 55 years. Around 60% of the patients had hypertension, and 18% had heart failure with reduced ejection fraction. The concurrent use of SGLT2-i and loop diuretics compared to the use SGLT2-i alone was tolerated at 1 month; however, it was associated with a significant increase in volume-depletion events at 12 months (**1 month**: 3.1% vs. 0.7%; *p*-value= 0.097, **12 months**: 10.2% vs. 1.7%; *p*-value <0.001).

Conclusion: The long-term concurrent use of SGLT2-i and loop diuretics compared to SGLT2-i alone increases the risk of volume depletion, warranting frequent monitoring.

39 | Deviations from guideline recommended antithrombotic therapy after transcatheter aortic valve insertion

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Introduction: Antithrombotic therapy (AT) following transcatheter aortic valve insertion (TAVI) is recommended to prevent ischemic events. ACC/AHA Guidelines recommend dual antiplatelet therapy or anticoagulation plus antiplatelet therapy for 3 months. However, patient regimens may differ from guidelines.

Research Question or Hypothesis: Evaluate prescribed AT following TAVI and whether deviations from guideline recommendations impact outcomes.

Study Design: Retrospective chart review of TAVI patients between March 18, 2018 and June 4, 2020.

Methods: Demographics, clinical characteristics, and AT at discharge, 30 days, 3, 6, and 12 months post-TAVI were collected. Deviations from guideline recommended AT were categorized as extra or missing AT. Reasons for deviation were collected. Major adverse cardiac events (MACE) and bleeding at 12 months and re-hospitalization at 30 days were compared between those with and without deviations.

Results: One hundred twelve patients, age 75 years, 78% male, 48% were white were included. Seventy (63%) and 20 (18%) of patients had a deviation at one and multiple time points, respectively. AT deviations are summarized in Table 1. Post-TAVI, extra AT was more frequent after 3 months due to pre-TAVI coronary stent placement, while missing AT was more frequent within 3 months for unknown reasons. There were no differences in MACE or bleeding outcomes between groups. Patients with missing AT were more likely to be re-hospitalized at 30 days (32% vs. 8.3%, p = 0.006).

Conclusion: AT deviations are common following TAVI. AT deviations do not impact MACE or bleeding events but may be associated with increased rehospitalization at 30 days

TABLE 1 Patterns of antithrombotic therapy deviations in TAVI patients

Time	N	Extra Antithrombotic Therapy N (%)	Missing Antithrombotic Therapy N (%)
Discharge	112	1 (0.9)	7 (6.3)
30 Days	107	1 (0.9)	9 (8.4)
3 Months	84	1 (1.1)	16 (19)
6 Months	94	43 (45.7)	1 (1.1)
12 Months	76	23 (30.2)	5 (6.6)

40 | Clinical Outcomes of Rosuvastatin 20mg versus Atorvastatin 80mg in Acute Coronary Syndrome: A Retrospective Cohort Study Using Real World Data

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Introduction: A high-intensity statin therapy, including atorvastatin and rosuvastatin, is recommended by clinical practice guidelines for the secondary prevention of cardiovascular (CV) diseases. Landmark clinical trials have established the efficacy of atorvastatin 80mg for secondary prevention. However, the effectiveness of rosuvastatin post acute coronary syndrome (ACS) has not been widely studied, especially in real-world context.

Research Question or Hypothesis: Does rosuvastatin 20mg have comparable effectiveness in CV prevention post-ACS compared to atorvastatin 80mg?

Study Design: A retrospective observational cohort study using real-world data was conducted to compare the effectiveness of two high-intensity statin therapies (rosuvastatin 20mg vs. atorvastatin 80mg) among ACS patients at 12 months after discharge.

Methods: The study included adult patients admitted with ACS to the Heart Hospital in Qatar between January 1, 2017 and December 31, 2018 and prescribed a high intensity statin (rosuvastatin 20mg or atorvastatin 80mg). The study included 2 groups: (1) patients discharged on rosuvastatin 20mg; (2) patients discharged on atorvastatin 80mg. The primary endpoint was a composite of CV disease-associated death, non-fatal ACS, and non-fatal stroke. Cox proportional hazard regression analysis was used to determine the association between statin use and CV outcomes.

Results: Of the 770 patients included, 619 received rosuvastatin 20mg and 151 received atorvastatin 80mg upon discharge. The majority of patients included were Asian (78%), male (95%) with a mean age of 51 years, and 62% presented with ST-elevation myocardial infarction. The 12-month primary composite outcome did not differ between rosuvastatin and atorvastatin groups (4.7% vs. 4%; aHR= 0.95, 95% CI 0.35-2.56, p= 0.919).

Conclusion: The use of rosuvastatin 20mg after ACS in comparison to atorvastatin 80mg resulted in similar CV outcomes. Larger studies are needed to confirm these findings.

41 | Impact of a pharmacist-led intervention on high-intensity statin prescribing following acute myocardial infarction

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Introduction: Standard of care following an acute myocardial infarction (AMI) includes the initiation/continuation of high-intensity statin therapy to lower the risk of future major adverse cardiovascular events. Despite the American College of Cardiology/American Heart Association guideline recommendations, the use of high-intensity statins post-AMI is suboptimal. A clinical pharmacist may be able to improve this metric in alignment with goals set by The Joint Commission for recognition as a Comprehensive Cardiac Center.

Research Question or Hypothesis: What is the impact of a clinical pharmacy intervention upon the rate of high-intensity statins issued at hospital discharge following AMI?

Study Design: Retrospective pre/post cohort

Methods: The study included patients 18-75 years of age who were discharged from one investigative site with a primary diagnosis of AMI (as determined by ICD-10 codes) between 07/01/2019 to 12/31/2020. The primary outcome was the proportion of patients prescribed high-intensity statins, defined as atorvastatin 40-80mg or rosuvastatin 20-40mg daily, at discharge pre- and post-implementation of a clinical pharmacy intervention. Patients were stratified into two groups for comparison: pre- (07/01/2019-3/31/2020) and post- (04/01/2020-12/31/2020) intervention, which included cardiology pharmacist-driven communication and documentation via the electronic medical record. A Chi-square test was utilized to compare outcomes pre- and post-intervention.

Results: A total of 418 patients were included: 223 (53.3%) pre-intervention and 195 (46.7%) post-intervention. The overall cohort was approximately two-thirds men and 90% Caucasian, with a mean ± SD age of 61.4 ± 9.7 years; the pre- and post-intervention groups were largely similar in terms of demographics. The rate of high-intensity statin prescribing at discharge improved from 83.0% pre-intervention to 95.4% post-intervention (p<0.0001). A total of 9.9% and 5.4% patients in the pre-intervention group received moderate-intensity or no statin at discharge, respectively, lowering to 3.1% and 0.5% post-intervention.

Conclusion: There was a statistically significant improvement in the rates of high-intensity statin prescribing post-AMI following the implementation of a clinical pharmacy intervention.

42 | Comparison of ischemic and bleeding events between short versus long duration tirofiban regimens in patients with ST-segment elevation myocardial infarction undergoing percutaneous coronary intervention

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Introduction: Use of antiplatelet agents is necessary to prevent thrombosis during intracoronary stenting. Ticagrelor and prasugrel achieve 50% platelet inhibition within 30 minutes, challenging the need for overlapping long duration intravenous antiplatelet use in this scenario.

Research Question or Hypothesis: Patients with ST-segment elevation myocardial infarction (STEMI) undergoing intracoronary stenting receiving short versus long tirofiban infusions will have similar rates of in-hospital ischemic events.

Study Design: Retrospective cohort study at an academic medical center

Methods: Adult patients who underwent intracoronary stenting with tirofiban from 01/01/2019-12/31/2019 were screened and included if administered ticagrelor or prasugrel at the time of STEMI. Short duration infusions were fewer than six hours and long duration six hours or more. The primary outcome was major adverse cardiovascular events (cardiovascular mortality, recurrent myocardial infarction, urgent target vessel revascularization, stroke). Secondary outcomes included individual primary outcome components, bleeding events defined by the International Society on Thrombosis and Haemostasis, and tirofiban cost. Statistical analysis included chi-square, Fisher's exact, and Mann-Whitney U tests, as appropriate. Institutional review board approval was obtained.

Results: Overall, 283 charts were reviewed, and 177 were included with similar baseline characteristics. Short duration tirofiban was administered to 57 patients and long duration to 120. The primary outcome rate was similar in short (0 [0%]) versus long duration groups (5 [4.2%]; p=0.18), including four instances of cardiovascular mortality and one recurrent myocardial infarction. Bleeding event rates were similar in short versus long duration groups including major bleeds (2 [3.5%] vs 2 [1.7%]; p=0.60) and clinically relevant non-major bleeds (3 [5.3%] vs 9 [7.5%]; p=0.75), respectively. Cost analysis indicated a statistically significantly decreased cost in short versus long duration groups.

Conclusion: In patients with STEMI receiving intracoronary stenting and ticagrelor or prasugrel, there was no difference in major adverse cardiovascular events or bleeding outcomes between short and long duration tirofiban regimens; however, long duration regimens were more costly.

43 | Comparison of Bleeding and Ischemic Events with the Use of Direct Oral Anticoagulants in Triple Antithrombotic Therapy Regimens

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Introduction: Patients who require triple antithrombotic therapy consisting of aspirin, a P12Y12 inhibitor, and an oral anticoagulant carry a high bleed risk. Direct acting oral anticoagulants (DOAC) are preferred over warfarin in this combination, but which DOAC poses the lowest bleed risk has not been determined.

Research Question or Hypothesis: Does apixaban or rivaroxaban carry a lower bleed risk when included in a triple antithrombotic therapy regimen?

Study Design: Retrospective cohort using electronic health record data from an academic medical center between July 2011 – September 2019.

Methods: Patients ≥ 18 years of age with atrial fibrillation or venous thromboembolism receiving triple antithrombotic therapy with apixaban or rivaroxaban were identified. The primary outcome assessed major bleeding rates including intracranial bleeds, gastrointestinal bleeds, and other major bleeding. Secondary outcomes assessed rates of an ischemic composite outcome including myocardial infarction, stroke, systemic embolism, and all-cause mortality. Categorical and continuous data were analyzed using Chi-Squared or Fishers exact and Mann Whitney U tests, respectively.

Results: Overall, 307 patients were included with 169 (55%) patients receiving apixaban and 138 (45%) receiving rivaroxaban. Baseline characteristics were similar between the apixaban and rivaroxaban treatment groups except age (71 [61-81] years vs 68 [59-75]; p=0.0252), weight (88 kg [77.1-99.7] vs 91 [77.1-108.9]; p=0.0455), and history of venous thromboembolism (9 (5.3%) vs 35 (25.4%); p<0.0001); respectively. There was no significant difference in major bleeding events, 6 (3.6%) with apixaban and 3 (2.2%) with rivaroxaban (p=0.52). Secondary outcomes were also similar with 5 (3.0%) ischemic events with apixaban and 2 (1.5%) with rivaroxaban (p=0.50), and mortality occurred in 6 patients (3.6%) with apixaban and 4 (2.9%) with rivaroxaban (p=1.0).

Conclusion: In patients who require triple antithrombotic therapy, choosing apixaban or rivaroxaban appears to be safe and effective with no significant difference in bleeding events, ischemic events, or all-cause mortality.

44 | Prolonged Exposure to Remdesivir Inhibits the Human Ether-a-go-go-related Gene Potassium Current

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Introduction: Remdesivir is indicated for the treatment of COVID-19 in patients requiring hospitalization. However, cases of QTc interval

prolongation and torsade de pointes (TdP) have been reported to the FDA Adverse Event Reporting System. Drug-induced QTc prolongation and TdP is the single most common cause of withdrawal, relabeling and use restriction of marketed drugs. Most drugs that prolong the QTc inhibit a potassium current (I_{Kr}), which is encoded by the human ether-a-go-go-related gene (hERG) and is crucial for ventricular repolarization and action potential duration.

Research Question or Hypothesis: To assess the potential for remdesivir and its metabolite, GS441524, to inhibit hERG-related currents.

Study Design: Cell-based hERG Assay

Methods: Whole-cell, voltage-clamp experiments were performed in HEK-293 cells stably expressing hERG. Borosilicate glass electrodes (resistance: 2-4 MW) filled with internal solution were used to record tail currents at depolarizing and repolarizing voltages tail current. To assess acute effects, drugs were added to the internal pipette solution, and for prolonged exposure; cells were incubated with remdesivir for 24 hours prior to recording.

Results: Acute exposure to remdesivir and GS-441524 did not significantly inhibit peak activation or maximum tail current density. However, prolonged exposure to remdesivir 100 nM and 1 mM, but not 10 nM, inhibited peak activation currents by 32% (19±2 pA/pF, $p = 0.03$) and 36% (18±2 pA/pF, $p = 0.02$) respectively. Remdesivir 100 nM and 1 mM, also inhibited the maximum tail current density by 40% (18±2 pA/pF, $p = 0.02$) and 37% (19±2 pA/pF, $p = 0.03$), respectively.

Conclusion: Prolonged exposure to physiological concentrations of remdesivir inhibits hERG-related currents. These results, coupled with clinical reports of QTc prolongation and TdP, highlight the need for a rigorous assessment of the effect of remdesivir on ventricular repolarization and risk of proarrhythmia.

45 | Evaluation of Thrombocytopenia in Patients Receiving Microaxial Percutaneous Mechanical Circulatory Support (pMCS)

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Introduction: Microaxial percutaneous mechanical circulatory support (pMCS) is indicated for cardiogenic shock and high-risk coronary angioplasty, among other conditions. Hemolysis and thrombocytopenia are commonly associated with this device; however, current data describing the time course is limited. Heparin is the only anticoagulant recommended by device manufacturers to prevent pMCS thrombosis. Changing heparin to a direct thrombin inhibitor may occur to due concern for heparin-induced thrombocytopenia. A description of the time course of thrombocytopenia during microaxial pMCS will inform clinical assessments and may prevent changes to antithrombotic therapy.

Research Question or Hypothesis: What is the time course of thrombocytopenia in patients receiving microaxial pMCS? What clinical factors are associated with thrombocytopenia during microaxial pMCS?

Study Design: Retrospective, multicenter cohort study

Methods: Patients 18-89 years of age who received microaxial pMCS ≥24 hours between April 2018 and August 2020 were included in this study. Patients with other pMCS devices or with a history of heparin-induced thrombocytopenia (HIT) were excluded. This is a descriptive analysis of the incidence, onset, nadir, and duration of thrombocytopenia (defined as platelets <150,000/μL or ≥50% decline from baseline). Predictors of thrombocytopenia were analyzed via logistic regression using SPSS Version 25.

Results: Ninety-three patients were included in the analysis. Thrombocytopenia occurred in 80 patients (86%) and was present within 24 hours with a median platelet count of 147,000/μL (IQR 100,000-184,750). The platelet nadir was 99,000/μL and observed 84 hours post-device insertion. Platelets returned to baseline 140.5 hours after pMCS removal. Signs of hemolysis occurred in up to 41 patients (44.1%), and no patients developed HIT. No predictors of thrombocytopenia were identified by logistic regression.

Conclusion: Thrombocytopenia occurred within 24 hours of pMCS and returned to baseline within 6 days of pMCS discontinuation. This study will inform clinician assessments of thrombocytopenia during pMCS and may prevent unnecessary modifications to antithrombotic medications.

46 | Evaluating methods to minimize the white coat effect in patient home blood pressure monitoring

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Introduction: Home blood pressure monitoring (HBPM) is an effective means for confirming a hypertension diagnosis and monitoring medication therapy to reduce influence of the white coat effect. However, there is limited evaluation of home BP method assessment including whether to keep or discard the first day of home BP readings or if the first of a consecutive series of BP readings should be discarded.

Research Question or Hypothesis: Is there a difference in home BP averages when measuring from day to day (up to a 10-day period) or a difference if the first BP reading in a series is discarded?

Study Design: Retrospective review of 196 written home BP log sheets of patients participating in a HBPM program where instructions are to take BP readings in triplicate (3 times in a row) in AM and PM for a minimum of 5 days.

Methods: Repeated measures ANOVA analyses evaluated differences in how the triplicate BP readings could be interpreted as well as comparing BP averages between days.

Results: The first of 3 BP readings taken in triplicate by a patient at home is significantly higher compared to the averaged second and

third readings (p<0.05) and all 3 readings averaged together (p<0.05). This is consistent for AM or PM readings, and for SBP or DBP.
Comparing the overall BP average from day to day suggests that Day 1 (p<0.05) and Day 2 (p<0.05) is higher than all other days. There was no difference between Day 3 through Day 10.
Conclusion: When evaluating patient self-monitored BP readings from home, consideration should be given to discarding the first of multiple daily BP readings as well as the first 2 full days of BP readings.

Clinical Administration

47 | Implementation of Pharmacist Competency Assessments

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Introduction: The pharmacist's role in optimizing medication use and patient outcomes requires demonstration of ongoing competence. Best practices for assessing this competence are uncertain.
Research Question or Hypothesis: Is a pharmacist competency assessment program feasible and acceptable?
Study Design: Within-site post-evaluation survey
Methods: The Pharmacist Skill Development Work-With is a competency assessment program within the pharmacy department, where pharmacists present a patient case or complete patient care activities, while a leadership team member evaluates using a competency rubric and provides the presenter feedback. Pharmacists could complete up to two assessments – one each of core and enhanced clinical services), and evaluators could evaluate multiple assessments. A post-evaluation electronic survey adapted from a validated tool regarding perceptions of program feasibility and acceptability was emailed to the pharmacist following each competency assessment and to evaluators at study conclusion. Feasibility was also measured through reviewing rubrics for completion in the 2-hour assessment timeframe. Descriptive statistical analyses were calculated utilizing Microsoft Excel.
Results: Seventeen pharmacists completed a total of 20 competency assessments and seven evaluators provided feedback. Of the 26 post-evaluation surveys completed (18 [69%] by pharmacists, eight [31%] by assessors), respondents agreed or completely agreed that the competency assessments seem possible (89%), implementable (77%), doable (77%), easy to use (77%), they meet respondents' approval (85%), are welcomed (81%), liked (62%), and were appealing (58%). The time required and resources available were acceptable (69% and 84% agreed or completely agreed, respectively). Ten (50%) assessments were not completed in the allotted timeframe; five rubrics and seven feedback sessions were completed after this timeframe. Participants noted the assessments provided professional development and unique learning opportunities, but challenges included time and rubric convenience (e.g. not electronic).
Conclusion: The competency assessment program was acceptable and feasible; however, barriers regarding time and convenience persist, requiring modification and further study for sustainability

48 | Perspective of Clinical Pharmacists on the Provision of Pharmaceutical Care through Telepharmacy Services during Coronavirus Disease 2019 (COVID-19) Pandemic: A Focus Group

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Introduction: Coronavirus disease 2019 (COVID-19) pandemic has created an unprecedented pressure on healthcare systems, resulting in widespread adoption of innovative technology and services including provision of pharmaceutical care through telepharmacy. This practice is novel in the state of Qatar and the lessons learned by clinical pharmacists who provide the service is unknown.
Research Question or Hypothesis: What are the perceived benefits, risks, barriers, and facilitators related to the use of telepharmacy for the provision of pharmaceutical care during COVID-19 pandemic from the perspective of clinical pharmacists?
Study Design: A qualitative methodology using focus group discussions
Methods: Clinical pharmacists across Hamad Medical Corporation were purposively selected to participate in the study. Focus group discussions were audio-recorded, and transcribed verbatim. Data were analyzed using inductive thematic analysis.
Results: Five focus groups, involving 24 pharmacists were conducted. Overall, the major perceived benefits of care provision through telepharmacy included decreased infection exposure risks, continuity of access to healthcare services, better resource utilization through deceased time and cost on patients, and expansion of clinical pharmacy services to cover higher number of patients in remote facilities. However, clinical pharmacists perceived the practice of telepharmacy as difficult and challenging. The major disadvantages highlighted were limited efficiency and timeliness of clinical pharmacy interventions; suboptimal patient communication due to language barrier; negative influence on the pre-established professional rapport with other healthcare providers, leading to reluctance to seek pharmacists' input. Perceived challenges of the service included lack of standardized training and timely access to patients' information, cultural resistance by both healthcare providers and patients and limited resources such as dedicated platforms, incomplete documentation in electronic health records. Participants recommended creating dedicated platforms and standardized protocols as potential facilitators of telepharmacy.
Conclusion: Despite perceived barriers, pharmacists identified several benefits of telepharmacy and recommended potential facilitators that

should be utilized to integrate and sustain the practice of telepharmacy in the future.

49 | Vancomycin and Cefepime After Hemodialysis Pre and Post Implementation of Omnicell Optimization

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Introduction: In hospitalized hemodialysis (HD) patients, timely administration of vancomycin and cefepime is challenging. These antibiotics are administered at the end of HD based on their pharmacokinetic profile, and HD patients are commonly transferred to their patient specific area at the time doses are due. Our institution began storing vancomycin and cefepime in automated dispensing cabinets (ADC) within the HD unit to facilitate timely antibiotic administration in 2016 and 2018, respectively. The effect storing these antibiotics in the HD unit has on improving appropriate administration timing has not been evaluated.

Research Question or Hypothesis: To evaluate the impact of storing vancomycin and cefepime in HD units on improving appropriate administration timing.

Study Design: Retrospective pre-post study

Methods: A retrospective chart review of patients admitted to Methodist Le Bonheur Healthcare between January-March of 2016 and July-September of 2019 with orders for IV vancomycin or cefepime to be given at the end of HD was conducted. Patients were excluded if HD was stopped prematurely. Patient groups were based on whether vancomycin or cefepime were stored in the HD unit at the time of admission. Antibiotic administration was considered "late" 2 hours after the end of HD. The primary outcome was the number of doses appropriately given within 2 hours after HD concluded. Categorical variables were analyzed with Fisher's exact test; continuous variables were compared with t-tests.

Results: Of the 150 patients screened, all were included (n = 75 before group; n = 75 after group). 120 patients received vancomycin and 30 received cefepime. For the primary outcome, significantly more doses were administered on time in the after group (61 vs 32; p<0.001). The average time to administration of antibiotics was also reduced in the after group (138.1 mins vs 74.4 mins; p = 0.0214).

Conclusion: Storing vancomycin and cefepime in the ADC in HD units increases appropriate administration timing of these antibiotics.

50 | Burnout Among Health-System Pharmacy Professionals in Qatar: A Quantitative Cross-Sectional Study

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Introduction: Pharmacists' roles and responsibilities have expanded in the modern pharmacy profession, and the expectations from pharmacists have increased. This has been associated with new psychological challenges and emotional stress that can induce burnout.

Research Question or Hypothesis: What is the prevalence of burnout syndrome among health-system pharmacy professionals in Qatar and what are the factors independently associated with burnout?

Study Design: A quantitative cross-sectional questionnaire-based study

Methods: The survey was circulated to 850 pharmacy professionals, including pharmacists and pharmacy technicians within Hamad Medical Corporation (HMC) in Qatar. The survey utilized the Maslach Burnout Inventory (MBI) Toolkit™ for Medical Personnel and a modified version of the Astudillo and Mendinueta questionnaire. Both descriptive and inferential statistics were performed using SPSS version 24. P-value of less than 0.05 was considered significant.

Results: One hundred ninety-four pharmacy professionals responded to the survey. The prevalence of burnout among respondents was 19.7% [95% Confidence interval (CI); 13.8% - 26.8%] and 17.3% [95% CI;11.7%-24.2%] according to MBI and Astudillo Mendinueta criteria, respectively. The most commonly reported factors that may lead to burnout were: tension and lack of organization in teamwork (59.6%), lack of recognition of or indifference to effort from patients, superiors, and colleagues (58.2%), and demanding and challenging patients and family members (56.7%). Multiple regression analysis showed that overtime working hours per month is independently associated with a higher risk of burnout [odds ratio (OR), 1.6; 95% CI, 1.16 – 2.22 for each 10-hours increase in monthly overtime, P= 0.004] while non-Arab ethnicity is associated with lower risk of burnout [OR, 0.24; 95% CI, 0.08 – 0.67; P=0.007].

Conclusion: There is a relatively lower prevalence of burnout syndrome among health-system pharmacy professionals in Qatar compared to its prevalence in other countries. Overtime working hours and Arab ethnicity are independently associated with burnout.

Community Pharmacy Practice

51 | Evaluating novel social determinant of health programs within community pharmacy using the RE-AIM framework

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Introduction: Social determinants of health (SDoH) account for up to 90% of health outcomes. Community pharmacies are positioned to play a major role in addressing SDoH, however there is limited literature on the different community pharmacy-SDoH practice models.

Research Question or Hypothesis: To describe the process for implementing a SDoH program in community pharmacy and report on the intervention using the RE-AIM framework.

Study Design: Pilot implementation study of two SDoH intervention models within community pharmacies affiliated with the Community Pharmacy Enhanced Services Network (CPESN) from October-December 2020.

Methods: SDoH intervention models were implemented within 10 community pharmacies in Charleston, MO (n=1) and Albany, NY (n=9), focusing on at-risk adults with limited social resources. The Charleston model primarily used community health workers to carry out interventions and the Albany model used pharmacy staff trained in SDoH as intervention specialists. Both models used the CPESN care model workflow as a basis for their SDoH interventions. Each program reported data on implementation practices, intervention feasibility/fidelity, and post-implementation program acceptability. Quantitative and qualitative data were integrated, and the RE-AIM evaluation framework was used to harmonize indicators.

Results: During the start-up phase, the pharmacies transitioned a current staff member to become main facilitator of their SDoH program and a majority focused their interventions on health literacy (89%) and socioeconomic disparities (78%). In the intervention phase, 76 patients were screened with 49 (64%) enrolled among all pharmacies (*reach*). Common SDoH categories addressed included economic stability (53%) and neighborhood/built environment (26%); with successful referrals executed in 11 (22%) subjects [*effectiveness*]. Program staff agreed that sufficient resources were provided and that program workflow and staffing was clearly defined (*adoption/Implementation*). Pharmacy staff reported a lack resources regarding SDoH screening as a major implementation barrier.

Conclusion: While these pilot programs demonstrated some success, the community pharmacy-SDoH practice model requires further testing prior to widespread implementation.

Critical Care

52 | Evaluation of percutaneous Impella ventricular assist device induced thrombocytopenia

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Introduction: The use of temporary mechanical circulatory support (MCS) for patients with refractory cardiogenic shock has rapidly increased in the last 10 years. Impella ventricular assist devices (VADs) have become popular MCS options but are reported to cause thrombocytopenia. However, no published data regarding the incidence or severity of thrombocytopenia exists. Development of thrombocytopenia in the setting of heparin anticoagulation may lead to concern for heparin-induced thrombocytopenia (HIT), with subsequent use of more expensive, less reversible, and less studied direct thrombin inhibitors.

Research Question or Hypothesis: The goal of this study was to determine the incidence, timing, and severity of thrombocytopenia in an Impella VAD population.

Study Design: Multicenter retrospective review

Methods: A retrospective multicenter review of electronic medical records identified all patients implanted with an Impella 2.5, 5.0, CP or RP device at the University of Iowa Hospitals and Clinics, Massachusetts General Hospital, and Brigham and Women's Hospital between June 2015 – August 2017. Patients were excluded for short-term procedural Impella use during supported percutaneous coronary intervention.

Results: Sixty-four patients underwent Impella insertion (95% for left-sided support) during the observed time period. Support was in place for a median duration of 5.2 (2.4-10.0) days. During or within 1-week post insertion, 98.5% of patients developed thrombocytopenia (platelet count <150,000/mL) and 81.3% of patients experienced a >50% platelet decrease. Average platelet count nadir was 68,200/mL or 63.9% from baseline occurring on median day 3.8 (2.4-5.4). Twenty-four patients (38.1%) were tested for HIT accounting for 31 heparin-dependent antibody (HDA) tests of which 2 resulted positive (6.4%). Serotonin release assay (SRA) were sent in 3 patients and were negative. The device was removed with platelet counts stabilizing and rebounding to baseline within 4 to 5 days.

Conclusion: Impella implant associated thrombocytopenia is common and resolves within days following device removal. Practitioners should consider this when evaluating supported patients for other causes of thrombocytopenia.

53 | The Four Rights of Fluid Stewardship in Critical Illness: Comparing Pharmacy Recommendations in COVID-19 and Non-COVID-19 Patients

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Introduction: Volume overload leads to increased mortality and length of stay in critically ill patients. The "Four Rights of Fluid Stewardship" (right patient, drug, dose, and route) is a tool pharmacists can consider when optimizing intravenous fluids to avoid volume overload. Pharmacy-driven fluid stewardship recommendations for critically ill patients with and without coronavirus disease 2019 (COVID-19) have not yet been compared using the Four Rights construct.

Research Question or Hypothesis: Due to risk of acute respiratory distress syndrome in COVID-19, pharmacy recommendations related to the Four Rights will occur more often in COVID-19 patients than non-COVID-19 patients.

Study Design: Conducted before and during the COVID-19 pandemic, this retrospective, single-center, observational study included all critically ill adults followed on academic rounds. Patients were divided based on COVID-19 diagnosis.

Methods: Pharmacy notes for each patient day were reviewed. Fluid stewardship-related recommendations were classified according to pre-determined definitions of the Four Rights. The primary outcome was the mean number of fluid stewardship recommendations per patient day. Secondary outcomes included the mean number of recommendations related to each Right. Outcomes were analyzed in SPSS using two-tailed, independent t-tests with an alpha of 0.05.

Results: Recommendations were reviewed for 420 COVID-19 and 895 non-COVID-19 patient days (79 and 350 patients). The COVID-19 and non-COVID-19 groups, respectively, averaged 0.421 and 0.556 fluid stewardship recommendations per patient day ($p=0.003$), of which 0.143 and 0.217 were related to the right patient ($p=0.004$), 0.043 and 0.095 to the right drug ($p=0.002$), 0.062 and 0.062 to the right dose ($p=0.977$), and 0.176 and 0.184 to the right route ($p=0.766$).

Conclusion: Fluid stewardship recommendations, especially those related to the right patient and drug, were less frequent in COVID-19 patients. This is surprising given the importance of fluid management in COVID-19 pathophysiology. Future research should investigate the relationship between direct patient-pharmacist contact and fluid stewardship recommendations and the impact on patient outcomes.

54 | Incidence of Hypotension Associated with Two Different Vasopressin Discontinuation Strategies in the Recovery Phase of Septic Shock

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Introduction: Safe and effective vasopressor discontinuation strategies during the recovery phase of septic shock are not addressed in clinical practice guidelines. The optimal strategy of discontinuing vasopressin (AVP) following catecholamine cessation is unknown.

Research Question or Hypothesis: The purpose of this study was to compare the incidence of clinically relevant hypotension associated with weaning vs. rapid discontinuation of AVP.

Study Design: Single-center, retrospective, cohort study

Methods: Adults with septic shock requiring concomitant norepinephrine and AVP for ≥6 hours with norepinephrine sequentially discontinued prior to AVP over a three-year period were included. Patients expiring ≤24 hours following AVP discontinuation were excluded. Patients were categorized into either "weaning" (any dose reduction prior to complete discontinuation) or "rapid discontinuation" (complete cessation without any dose reductions) AVP discontinuation study groups. Clinically relevant hypotension was defined requiring reinitiating AVP or norepinephrine, any dose escalation in the AVP "weaning" group, or fluid administration. The primary endpoint was to compare the incidence of clinically relevant hypotension between study groups ≤24 hours following discontinuation. Secondary analyses included the incidence of any hypotensive event after AVP complete cessation, length of stay, and mortality.

Results: A total of 74 patients were included in the study. Clinically relevant hypotension was not significantly different between the AVP "weaning" and "rapid discontinuation" groups (52.3% and 57.1%, respectively, $p=0.68$). The incidence of any hypotension in the AVP wean (73.9%) and no wean (67.9%) groups were also similar ($p=0.58$). The AVP discontinuation strategy did not predict the occurrence of clinically relevant hypotension. Secondary outcomes were not significantly different between study groups.

Conclusion: The incidence of clinically relevant hypotension between two different AVP discontinuation strategies was not significantly different. These findings suggest incremental weaning and sudden cessation of AVP are both acceptable discontinuation strategies without negatively impacting outcomes.

55 | Evaluation of delirium outcomes in critically ill patients receiving oral versus subcutaneously injected anticoagulants

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Introduction: Several iatrogenic factors, including subcutaneous route of medication administration, have been theorized as potential contributors to ICU delirium. The impact of route of anticoagulation administration on ICU delirium has not been directly examined.

Research Question or Hypothesis: Is ICU delirium more common in critically ill patients receiving subcutaneous anticoagulants compared to those receiving oral anticoagulants?

Study Design: Single-center retrospective analysis

Methods: Adults admitted to the ICU from January through December 2020 taking direct acting oral anticoagulants (DOACs) for any indication or subcutaneous (SQ) heparin or enoxaparin for VTE prophylaxis were included. Patients with prior cognitive impairment or chronic alcohol or tobacco use were excluded. The remaining patients were assessed for delirium according to the CAM-ICU. The primary outcome was incidence of delirium. Secondary outcomes included duration of delirium, ICU length of stay (LOS), and hospital LOS. Outcomes were compared between the SQ versus DOAC groups using the Chi-squared test or Mann-Whitney U test. Binary logistic regression was applied to the primary outcome to determine factors associated with ICU delirium. Alpha less than 0.05 was considered significant.

Results: 428 patients received SQ anticoagulation, and 34 patients received only DOACs. Delirium occurred in 86 (20%) of the SQ group and 5 (15%) of the DOAC group (p=0.447). In logistic regression, anticoagulant route was not a predictor of delirium (OR 1.009, 95% CI 0.363-2.805). The median duration of delirium was 2 days (IQR 1-2 and 1-3) in the SQ and DOAC groups, respectively (p=0.754). Hospital and ICU LOS did not differ between groups.

Conclusion: The overall incidence of ICU delirium was higher in the SQ group compared to the DOAC group; however, this was not statistically significant. The study was limited by small sample size and retrospective design. Larger studies could help determine the impact of medication route on ICU delirium.

56 | Medication administration-related sleep disruption in the intensive care unit

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Introduction: Acute sleep deprivation is associated with adverse clinical outcomes and thought to contribute to ICU delirium. Disrupted ICU sleep is multifactorial. Clustering care to avoid nighttime administration of medications is one strategy to promote healthy sleep in the hospital setting.

Research Question or Hypothesis: To characterize nighttime medication administration in the ICU and evaluate potential impact on clinical outcomes.

Study Design: Retrospective cohort study

Methods: Records for chart review included a convenience sample of patients screened for a multicenter sleep assessment program in January 2020. Data collected patient characteristics, prescribing of medications to promote sleep, and clinical outcomes. Nighttime medication administration was defined as charting between 22:00-6:00 (collected up to ICU Day7). A comparison between patients who received 0-3 medications (Group 1) vs. patients with >4 medications administered overnight (Group 2). The primary endpoint was ICU delirium as defined by a positive CAM-ICU.

Results: Of 104 included patients, 87.5% were administered a medication at night, with a median of 3.8 medication administrations/night. The groups were similar at baseline except Group 2 had higher APACHE II (30.7 vs. 24.4, p=0.006) and SOFA (10 vs. 7, p=0.02) scores. Prescribing of medications to promote sleep was more common in Group 2 (50.0% vs. 27.8%). Group 2 had worse clinical outcomes, including delirium by ICU Day 14 (40.6% vs. 13.9%, p=0.002), ICU length of stay (12 vs. 4 days, p=0.001), and duration of mechanical ventilation (9.5 vs. 5.0 days, p=0.009). Multivariate analysis of baseline characteristics indicated that >4 nighttime medications administered was associated with a nearly 4-fold increased odds for ICU delirium by Day14.

Conclusion: Nighttime medication administration in the ICU is highly prevalent and can be a cause of frequent disruptions to sleep. Whether worse clinical outcomes observed are related to poor sleep quality caused by nighttime medication administration is an area for future investigation.

57 | Optimal Dosing of Enoxaparin in Critically Ill Patients with VTE

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Introduction: Evidence suggests 33% of critically ill patients will achieve therapeutic anti-Xa levels with standard prophylactic enoxaparin dosing. It is unknown if the suboptimal anticoagulation observed with prophylactic dosing will also be present in medically critically ill (MICU) patients receiving enoxaparin for treatment of venous thromboembolism (VTE).

Research Question or Hypothesis: Will MICU patients with VTE achieve therapeutic anti-Xa levels with standard enoxaparin dosing?

Study Design: Retrospective, observational cohort study conducted in a 350-bed community teaching hospital

Methods: MICU patients receiving enoxaparin 1 mg/kg twice daily or 1.5 mg/kg daily for VTE treatment between 2013 and 2019 with at least one peak anti-Xa level measured were included. The primary

outcome was the proportion who achieved therapeutic anti-Xa levels with standard dosing. This was compared between patients receiving once- or twice-daily dosing using a Chi-squared test with $p<0.05$ considered significant. Secondary outcomes were reported using descriptive statistics and included types of dose-adjustments required and the proportion requiring subsequent dose-adjustments.

Results: Fifty-three patients were included, with 41 receiving twice-daily and 12 receiving once-daily dosing. Therapeutic anti-Xa levels were achieved in 40 (75.5%) patients. In the remaining 13 patients, dose adjustments were made appropriately to increase (7 [13.3%]) or decrease (6 [11.3%]) the enoxaparin dose. Ninety-two percent (12/13) of patients required secondary dose adjustments, including 4 (7.5%) dose increases and 8 (15.1%) dose decreases. All patients achieved therapeutic anti-Xa levels after these adjustments. Initial dose-adjustment was required in 24.4% (10/41) receiving twice-daily dosing and in 25% (3/12) receiving once-daily dosing ($p=0.966$).

Conclusion: Standard enoxaparin dosing in MICU patients resulted in therapeutic anti-Xa levels for three-quarters of patients with remaining patients requiring similar numbers of dose increases and decreases. This finding was consistent regardless of daily dosing interval. Future studies should identify patient factors associated with requirement for higher or lower enoxaparin dosing.

58 | Evaluating the Impact of Severe Sepsis and Septic Shock Management Bundle Compliance on In-Hospital Mortality among Patients with Severe Sepsis: A Propensity Adjusted, Nested Case-Control Study

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Introduction: The Centers for Medicare and Medicaid (CMS) SEP-1 Bundle (SEP-1) is a quality metric for sepsis management and assesses antibiotic administration, lactate measurement, and blood culture collection within 3 hours of severe sepsis onset. Research has not established a mortality benefit in severe sepsis. It is imperative to examine the impact of SEP-1 in severe sepsis and evaluate how to optimize sepsis care.

Research Question or Hypothesis: It is unknown whether patients with severe sepsis derive a mortality benefit from SEP-1. This investigation aims to describe the impact of SEP-1 on mortality in severe sepsis.

Study Design: Retrospective, propensity adjusted, nested case-control study.

Methods: Patients admitted to a large academic medical center with an initial episode of severe sepsis from 7/1/2017-12/31/2019 were included. Cases were defined as those suffering 28-day in-hospital mortality and controls as those surviving at or discharged by 28 days. The analyzable cohort was nested in a larger cohort that provided crude outcome estimates. Severe sepsis time zero was manually validated. Patients with septic shock, requiring vasopressors within eight hours of onset, or those not analyzable by SEP-1 were excluded. The primary endpoint was the propensity adjusted odds of 28-day in-hospital mortality among patients compliant versus noncompliant with SEP-1. The secondary endpoint was propensity adjusted odds of 28-day in-hospital mortality specifically assessing antibiotic compliance. SPSS statistics 25 was used for analysis.

Results: 325 SEP-1 compliant and 325 SEP-1 noncompliant patients were included and analyzed. The median age was 63 and 62 years and median SOFA scores 3 and 2 between groups, respectively. There was no significant difference in 28-day in-hospital mortality among those compliant versus noncompliant with SEP-1 (Odds Ratio 1.039 [0.721-1.497]). Isolating analysis to SEP-1 antibiotic compliance revealed no difference.

Conclusion: Patients with severe sepsis may not benefit from SEP-1. Further investigations are warranted to describe the impact of SEP-1 in severe sepsis.

59 | The Impact of a Clinical Pharmacist in an Interprofessional Intensive Care Unit Recovery Clinic in Providing Care to Intensive Care Unit Survivors

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Introduction: Intensive care unit (ICU) survivors face increased risk for medication-related problems (MRPs) and further health deterioration. ICU recovery clinics (ICU-RCs) are proposed potential mechanisms to address the clinical needs of ICU survivors. There are limited data evaluating clinical pharmacist impact in an interprofessional ICU-RC on medication-related and clinical outcomes in ICU survivors.

Research Question or Hypothesis: What is the clinical pharmacist impact in an ICU-RC on medication-related and clinical outcomes in ICU survivors?

Study Design: Single-center, pre-post study

Methods: This retrospective study assessed clinical pharmacist impact in an interprofessional ICU-RC on medication-related and clinical

outcomes in ICU adult survivors vs. control. ICU survivors with sepsis/septic shock and/or respiratory failure who were followed in the clinic (March 2018-July 2020) were included (intervention). The control group included ICU survivors (March 2015-September 2017) matched 1:1 by age, gender, and ICU diagnosis. The primary outcome included number of MRPs within six months post-ICU discharges. Secondary outcomes included type of MRPs, MRPs between initial and 6-month follow-up visits, and clinical outcomes.

Results: Fifty-two patients were included in the intervention group and 52 in control. The mean number of MRPs between intervention and control groups was not significantly different (2.12±2.79 vs. 1.62 ±2.34; p=0.37). There were no significant differences in MRP type between groups. Most common MRP type included safety (30.8% in intervention vs. 28.8% in control; p>0.999), worsening condition (30.8% vs. 23.1%; p=0.51) and adherence (17.3% vs. 19.2%; p>0.999). Among the intervention group, there was a significant decrease in the mean number of MRPs (3.52±1.70 vs. 2.36±1.26, respectively; p=0.025) between initial and follow-up visits. Intervention group had significantly lower 90-day ED visits (30.4% vs. 55.8%; p=0.017), 1-year hospital readmissions (32.7% vs. 59.6%; p=0.010) and 1-year mortality rates (7.7% vs. 28.8%; p=0.010) vs. control.

Conclusion: Clinical pharmacist involvement in an interprofessional ICU-RC helped improved MRPs and clinical outcomes.

60 | Ketamine Analgosedation Increases Incident Delirium in Critically Ill Adults.

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Introduction: Ketamine is increasingly being used in critically ill adults for analgosedation but published reports are conflicting whether ketamine increases ICU delirium risk. We evaluated the association between ketamine analgosedation and incident delirium in critically ill adults.

Research Question or Hypothesis: We hypothesize ketamine analgosedation increases delirium in critically ill adults.

Study Design: Subgroup analysis of a prospective cohort study.

Methods: Consecutive adults admitted to a 36-bed medical-surgical ICU in the Netherlands (July 2016-Februay 2020) without delirium or after elective surgery expected to survive ≥48 hours were enrolled. Daily ketamine exposure was collected until ICU delirium occurrence or discharge. Well-trained nurses evaluated patients without coma (RASS=-4/-5) q8h with the CAM-ICU; a delirium day was defined by ≥1 +CAM-ICU and/or scheduled antipsychotic use. A multivariable logistic regression controlling for 9 delirium risk variables [*Baseline*: age, Modified Charlson Comorbidity, presence of cognitive impairment, admission type (medical or urgent surgery) and APACHE-IV score; *daily ICU* (until incident delirium or discharge): average Sequential Organ Failure Assessment score, presence of coma, benzodiazepine use (≥5mg midazolam equivalents), opioid use (≥10mg IV morphine equivalents)] and ICU days evaluated the association between ketamine use and ICU incident delirium. A P-value<0.05 was deemed significant. All analyses were performed using R version 4.0.3.

Results: Among 66/933 (7%) patients who received ketamine for analgosedation, eight were excluded because delirium occurred on or before the first day of ketamine. Delirium occurred in 54/58 (93%) of the remaining ketamine patients. Ketamine was associated with greater incident ICU delirium [adjusted odds ratio=5.60; 95%CI 1.09-29.15; P=0.04]. The median (IQR) ketamine dose tended to be higher in delirium (vs. no delirium) patients [0.50(0.17-0.83) vs. 0.12 (0.06-0.29) mg/kg/hr; P=0.10].

Conclusion: Ketamine use for analgosedation in critically ill adults is strongly associated with greater delirium. Further prospective research is needed to confirm and better characterize this risk.

61 | Retrospective Evaluation of Vancomycin Levels in Patients with Extracorporeal Membrane Oxygenation

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Introduction: Vancomycin is often used in extracorporeal membrane oxygenation (ECMO) related infections. However, information regarding optimal vancomycin dosing strategies in ECMO is limited. Therefore, the purpose of this study was to evaluate vancomycin regimens in critically ill (CI) patients with or without ECMO support.

Research Question or Hypothesis: Does ECMO affect vancomycin levels?

Study Design: Retrospective chart review

Methods: A retrospective chart review was conducted from June 1st 2016 to June 1st 2020, in which CI patients with or without ECMO support, who received an initial 15 to 20 mg/kg dose of vancomycin and met the study criteria were included in the analysis. The primary objective was to compare vancomycin doses and levels in CI patients with or without ECMO support. The secondary objective is to assess if vancomycin-induced nephrotoxicity leads to RRT in patients with ECMO support. Sample size was calculated as 76, based on a delta of 0.3, alpha of 0.05 and beta of 0.8. A p-value of less than 0.05 was considered significant.

Results: Baseline characteristics were balanced among the study groups, 39 patients in the ECMO group and 45 patients in the non-

ECMO group were included. No statistical significant difference in the mean doses of vancomycin (mg/kg), 15.4 ECMO versus 15.1 non-ECMO (p=0.379), was reported. Comparing both groups, 31.3% in the ECMO group versus 8.3% in the non-ECMO group attained therapeutic vancomycin levels within first 24 hours, p=0.016. Nineteen patients in the ECMO group required RRT versus two patients in the non-ECMO group, (48.7% and 4.4%, respectively, p<0.0001).

Conclusion: Although vancomycin doses and levels were similar among the ECMO- and non-ECMO groups up to 72 hours, time to reach therapeutic vancomycin levels was shorter in the ECMO group, maybe due to several co-factors (e.g. accumulation and/or altered pharmacokinetics). Despite higher incidence of RRT initiation after vancomycin therapy, multiple contributing factors could not be ruled out.

62 | Relationship between activated partial thromboplastin time and bleeding and thrombosis in patients with acute on chronic liver failure

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Introduction: The North American Consortium for the Study of End-Stage Liver Disease (NACSELD) defines acute-on-chronic liver failure (ACLF) as 2 or more extrahepatic organ failures along with a diagnosis of cirrhosis. Treating patients with ACLF is difficult due to the coagulopathies associated with liver disease and little is known about the association of trends in common coagulation parameters and patient outcomes.

Research Question or Hypothesis: Is an elevated activated partial thromboplastin time (aPTT) associated with changes in bleeding and thrombosis risk among patients with ACLF?

Study Design: Retrospective cohort study

Methods: Subjects were identified by ICD-10 codes for cirrhosis and included if they met NACSELD-ACLF criteria and required intensive care unit admission. Subjects were divided into 3 groups based upon highest aPTT. The co-primary outcome was the development of bleeding and/or thrombosis, incidences were analyzed across groups using Fisher's exact test. Secondary outcomes included describing coagulation profiles in subjects with bleeding episodes and mortality at 30 and 90 days. A pre-planned logistic regression was conducted to assess risk factors associated with bleeding events; included variables were platelets, total bilirubin, albumin, ALCF organ failures, INR and aPTT.

Results: A total of 78 subjects were included (median age 54.5 years [IQR 45.3-64], 38.5% female). At ICU admission, median MELD was 33.5 [27-39], median APACHE II score was 31 [25-35], and median aPTT was 46.1 seconds [36.5-56.7]. Bleeding and thrombotic events occurred in 37.2% and 7.7%, respectively. Highest aPTT was significantly associated with bleeding but not thrombosis. On logistic regression, risk factors associated with bleeding included aPTT greater than 60 seconds and platelets less than 50 thousand/microliter.

Conclusion: Elevated aPTT during ICU admission was significantly associated with increased risk of bleeding, but no difference in thrombosis. This study helps to inform clinicians in determining bleeding and thrombosis risk in patients with ACLF.

63 | Clinical Outcomes of Intravenous Immunoglobulin Therapy in COVID- 19 Related Acute Respiratory Distress Syndrome: A Retrospective Cohort Study

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Introduction: Intravenous immunoglobulin (IVIG) has been used as an immunomodulatory therapy to counteract severe systemic inflammation in coronavirus disease 2019 (COVID19) but its use in COVID19-related acute respiratory distress syndrome (ARDS) is not well-established.

Research Question or Hypothesis: Is IVIG therapy associated with lower mortality in COVID19-related ARDS?

Study Design: Retrospective cohort

Methods: We included adult COVID19 patients admitted to intensive care units (ICUs) at Hazm Mebaireek General Hospital, Qatar between March 7, 2020 and September 9, 2020. Patients receiving invasive mechanical ventilation for moderate-severe ARDS were divided into two groups based on whether they received IVIG therapy. Primary outcome was all-cause ICU mortality. Secondary outcomes were ventilator-free days and ICU-free days at day-28, and incidence of acute kidney injury (AKI). Propensity score matching was used to adjust for confounders. The primary outcome was compared using competing-risks survival analysis. Statistical analysis was conducted using Stata MP 16.0. P values of less than 0.05 was considered significant.

Results: Among 590 patients included in the study, 400 received routine care and 190 received IVIG therapy in addition to routine care. One-hundred eighteen pairs were created after propensity score matching with no differences between the groups. The median time from ICU admission to initiation of IVIG therapy was 6.3 days (interquartile range [IQR] 2.1-11.9 days) and the median cumulative dose of IVIG received was 150 grams (IQR 105-235 grams). ICU mortality was 27.1% overall and 25.8% in the matched cohort. Mortality was higher among IVIG-treated patients (36.4% vs. 15.3%; sub-distribution

hazard ratio[sHR] 3.5; 95% CI 1.98- 6.19; P<0.001). Ventilator-free days and ICU-free days at day-28 were lower (P<0.001 for both), and incidence of acute kidney injury was higher in the IVIG group (85.6% vs. 67.8%; P=0.001).

Conclusion: IVIG therapy in patients with COVID19-related moderate-severe ARDS was associated with higher ICU mortality. A randomized clinical trial is needed to further confirm this observation.

64 | Fluid Stewardship and the ROSE Model: Comparing Pharmacy Recommendations in the Treatment of Critically Ill Adults With and Without COVID-19

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Introduction: Intravenous fluids are the most commonly administered drug in critical care but can negatively impact outcomes if used inappropriately. The ROSE (Rescue, Optimization, Stabilization, Evacuation) model consists of four dynamic phases used to guide fluid-related decisions, and it may be used as a construct to direct pharmacistinvolvement in fluid stewardship. During the COVID-19 pandemic, patient-to-pharmacist ratios increased and a more efficient approach to fluid therapy was necessary, as these patients may manifest different fluid needs than more typical ICU patients.

Research Question or Hypothesis: When categorizing recommendations by the ROSE model, how does pharmacy-directed fluid stewardship differ in critically ill adults with and without COVID-19?

Study Design: IRB-approved, single-center, retrospective, cohort study.

Methods: Critically ill adults with and without COVID-19 being followed by the ICU pharmacy team between May and September 2020 were included. Daily pharmacist notes were reviewed for recommendations. The primary outcome was the number of fluid stewardship-related recommendations. Secondary outcomes included the number of recommendations stratified by the ROSE phases. Results were compared between patients with and without COVID-19 using a two-sided t-test.

Results: In patients with (n=79) and without (n=350) COVID-19, 1338 and 2597 recommendations were made across 420 and 895 patient days. Fewer fluid stewardship recommendations per patient day were made in the COVID-19 group (0.421 vs 0.556, p=0.003). The COVID-19 group had more recommendations in the rescue (0.029 vs 0.007/patient day, p=0.001) and optimization (0.026 vs 0.02/patient day, p=0.525) phases. The non-COVID-19 group had more recommendations in the stabilization (0.288 vs 0.429/patient day, p<0.001) and evacuation (0.045 vs 0.093/patient day, p=0.005) phases.

Conclusion: Despite an important role in COVID-19, fluid stewardship recommendations were more frequent among patients without COVID-19. One explanation may be prolonged length of stay in COVID-19 patients, extending the stabilization and evacuation phases thereby lessening recommendations per patient day. Future research should evaluate outcomes related to pharmacist-directed fluid stewardship.

65 | Comparison of the Efficacy and Safety of Enoxaparin vs Unfractionated heparin for Venous Thromboembolism (VTE) Prophylaxis in Critically ill Medical Patients

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Introduction: Critically ill patients are at higher risk of VTE due to underlying severe illness, sedative drugs, invasive lines, and prolonged immobilization. Thromboprophylaxis is a crucial component of critically ill patients because of their high risk of venous thromboembolism. However, there is uncertainty about the appropriate dosing regimen in critically ill medical patients.

Research Question or Hypothesis: To evaluate the efficacy and safety of standard dosing of different regimens (Enoxaparin vs. UFH) as a pharmacological VTE prophylaxis in those populations.

Study Design: A retrospective cohort study.

Methods: Patients were included if they were critically ill medical patients aged ≥ 18-years with a normal BMI who received either Enoxaparin 40 mg daily or UFH 5000 Unit three times daily as a VTE prophylaxis between January 1, 2018, to December 31, 2018. The primary outcome was thrombosis, and the secondary outcomes included ICU-related complication (s) during the ICU stay (i.e., major bleeding, minor bleeding, RBC transfusion during ICU stay, HAT, and HIT). Propensity score (PS) adjustment used for patient's APACHE II score, serum creatinine baseline, INR baseline, and cancer as coexisting illness.

Results: A total of 1866 patients were screened; 307 patients were included in the study. The differences in venous thromboembolism (OR 0.47; 95% CI 0.10-4.10; P =0.49) and any case of thrombosis (OR 0.43;95%CI 0.14-1.32; P=0.14) during ICU were less likely to occur in enoxaparin group; however, were not statistically significant. Moreover, no statistically difference in either minor bleeding (OR 0.83; 95% CI 0.46-1.50; P =0.54), major bleeding (OR 3.30; 95% CI 0.85-12.61; P =0.08) nor and any case of bleeding (OR 1.03; 95% CI 0.59-1.79; P =0.93) between the two groups.

Conclusion: Standard dosing of enoxaparin associated with thrombosis benefit; however, was not statistically significant. Given the current differences in cost and the frequency of administration, VTE prophylaxis with enoxaparin should be considered in critically ill medical patients.

66 | Effectiveness of subcutaneous insulin regimens versus intravenous insulin infusion protocols on glycemic control in critically ill patients

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Introduction: Although correctional dose insulin may lead to glycemic variability, it is often used for glycemic control in the intensive care unit (ICU). Evaluations of glycemic control and patient outcomes using correctional dose insulin compared to continuous infusion protocols are lacking.

Research Question or Hypothesis: Is correctional dose with or without long-acting subcutaneous insulin safe and effective for achieving glycemic control in critically ill patients?

Study Design: Observational, retrospective, historical control study

Methods: A random sampling of 100 adult ICU patients who received subcutaneous insulin in 2020 were included. Baseline demographics and blood glucose (BG) values over the first four ICU days were collected. The primary outcome was the percentage of BG values within 70-180 mg/dL. Secondary outcomes included average overall BG and frequencies of hypoglycemia and hyperglycemia. Data was compared to a historical control group that received continuous intravenous insulin infusion protocol (IIP) using the Chi-squared test or two-sided t-test for categorical and continuous variables, respectively, with alpha <0.05 to determine significance.

Results: The 100 participants in the subcutaneous insulin group had 1622 BG readings and the 171 patients in the historical IIP group had 8332 BG readings. Demographics between the groups were similar, containing predominantly older, Caucasian males. The subcutaneous group had fewer BG readings in the target range (51% vs 63%, p<0.001), a higher average overall BG (187.9 vs 172.4, p=0.002), and more BG readings >180 mg/dL (63% vs 36%, p<0.001). There was no statistically significant difference in the proportion of BG readings 41-69 mg/dL (0.6% vs 1.1%, p=0.087) or ≤40 mg/dL (0.3% vs 0.1%, p=0.074).

Conclusion: Compared to a historical IIP, subcutaneous insulin resulted in greater glycemic variability with a 75% relative increase in hyperglycemia events and a nearly 3-fold increase in severe hypoglycemia events. Although glycemic variability has previously been associated with nosocomial infections and mortality, patient outcomes were not evaluated in this study.

67 | Risk of serotonin syndrome in critically ill COVID-19 patients receiving linezolid and opioids concomitantly: A retrospective cohort study

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Introduction: Linezolid is an oxazolidinone antibiotic characterized by a reversible, non-selective monoamine oxidase inhibitory (MAOI) effect. Combining linezolid with MAOIs may increase serotonin syndrome (SS) risk.

Secondary to its high lung tissue penetration, linezolid is recommended in patients with suspected or confirmed resistant gram-positive bacterial pneumonia, especially if vancomycin cannot be used. Opioids are required for sedation and analgesia in patients with respiratory failure requiring invasive mechanical ventilation. However, it remains unclear whether co-administration of linezolid with opioids should be avoided due to the risk of Serotonin syndrome.

Research Question or Hypothesis: Whether combing linezolid with opioids will increase the incidence of SS in coronavirus disease 2019 (COVID-19) critically ill patients.

Study Design: Retrospective observational study.

Methods: All adult patients admitted to the intensive care units with COVID-19 pneumonia who received linezolid between March 2020 and September 2020 were included in the study.

The primary outcome is the prevalence of SS defined by Hunter's criteria. SS was confirmed if the patient had spontaneous clonus; inducible clonus plus agitation or diaphoresis; ocular clonus plus agitation or diaphoresis; tremor plus hyperreflexia; or hypertonia plus fever plus ocular clonus or inducible clonus. Descriptive statistical analysis was done using SPSS version25.

Results: We included 106 patients, most of the patients were males (91.5%). Approximately half of the patients had hypertension and diabetes (51.9%, and 44.3%, respectively). More than half of the cohort (56.6%) received a concomitant opioid agent. Morphine and fentanyl were the most commonly prescribed opioids (37.7% and 34%, respectively). Among patients who received opioids, only one incident of SS (1.6%) manifested as spontaneous clonus. However, this patient developed spontaneous clonus post cardiac arrest, which made the association with the linezolid-opioids combination doubtful.

Conclusion: In this study, the incidence of SS was low in COVID-19 patients who received concomitant linezolid and opioids. However, larger prospective studies are required to confirm this finding.

68 | Automated MRC-ICU calculations in the electronic medical record of an academic medical center: A retrospective analysis of critical care pharmacist workload

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Introduction: A lack of pharmacist-specific complexity scores are available in electronic medical records (EMR). The medication regimen complexity – intensive care unit (MRC-ICU) score is a validated method of quantifying the medication-specific complexity of ICU patients. MRC-ICU has only been retrospectively calculated and real-time EMR calculation has not been previously described.

Research Question or Hypothesis: Does real-time EMR-embedded MRC-ICU calculation correlate with pharmacist workload?

Study Design: Retrospective, cohort study

Methods: Data extracted included age, gender, number of daily medication orders, number of daily pharmacist interventions (Epic i-Vents), and sequential organ failure assessment (SOFA) scores. To account for variability pharmacist i-Vent workflow, number of i-Vents were normalized by pharmacist. Pearson's correlation was used to estimate the correlation between the sum of daily MRC-ICU scores per unit to the sum of daily orders and normalized i-Vents per unit. The sum was used to estimate the total workload of an individual pharmacist. The correlation between MRC-ICU and SOFA was also assessed.

Results: Data were collected on 1,205 patients. Patients were aged 59 (SD 16) years old and 40% were female. On average, patients had 8 orders verified per day (SD 7), had 0.11 normalized i-Vents per day, and had a median maximum MRC-ICU score of 6 (IQR 3, 9). Summative daily maximum MRC-ICU was found to be correlated with both sum of daily orders (r_s 0.61, $p < 0.001$) and normalized daily i-Vents (r_s 0.32, $p < 0.001$). MRC-ICU and SOFA were also moderately correlated (r_s 0.44, $p < 0.001$).

Conclusion: MRC-ICU can be implemented within EMRs to provide real-time information on ICU patients which correlates with pharmacist workload, represented as orders processed and interventions placed. With prospective research, this scoring system may help triage pharmacists to high-complexity patients to optimize pharmacist resources.

69 | Chronic Opioid Use Associated with Opioid Infusions in the Intensive Care Unit

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Introduction: Chronic pain and opioid use after critical illness have been reported in more than 70% of intensive care unit (ICU) survivors. Opioid infusions are commonly used in the ICU to provide analgosedation, but the effects of this practice on long-term opioid use are unknown.

Research Question or Hypothesis: Are ICU continuous opioid infusions (COIs) associated with chronic opioid use after discharge in opioid-naïve patients?

Study Design: Retrospective observational study

Methods: Adult medical/surgical ICU patients who received a COI (March-September 2020) were included. Those who were not opioid-naïve, had a hospital admission or no outpatient encounter in previous 3 months, were transferred from another hospital, had a hospital stay > 45 days, or were deceased at discharge were excluded. The primary outcome was prescription opioid use at 90 days. Secondary outcomes included opioid use at discharge, 30, and 60 days and readmission for an opioid related event. The prescription monitoring program in New York (iSTOP) was used to determine opioid use. Data were analyzed using descriptive statistics. A logistic regression was conducted to assess for risk factors associated with opioid use after discharge.

Results: A total of 465 patients were screened and 111 (mean ± SD age 58 ± 17 years, 58.6% male) were included in the final analysis. Most received fentanyl COIs (n=87). Chronic opioid use at 90 days was found in 7 (6.3%) patients. The proportion of patients receiving opioids at ICU discharge, 30, and 60 days were 35%, 14%, and 14%, respectively. Overall, 34 (30.6%) patients filled a prescription for an opioid at some point within 90 days after discharge. There were no patients readmitted for an opioid related event. On logistic regression, risk factors for chronic opioid use included transplant surgery.

Conclusion: Opioid prescription use after receiving a COI in the ICU is significant. Post-ICU follow-up is critical to limit opioid use and manage chronic pain.

70 | MeRIT Project: Performance of the Cockroft-Gault equation using different body weights in ICU patients with and without augmented renal clearance

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Introduction: Up to 65% of patients in the intensive care unit (ICU) experience augmented renal clearance (ARC). The gold standard for evaluating creatinine clearance (CrCl) in the ICU is by urinary measurement (mCrCl). The performance of the Cockroft-Gault (CG) in ARC is largely unknown.

Research Question or Hypothesis: In ICU patients at-risk for ARC, how does the CG equation perform using different body weights (BW) as compared to the mCrCl?

Study Design: Observational, multicenter, retrospective cohort of adult ICU patients at risk for ARC admitted from January 1, 2010 to July 30, 2020.

Methods: Adult patients were eligible for inclusion if at least one mCrCl was collected within the initial 10 days. The primary objective was to evaluate the performance of the CG equation using different BW compared to the mCrCl in a cohort of ARC (mCrCl≥130 mL/min/1.73m^2) and non-ARC (mCrCl<130 mL/min/1.73m^2) patients. Correlation was analyzed by Pearson's correlation coefficient, bias by mean difference, and accuracy by the percentage of patients within 30% of the mCrCl.

Results: A total of 383 patients were included, which provided 1,708 mCrCl values. The majority were male (n=239, 62%), median age of 55 [IQR 40-65] and a surgical diagnosis (n=293, 77%). ARC was present in 229 (59%) of patients. The ARC group had a higher mCrCl (173 vs. 90 mL/min/1.73m^2). Among non-ARC patients there was a moderate correlation (r=0.36-0.37) and accuracy (57-58%) with low bias (5.6 to 7.2) using the CG-adjusted BW estimations. Conversely, among ARC patients there was low correlation (r=0.24-0.28) with all the estimations and the CG-actual BW had the highest accuracy (70%) and least bias (-21.6).

Conclusion: The CG-adjusted BW had the best performance in the non-ARC patients, while CG performed poorly with any BW in the ARC population.

71 | Modafinil versus amantadine to promote wakefulness in mechanically ventilated adults with acute stroke or traumatic brain injury.

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Introduction: Patients with acute stroke or brain injury requiring mechanical ventilation may have delayed neurologic recovery. Amantadine and modafinil are neurostimulants that may be used to promote wakefulness in such patients to facilitate ventilator weaning however evidence comparing them is lacking.

Research Question or Hypothesis: Amantadine and modafinil are similar and only minimally effective in promoting wakefulness in patients with acute stroke or brain injury.

Study Design: Retrospective cohort study

Methods: The study evaluated hospitalized adults admitted between 2013 and 2020 for ischemic stroke, hemorrhagic stroke, and/or traumatic brain injury who received mechanical ventilation with a new start of modafinil or amantadine for ≥ 24 hours. The primary outcome was 72-hour change from baseline in Glasgow Coma Score (GCS) upon receipt of neurostimulants. Secondary outcomes included 30-day in-hospital mortality, hospital and ICU lengths of stay, duration of mechanical ventilation, neurostimulant duration, development of delirium, and new-onset seizure or agitation.

Results: A total of 80 patients were included in the analysis, 57 receiving modafinil and 23 amantadine. The modafinil group had a higher baseline GCS and had a higher rate of concomitant fentanyl infusion use. Groups were otherwise similar at baseline. Mean change in GCS from baseline was negligible for both neurostimulants and there was no difference between modafinil and amantadine (0.02 vs. 0.55, $p = 0.213$). There were also no differences between modafinil and amantadine in any secondary outcomes, including mortality (47% vs 43%, $p = 0.90$), median ICU length of stay (12 vs. 12 days, $p = 0.73$), and median mechanical ventilation duration (11 vs. 11 days, $p = 0.94$).

Conclusion: In mechanically ventilated adults with acute stroke or brain injury, neither modafinil nor amantadine increased wakefulness as assessed by 72-hour change in GCS from baseline. There were no differences between neurostimulants on any secondary outcomes.

72 | Deferred Renal Adjustment of β-lactam Antibiotics in Critically Ill Patients Presenting with Acute Kidney Injury

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Introduction: Antibiotic administration is complicated in critically ill patients presenting with acute kidney injury(AKI), which is often transient and can lead to subtherapeutic drug exposure because of renal dose adjustments based on FDA labeling derived from chronic kidney disease(CKD) studies.

Research Question or Hypothesis: What are the clinical implications of a 24-hour-deferment of the renal dose adjustment of β-lactam-antibiotics(BLABX) in critically ill patients presenting with AKI?

Study Design: Institutional review board(IRB) approved, prospective, controlled-group study.

Methods: Adult patients presenting with AKI and ≥2 systemic-inflammatory-response-syndrome(SIRS) criteria with hypotension requiring vasopressor use and received a BLABX within the first 24-hours of presentation were included. Patients were enrolled prospectively with a retrospective control group. Patients were excluded with baseline creatinine clearance<50mL/min, on hemodialysis, weight<50kg, or serious allergic reaction to BLABX. Primary outcome was time to shock reversal, and secondary outcomes include time to: defervescence, normotension, normalization of white blood cell(WBC) count, lactic acid and serum creatinine, both intensive care unit(ICU) and hospital length of stay, 7&30-day mortality, total antibiotic and ventilator days, and progression to dialysis.

Results: Fourteen patients met inclusion criteria. Shock reversal occurred in 4/6(66%) of patients in the treatment arm with median

time of 91-hours, and in 2/8(25%) of patients in control arm with median time of 43.5-hours(p=0.27). The treatment arm was associated with longer hospital length of stay vs. the control arm (8-days vs. 3-days,p=0.04), and greater total antibiotic days (13.5-days vs. 2.5-days,p=0.01). There was a numerically lower mortality rate in the treatment arm (33.3%) vs. control arm (75%). There were no significant differences between the treatment and control group for other secondary outcomes.

Conclusion: Time to shock reversal was non-significantly longer and reversal occurred more frequently in the treatment arm. The treatment arm demonstrated significantly greater total antibiotic days and length of hospital stay compared to the control group, likely due to a lower mortality rate.

Education/Training

73 | A Scorecard to Rate Curriculum Vitae Predictors of Pharmacy Residency Placement

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Introduction: Previous literature suggests that health systems prioritize specific portions of a residency candidate's curriculum vitae (CV) and experience when ranking candidates. We considered the perspective of the candidate and whether key features of each applicant's CV predict the probability of matching.

Research Question or Hypothesis: We hypothesized that an evidence-based scorecard to evaluate CVs would determine a student's likelihood of obtaining residency placement.

Study Design: This quantitative retrospective study incorporated iterative design of a new residency predictor scorecard and validation with two multiple graduating classes at a college of pharmacy.

Methods: We designed an initial quantitative scorecard based on prior literature and modified categories after reviewing CVs for the class of 2019. Following the iterative design phase, a single evaluator used the scorecard to assess two additional graduating classes and remained blinded to residency placement status during the data collection and testing phases.

We analyzed 2019 class scores by multinominal regression (SPSS) to identify a best-fit model for predicting residency placement. We then applied the final model to the 2018 and 2020 cohorts.

Results: The best fit model included the parameters of pharmacy club leadership, hospital internship, high GPA indicators, research beyond class requirements, and overall impression. Multinominal regression demonstrated significant results for the classes of 2018 (p=0.019) and 2020 (p=0.048).

We chose a score of 8 as the minimum threshold for a competitive CV based on sensitivity breakpoints. With this cutoff, our scorecard demonstrated an overall sensitivity of 87% (range=80-100% for each cohort) and a specificity of 42% (29-62%) for predicting residency placement. Overall, the scorecard had a 57% positive predictive value for residency placement (43%-80%), and a negative predictive value of 78% (50-100%).

Conclusion: This new scorecard resulted in 87% sensitivity for predicting students who obtained residencies. These results may provide meaningful guidance to students interested in residency training.

74 | Prevalence and Perceptions of Tattoos at a College of Pharmacy

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Introduction: tattoos are becoming increasingly common; however, there is limited data on prevalence in health professionals. Because tattoos may negatively influence views of professionalism, interactions with patients and providers, and career opportunities, studies of prevalence and perceptions of tattoos at COPs are needed.

Research Question or Hypothesis: how prevalent are tattoos at the Marshall B. Ketchum University (MBKU) COP and are there differences in attitudes of COP students and employees towards students and faculty with tattoos?

Study Design: cross-sectional survey.

Methods: an online survey was distributed to students and employees at the MBKU COP. Respondents were asked to provide demographic information, if they had tattoos, and tattoo characteristics. Subsequently, respondents were asked to state opinions on students and faculty with tattoos by utilizing a Likert-like scale (range 1=strongly disagree to 5=strongly agree). Statements related to professionalism, the impact on interpersonal interactions, and the impact on employment opportunities. Student responses were compared to employee responses and are reported as n (%) or median (IQR).

Results: 40.5% (30/74) of students and 20% (4/20) of employees stated they had tattoos (p=0.09). 26.7% (8/30) of students and 0% (0/4) of employees said their tattoos were visible when wearing professional clothing (p=0.24). Most students and employees stated body surface area covered by their tattoos was <9% (85.3% [29/34]). There were no differences in perceptions of pharmacy students with tattoos. Employees more strongly believed faculty should cover tattoos when interacting with students (4 [2-4] vs. 2 [2-4]; p=0.04), that tattoos negatively impact faculty employment opportunities (4 [3-4.1] vs. 3 [2-4]; p=0.02), and that other healthcare providers view tattooed faculty as less professional (4 [3-4.1] vs. 3 [2-4]; p=0.01).

Conclusion: tattoos among students and employees were common. There were differences in views of faculty with tattoos between students and employees. Future studies assessing the impact of tattoos in the pharmacy profession are needed.

75 | Emergency Department Medication Discrepancies Identified by Student Pharmacists and Pharmacy Medication Reconciliation Technicians

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Introduction: Compared to physicians, pharmacists identify a more accurate best possible medication list (BPML) and greater number of medication discrepancies during medication reconciliation. No prior study has compared medication reconciliation performed by student pharmacists (SPs) to medication reconciliation technicians (MRTs).
Research Question or Hypothesis: Compared to MRTs, do P4 SPs identify a similar number of discrepancies per patient?
Study Design: Prospective single center study in the emergency department (ED) of a 280-bed medical center.
Methods: Patients deemed needing hospital admission were included in the study. Patients were excluded if they (or a caregiver) were unable to provide a verbal medication history, their ED stay was less than 90 minutes, or no medications were listed. The SPs and MRTs performed medication reconciliation to produce the BPML while identifying discrepancies. The primary outcome was the mean number of unintentional discrepancies identified per patient. Comparisons between groups were made using an unpaired t-test for continuous data or chi-squared test for categorical data (SPSS ver 27). The study was approved by the IRB.
Results: After applying exclusion criteria, a total of 201 patient encounters were evaluated (N=85 SPs, N=116 MRTs). Patient sex, age and admitting diagnosis were similar between groups. More patients in the MRT group reported race missing and there were more Caucasians in the SP group. The mean number of medications per patient were similar between groups (10.0±6.4 vs. 9.9±6.9, p=0.92, SP vs MRT). SPs and MRTs identified a similar mean number of medication discrepancies (8.0± 9.2 vs. 7.7±10.2, p=0.82). The most frequent type of discrepancy identified by both groups was discontinuation of therapy. Mean time to perform medication reconciliation was similar between groups (21.2±13.5 min vs. 22.5±13.6 min, p=0.51).
Conclusion: P4 student pharmacists and hospital MRTs identify a similar number and type of medication discrepancies in patients admitted to the hospital from the ED.

76 | Implementation of a learning Electronic Health Record in an Online, Distance-Based Capstone Pharmacotherapy Course

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Introduction: Electronic healthcare records (EHRs) are an essential component of healthcare system. A learning EHR was implemented in the University of Colorado Distance Degrees and Programs for North American- and International-Trained Pharm.D. Candidates in a clinical capstone course. The purpose of the learning EHR was for these practicing pharmacy students to gain familiarity with an EHR and the pharmacist's patient care process (PPCP).
Research Question or Hypothesis: The primary outcome was student-perceived value of the learning EHR in gaining experience with the PPCP steps within a capstone course. Secondary outcomes included comparison of academic performance to pre-EHR years and other student perceptions of the EHR.
Study Design: Educational cohort study and cross-sectional survey
Methods: Elements of the perceived value of the learning EHR offering PPCP experience were assessed using a 5-point Likert scale (1=strongly disagree, 5=strongly agree). Internal survey consistency was measured with Cronbach's alpha. Grades were compared using the Wilcoxon rank-sum test.
Results: Of the 25 students in the class, 60% of students (n=15) in the course responded to the survey. Students had a median experience of 0.5 (IQR 0-4.25) years as clinical pharmacists and 1 year (IQR 0-8.25) of EHR experience. Students agreed (median Likert score) the EHR conferred value in data collection processes (4), assessing therapy and disease (4), plan composure (5), and monitoring/follow-up (5) with a Cronbach's alpha of 0.95. Student-perceived value of the EHR was high for both inpatient (5) and ambulatory care (4) cases and students felt better-prepared for experiential rotations with an EHR (4). Students with prior EHR experience agreed the program simulated clinical EHRs well (4). There were no significant differences in academic performance before and after EHR implementation.
Conclusion: The learning EHR was perceived by practicing pharmacy students to be valuable in learning the PPCP and simulating EHR use. Further data on preceptor perceptions of student EHR competence will be collected.

77 | Using the HyFlex Model to Deliver a Capstone Seminar Course for Fourth-Year Pharmacy Students

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Introduction: The "HyFlex Model," is a hybrid course structure that allows students to attend class in-person or via synchronous video-conferencing technology. Previous studies have demonstrated success of the model in undergraduate and graduate-level coursework, but studies are lacking in pharmacy education.

Research Question or Hypothesis: Does HyFlex delivery of a capstone seminar course impact student engagement?

Study Design: Observational, cross-sectional study

Methods: All fourth-year pharmacy students enrolled in "Grand Rounds" (GR) were eligible. The GR Engagement Assessment Tool (G.R.E.A.T.) measured engagement three times during the semester. Eighteen statements, divided into four domains (importance, boredom, elaboration, and engagement) were rated using a five-point Likert scale (1 = "not true at all" and 5 = "completely true"). Free-text responses were collected for qualitative analysis. Primary outcome compares GR engagement between students attending in-person versus remotely. Descriptive statistics were used for demographic information. Wilcoxon rank-sum tests were used to compare Likert-scale G.R.E.A.T. responses between in-person and remote attendance. Free-text responses were evaluated using qualitative analysis theme development.

Results: Surveys included 128 responses from 88 unique students. There were no differences between remote and in-person attendance for any statement in the boredom and elaboration domains. In-person students reported listening more intently (median 4, IQR [3,4]) than remote students (median 3, IQR [3,4]; p=0.0324). In-person students also felt the material was more practical (median 4, IQR [4,5]) than remote students (median 4, IQR [3,4]; p=0.0023) and more applicable to other situations (median 3, IQR [3,5]) compared to remote students (median 3, IQR [2,4]; p=0.0363). Qualitative analysis demonstrated five themes related to satisfaction: safety, flexibility, convenience, technology, and professionalism.

Conclusion: There was no significant loss in student engagement or satisfaction in GR using the HyFlex Model. This study may be used to expand similar courses to other universities where remote instruction is needed.

78 | Effectiveness of Standardized Patients in a Telepharmacy Motivational Interviewing Simulation.

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Introduction: Motivational interviewing (MI) is a communication technique used for health behavior change. Studies have evaluated standardized patient (SP) simulation to develop communication skills, but little is known about the use of asynchronous feedback in a telepharmacy scenario.

Research Question or Hypothesis: Will the use of SP simulations with embedded video feedback in a telepharmacy setting improve student skill using the MI technique?

Study Design: Pre/Post

Methods: In Week 1, students were introduced to MI, practiced evaluation using a standardized rubric (max score 25) and peer-role played. For Week 2 students completed a five-minute MI with an SP via Zoom© in a smoking cessation (SC) scenario. Interviews were recorded for student self-evaluation and faculty review. Trained faculty provided feedback by embedding comments in each student's video and completing the rubric which established the baseline score. The formative feedback served as the intervention. In Week 3 students completed a second five-minute interview with a different SP and SC scenario. Primary outcome measure was the difference in faculty score from Week 2 to Week 3. Secondary outcome measures included: Difference in student self-evaluation score from Week 2 to Week 3 and number of students achieving competency (≥ 80%) or mastery (≥ 90%) after Week 3. Statistical analysis was completed using Wilcoxon signed rank tests (SAS® version 9.4).

Results: One hundred fourteen students completed the study. Scores improved from Week 2 to Week 3 (18.4 vs 22.2, 95% CI 3.1 - 4.5, p< 0.0001). Student self-evaluation improved from Week 2 to Week 3 (19.1 vs. 20.5, 95% CI 0.9 - 2.0, p< 0.0001). Competency and Mastery were achieved by 89.5% and 52.6% of students, respectively. Score differences were not influenced by SP assigned (p = 0.263).

Conclusion: Use of SP and embedded asynchronous feedback in a MI telepharmacy simulation resulted in improved student performance.

79 | Gender Biopsy of Pharmacy Leadership & Pharmacy Residency Programs

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Introduction: Women in pharmacy make up a majority of the graduating doctorate of pharmacy (Pharm.D.) students and the practicing pharmacist workforce. Few studies have evaluated a leadership gender gap in pharmacy, but previous analysis of academic pharmacy leadership showed disparities in tenure, leadership, salary and awards between genders.

Research Question or Hypothesis: To compare the gender distribution of Pharmacy Residency Program Directors (RPD) and their Directors of Pharmacy (DOP).

Study Design: This was a descriptive, retrospective cohort study.

Methods: Data was extracted from the National Matching Service's (NMS) website and compared to the American Society of Health System Pharmacy (ASHP) Residency Database for the 2020 match. The name of the institution, program type, RPD and DOP names were collected. Gender was determined by name, and when it was not obvious, the program website and internet searches were utilized to determine gender.

Results: A total of 2,570 residency programs were collected. Females accounted for 67.1 % of the RPDs. When comparing postgraduate year (PGY) 1 to PGY2 RPDs, a similar breakdown was observed. There were 1,409 individual DOPs identified, with 41.8% of them being female. In assessing the relationship between the DOP gender and the RPD gender, health systems with a female DOP, had a higher percentage of female RPD's (71.8%) compared to those institutions with male DOP (64% female RPDs). When comparing the percentage of female RPDs to DOPs, there were less female DOPs (67.1% vs. 41.8%; p<0.001).

Conclusion: The gender makeup of RPDs appears similar to the gender distribution of pharmacists; women are still underrepresented as DOPs in the United States.

80 | Personality Type Impact on Second-Year Pharmacy Academic Performance in Integrated Systems-Based Therapy Courses

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Introduction: Personality type can influence academic performance within pharmacy programs, and the conscientiousness personality type has been associated with increased didactic performance in health professions programs. The purpose of this study was to evaluate impact of personality type on academic performance in second year (P2) systems-based therapy (SBT) courses within a Doctor of Pharmacy (Pharm.D.) curriculum.

Research Question or Hypothesis: Students with a conscientiousness dominant personality type via DiSC assessment will have a higher P2 SBT cumulative grade point average (GPA) than other personality types.

Study Design: This was a prospective cohort-based evaluation regarding the correlation between dominant personality type and P2 SBT academic performance.

Methods: Students entering the Pharm.D. program from 2015-2018 were invited to participate. During orientation week, participants completed an online DiSC personality assessment to identify a dominant personality type (i.e., dominance, influence, steadiness, or conscientiousness). SBT course grades and fall, spring, and cumulative SBT GPAs were collected at the end of the P2 year. For the primary outcome, conscientiousness was compared against the other three personality types using the Mann-Whitney test. For the secondary outcome, all four personality types were compared against one another via the Kruskal-Wallis Test. Statistical significance was set at a p-value of <0.05.

Results: A total of 304 of 318 eligible students (96%) provided informed consent and participated. Students exhibiting conscientiousness as their dominant personality type had significantly higher P2 fall semester SBT GPA (3.22 vs 3.04, p=0.02) and P2 cumulative SBT GPA (3.26 vs 3.12, p=0.04) compared to other dominant personalities. No differences in performance were found in P2 SBT semester or cumulative GPAs when directly comparing all four dominant personality types.

Conclusion: Students exhibiting a dominant personality type of conscientiousness achieved a higher P2 fall semester and cumulative SBT GPA. This finding is consistent with published data for other health professions students.

81 | Self-assessment of cultural competency within a first-year required pharmacy course

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Introduction: Practitioners must be culturally competent with training beginning in college per Accreditation Council of Pharmacy Education standards. Cultural competency assessments exist; however, they have limited scope, limited psychometric analyses, and/or lack social determinants of health (SDOH) items. The revised Self-Assessment of Perceived Level of Cultural Competence (SAPLCC) tool is validated, includes SDOH, and could evaluate curriculum content.

Research Question or Hypothesis: Can SAPLCC capture cultural competency and SDOH learning after a required course with extensive cultural and SDOH topics?

Study Design: Pre/post course survey

Methods: First-year student pharmacists completed the SAPLCC as one-point assignments before and after a required two-credit winter semester social and administrative sciences course (SAS). The validated, revised SAPLCC is a 75-item survey with six domains and one global score and 5 demographic items; 4-point Likert scales with 4 being high. Descriptive statistics, paired t-tests for pre/post responses, and t-tests for subgroup differences were analyzed with SPSS v27; $p \leq 0.05$ significant. IRB exempted.

Results: Eighty-five of 90 (94%) students completed both pre/post surveys. Demographics were 67% female, 24% nonwhite, 40% with college degree, 35% foreign-born, and age 23.5±4.0 years. All domain and global scores improved ($p \leq 0.001$) after the course; knowledge [16 items; 30.3 pre to 51.5 post], skills [11 items; 19.4 to 36.0],

attitudes [15 items; 50.0 to 55.3], encounters [11 items; 26.2 to 35.6], abilities [13 items; 36.3 to 44.1], awareness [9 items; 30.2 to 32.6], global [75 items; 191.5 to 249.7]. Scores did not vary by gender, race, college degree, nor foreign-born status. 96% of individual items increased ($p \leq 0.05$). Individual item means post-course were 40% (n=30) above 3.5; 56% (n=42) between 3.0-3.4; 4% (n=3) between 2.5-2.9.

Conclusion: SAPLCC survey captured cultural competency and SDOH learning of first-year student pharmacists. Focusing on post item scores ≤ 4 could highlight areas needing additional learning.

82 | A Survey on the Knowledge and Attitudes of Pharmacists towards the Application of Antimicrobial Therapeutic Drug Monitoring and its Challenges inQatar

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Introduction: Therapeutic drug monitoring (TDM) is an integral part of pharmaceutical care. Antimicrobials are amongst the most commonly monitored medications. Therefore, identifying the gaps in antimicrobial pharmacokinetics and TDM knowledge and skills among pharmacists is crucial to optimize TDM application.

Research Question or Hypothesis: What is the current knowledge, attitudes and perceived barriers of pharmacists in Qatar towards the application of antimicrobial TDM?

Study Design: Cross-sectional survey.

Methods: The psychometric validation of the survey underwent 3 stages: domain identification and item generation, content validation, and pilot test. The survey was divided into 4 domains (participant characteristics, knowledge, attitudes, and perceived barriers). It was developed in Survey Monkey and distributed to all pharmacists in Hamad Medical Corporation (HMC) hospitals via email. Data was analyzed using IBM *Statistical Package for the Social Sciences*(SPSS). Categorical and quantitative variables were expressed as frequencies with percentages and median with interquartile ranges, respectively. Mann–Whitney U-test was used to test the effect of demographic and professional parameters on the knowledge scores. P values less than 0.05 were considered significant.

Results: Forty-nine responses were collected. The median age of respondents was 34 years and 51% were males. Most respondents were clinical pharmacists (47%). On average, 44% of knowledge questions were correct, whereas 32% were incorrect and 23% were not sure of the answer. The median knowledge score was 5 out of 10 (interquartile range 2.5-6). Participants with post-graduate degrees or prior pharmacokinetic training showed trends towards higher knowledge scores. Online pharmacokinetics calculators were the most frequently used dose adjustment method. The top perceived barriers for the implementation of antimicrobial TDM were the lack of knowledge and educational sessions.

Conclusion: Albeit pharmacists in Qatar had low level of knowledge about antimicrobial TDM, they had positive attitudes towards TDM and its implications in the clinical practice. Future plans should include providing TDM-related education activities.

83 | Impact of using high-fidelity simulation training for pharmacy practice residents in academic tertiary hospital in Riyadh, Saudi Arabia

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Introduction: High-fidelity patient simulation (HFPS) provides a safe educational environment for the learners without affecting patients' clinical outcomes. Despite the routine use of HFPS in healthcare disciplines, pharmacy residents' involvement in HPFS is limited.

Research Question or Hypothesis: Pharmacy residents' self-confidence in clinical skills dealing with acute medical scenarios will improve by using HFPS.

Study Design: Questionnaire-based pre- and post-HFPS, and six months after.

Methods: Three separate HFPS sessions (stroke, ACLS, and acetaminophen poisoning) were conducted for pharmacy residents at a designated simulation center using a high-fidelity mannequin. Reading materials for each session were shared with the residents at least two weeks prior. The residents were blinded about the exact simulation scenario. The scenarios were facilitated by experienced physicians, nurses, and clinical pharmacists. The residents were divided into two groups with a layered representative of each residency year. After each session, a structured debriefing was provided by two specialized clinical pharmacists. The primary outcome was to assess residents' confidence with acute medical scenarios. Outcomes were analyzed using Wilcoxon signed-rank test via SPSS®. The significant level was set at 0.05.

Results: Nine PGY-1 residents (64.3%) and five PGY-2 residents (35.7%) were participated [mean age of 27.7 years; 71.4% female; 57% have ≥ three years of pharmacy experience]. Around 85.6%,78.6%, and 64.3% of the residents encountered stroke, ACLS, and acetaminophen poisoning cases, respectively. After the HFPS sessions, the residents felt significantly more confident in communicating with the health care team ($P<0.024$), sharing information during an emergency ($P<0.021$), and providing recommendations to a health care team ($P<0.025$) promptly ($P<0.021$). Additionally, the residents significantly felt more confident preparing medications during an emergency ($P<0.024$). No significant difference between a poststimulation and six months post-simulation scores were noted.

Conclusion: High-fidelity simulation is a valuable active learning tool in improving pharmacy residents' confidence in acute medical situations.

84 | Undergraduate and Doctor of Pharmacy Students' Knowledge and Perceptions of Personal Finance

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Introduction: Financial decisions made during the college years can have a lasting impact throughout adult life; however, it is unknown how perceptions and knowledge evolve over the course of a college career.
Research Question or Hypothesis: How do baseline knowledge and perceptions of personal finance differ between undergraduate freshman and doctor of pharmacy (Pharm.D.) students?
Study Design: Cross-sectional survey of freshman and P2/P3 Pharm. D. Candidates enrolled in personal finance elective courses
Methods: On the first day of class, students were asked to complete an anonymous survey through the Qualtrics platform evaluating demographics, opinions and knowledge regarding personal finance, and current financial status. The primary outcome was performance on the knowledge questions. Secondary outcomes included perceptions of financial knowledge and frequency and quantity of personal debt and savings. All outcomes were compared between groups using the Chi-squared and Mann-Whitney U tests, respectively, using SPSS Statistics
Results: The Pharm.D. group (n=28) was older (24 [IQR 23-25] vs 18 [IQR 18-18] years, p<0.001) and contained more female students (64% vs 42%, p=0.113) than the freshman group (n=19). Demonstrated knowledge was similar between groups (knowledge score 50% [IQR 43-64] vs 58% [IQR 46-62], p=0.571). Pharm.D. Candidates were non-significantly less likely to self-report as "savers" versus "spenders" (54% vs 74% savers, p=0.177) and both groups reported a high perception of poor/average personal finance skills (79% vs 79%, p=0.975). Personal debt was more common amongst Pharm.D. Candidates (86% vs 5%, p<0.001), with 68% of Pharm.D. Candidates having >$50,000 of debt. Personal savings were reported by 68% of Pharm. D. and 84% of freshman students (p=0.110), with 15% in both groups reporting >$10,000 in savings (p=0.346).
Conclusion: Despite additional years of education and life experience, Pharm.D. Candidates have similar knowledge and perceptions of personal finance while reporting more debt than freshmen. Personal finance-focused education may be helpful to empower graduating pharmacists for financial decision-making upon entering the workforce.

85 | An Innovation Sprint as Method to Promote Interprofessional Skills Among Pharmacy and Public Health Students

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Introduction: Innovation and entrepreneurship are key outcomes of personal and professional development within pharmacy curricula. Innovation sprints are a novel pedagogy where small, diverse groups of students gather to find innovative solutions to problems within a given field.
Research Question or Hypothesis: An interprofessional innovation sprint will positively affect student interprofessional collaboration-related competencies, self-awareness and creative problem solving.
Study Design: A retrospective pre-posttest quasi-experimental design with an objective evaluation of student performance was used for this study.
Methods: Third-year pharmacy and masters of public health students completed a one-time, 120-minute innovation sprint related to medication adherence among low-income patients during Fall 2020. Student teams prepared and submitted a final pitch presentation with their creative solution to the challenge statement. The final pitch presentations and student performance were evaluated by a faculty member using a standardized rubric. Additionally, students completed a post-program survey that consisted of several items including the Interprofessional Collaborative Competency Attainment Survey (ICCAS) and seven retrospective pre- and post- rating questions related to ACPE Standards 3 and 4. Appropriate tests (paired sample t-tests) compared pre/post data using SPSS v26 with alpha=0.05.
Results: A total of 133 students participated in the innovation sprint, with 127 students completing the post-program survey (response rate=95%). Mean ICCAS scores for each subscale significantly increased from pre to post for all students. The majority of respondents reported that compared to the time before the innovation sprint, their ability to collaborate interprofessionally is somewhat better (42.5%) or much better (21.3%). Mean scores for each item related to ACPE Standards 3 and 4 significantly increased from pre-to-post. A total of 124/133 (93%) of students met the competencies for performance during the sprint.
Conclusion: An interprofessional innovation sprint increased pharmacy and public health students' ability to collaborate interprofessionally, while also positively affecting areas of the affective domain of ACPE Standards 3 and 4.

86 | Use of a clinical reasoning scaffolding tool improves future student clinical reasoning performance

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Introduction: Clinical reasoning skills are arguably the most important skill set a healthcare professional can possess. Anecdotally, students in the latter half of pharmacotherapy course series were underachieving in developing medication-centric patient assessments and goals from collected patient data. Scaffolding is a pedagogy used to progressively advance students toward stronger understanding, skill acquisition, and independence in learning process. A clinical reasoning scaffolding tool (CRST) was designed to improve students' ability to collect pertinent information, assess patient medication therapy problems, and develop appropriate goals of therapy with specific monitoring parameters.

Research Question or Hypothesis: Can a CRST improve student clinical reasoning performance?

Study Design: Prospective observational cohort

Methods: The CRST was implemented in Fall 2020. To assess its impact, student performance on pharmacotherapy clinical reasoning think-alouds (CRTA) in Spring 2021 were compared to historical 2020 CRTAs not exposed to CRST. Students were evaluated using entrustable professional activity-like (EPA) ratings on five CRTA sections (Findings, Assessment/Goals, Recommendations, Monitoring, Rationale) and a Percent Grade calculated. Median EPA ratings and Percent Grade were compared between 2020 and 2021 cohorts using Mann-Whitney U or Kruskal-Wallis test which were also conducted, when appropriate, to assess impact of covariates including experiential education and case progression. CRTA cases during the beginning of COVID19 were excluded from analysis.

Results: Twenty-six CRTA from 2020 and 56 from 2021 were analyzed. To minimize the effect of case progression only the first two CRTAs were included. The CRST cohort had significantly higher Assessment/Goals (2[2-2.5] vs. 2[1.5-2],p=0.001) and Monitoring (2 [2-2.5] vs 1.5[1.5-1.75],p<0.001) EPA-ratings, but there was no difference in Findings. Additionally, there was a significant improvement in Percent Grade in the CRST cohort (86% vs 83%, p<0.001).

Conclusion: The implementation of a CRST in an early course significantly improved future student clinical reasoning performance in assessing MTPs, developing goals of therapy, and patient monitoring.

87 | Prevalence and value of board certification among pharmacy practice faculty at colleges and schools of pharmacy in the United States

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Introduction: In 2011, the prevalence of board certified pharmacy practice faculty in the United States was 37%. With an increasing number of board certified pharmacists and expansion of the number of the Board of Pharmacy Specialties (BPS) specialties, the prevalence of board certification as well as barriers and motivators for board certification are currently unknown.

Research Question or Hypothesis: It is hypothesized the prevalence of board certified pharmacy practice faculty has increased.

Study Design: This was a two-phase study.

Methods: In phase I of the study, the lists of pharmacy practice faculty from the American Association of Colleges of Pharmacy (AACP) and board certified pharmacists from BPS were cross-referenced to determine the prevalence of board certified pharmacy practice faculty in the United States. In phase II, faculty in the AACP list were stratified by rank and invited to participate in the survey comprised of 52 questions about professional characteristics, motivators and barriers to board certification, and professional accomplishments that may support career advancement.

Results: The prevalence of board certification among the 3276 pharmacy practice faculty was 56.4%. Of 2284 faculty invited to participate, 746 completed the survey with a 32.7% response rate. Among currently (n=546) and previously (n=27) certified faculty, the desire to be recognized as an expert in the field was ranked as the most common reason they obtained board certification (61.0%). Among those never certified (n=173), no perceived need was recognized as the most common barrier to board certification (55.1%), with the majority stating that they would pursue board certification if required by their employer (55.1%) or for a salary increase (52.7%). We found a positive correlation between board certification and professional accomplishments that may support career advancement for pharmacy practice faculty.

Conclusion: Although the prevalence of board certified pharmacy practice faculty has increased, barriers and motivators for board certification remained similar.

88 | Impact of a team-based research program on pharmacy resident research publications and subsequent publications

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Introduction: Completion of a research or quality improvement project is required of all accredited post-graduate year (PGY) 1 and 2 pharmacy residency programs. Not all residents pursue publication, as reported publication rates range from 1.8-37%. In 2010, the University of Oklahoma College of Pharmacy (OUCOP) residency oversight committee implemented a standardized team-based research program with a dedicated research committee for each resident, but

data evaluating the impact of team-based programs on publication rates is limited.

Research Question or Hypothesis: Implementation of a team-based program results in high rates of residency publications compared to previously reported rates.

Study Design: Descriptive study including PGY1 and PGY2 residents at the OUCOP program between 7/1/2010-6/30/2019.

Methods: Data collection included residency program (PGY1 or PGY2), position following residency, study design, and project type. Two investigators performed literature searches to identify published projects and publications following residency. The primary objective was to identify the overall publication rate. Secondary objectives included characterization of the published projects and comparison of factors among residents who did and did not publish their projects. Comparisons were made using Chi-square or Mann-Whitney U tests with an a priori alpha of 0.05.

Results: Twenty-seven PGY1 (32.9%) and 55 PGY2 (67.1%) residency projects were completed by 73 residents; ten completed their PGY1 and PGY2 at OUCOP. Forty-three of 82 projects were published (52.4%) by 39 of 73 residents (53.4%). The majority of publications were by PGY2 residents (69.8%) in medicine journals (65.1%) with a median (IQR) time to publication of 2 (1.5-2.6) years. There were no differences between those who did and did not publish their project in regards to initial position, residency type, study design, or project type ($p>0.05$). Those who did publish had more publications following residency [4 (2.3-6.8) versus 2 (1-5), $p=0.04$].

Conclusion: After implementing a team-based program, 52% of projects were published and those who published had more subsequent publications.

89 | Evaluation of the Incorporation of Ethical Decision Making into a Required Pharmacotherapy Class

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Introduction: Graduating pharmacists promise to hold themselves to the highest principles of the profession's moral, ethical and legal conduct. Despite the importance of ethics to the pharmacy profession, ethics is not always a topic of emphasis in pharmacy curriculums, leaving students unprepared and uncomfortable with identification and management of clinical ethical dilemmas.

Research Question or Hypothesis: Does teaching ethics principles and implementing ethical decision-making practice activities affect students' performance on ethics exam questions and comfort with identifying and addressing ethical situations in patient care?

Study Design: Prospective single cohort study with longitudinal survey

Methods: Students enrolled in an integrated pharmacotherapy course between January and April 2021 who consented were included. Ethics activities included lecture, discussion assignments, and multiple-choice questions on three exams. A pre- and post-survey included questions addressing student knowledge of ethical principles and comfort with ethical scenarios. The primary outcome was to determine the difference in ethics exam question scores between the first and last exams. Data was analyzed via Students t-test (primary outcome) and descriptive statistics.

Results: Eighty-eight primarily white (75.0%), female (61.4%) students aged 21-25 years (85.2%) and who had not previously taken an ethics course (70.5%) were included. Of two questions each on the first and last exams, students averaged 1.99 ± 0.11 and 1.50 ± 0.66 correct (mean difference -0.49, CI -0.35 to -0.62, $p<0.001$). Comparing pre- and post-survey total percent responses of somewhat or very comfortable regarding a) identifying and b) addressing ethical scenarios, 69.3% and 48.9% of students responding on the pre-survey increased to 96.3% and 94.4%, respectively, on the post-survey.

Conclusion: Despite declining exam scores, pre- and post-survey data suggest improved student comfort with ethics scenarios. Low exam scores may ensue from increasing complexity of other course content and limited repetition of didactic ethics content. Continued course modifications to weight ethics content more heavily may increase student prioritization of this material.

90 | Instruction of Continuous Glucose Monitoring in U.S. Pharm.D. Curricula

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Introduction: With increases seen in pharmacy benefit coverage of continuous glucose monitors (CGMs), pharmacists are now commonly educating patients on their utility upon dispensing. It is essential that pharmacy students are educated about these devices in the context of their diabetes education.

Research Question or Hypothesis: To what extent do Doctor of Pharmacy (Pharm.D.) programs in the United States (U.S.) provide CGM education?

Study Design: Cross-sectional survey study

Methods: An online Qualtrics survey was administered to 139 accredited U.S. Pharm.D. programs. The primary survey question asked if CGM education was provided. If yes, respondents were asked about the total number of contact hours, and year and type of courses in which the education was provided. Pharmacy faculty with diabetes expertise (defined by a credential such as Certified Diabetes Care and Education Specialist (CDCES) or Board Certification–Advanced Diabetes Management (BC-ADM) or who indicated diabetes-focused research or teaching) were identified for each program. A survey invitation was sent to these individuals, with follow-up e-mails and phone calls, two and four weeks later, respectively.

Results: A total of 57 programs responded (41% response rate). Fifty-one programs (89.5%) provided CGM education for an average of 2.2 hours (n=46, range: 0.1-30). Out of 48 programs providing detailed responses, 29 (60.4%) provided CGM education in required lectures, six (12.5%) in required labs, 22 (45.8%) in elective lectures, and 20 (41.7%) in experiential settings. Three programs (6.3%) provided CGM education in the first year, 21 (43.8%) in the second year, 28 (58.3%) in the third year, and 18 (37.5%) in the fourth year.

Conclusion: Most respondents provided CGM education, however, there is variation in total hours, timing, and type of course in which education is provided. Given the need to integrate this education into pharmacy curricula, future research should focus on optimal timing and methods for doing so.

91 | Sleep Quality Variances Among Students in an Accelerated Pharmacy Program

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Introduction: Literature evaluating sleep quality in pharmacy students is limited (AJPE 2015). A 2020 study identified significant correlations in pharmacy students between sleep quantity and memory but different styles of pedagogy were unconsidered. For fast-tracked pharmacy students, the correlation between specific stressors and sleep quality is nonexistent.

Research Question or Hypothesis: Do differences in sleep quality exist between classes within an accelerated pharmacy program, and are there correlating stressors affecting sleep quality?

Study Design: Prospective, quantitative study with surveys

Methods: An anonymous, voluntary survey was distributed to accelerated pharmacy students at William Carey University School of Pharmacy (WCUSOP). The survey collected demographics, information on various stressors, and assessed sleep quality using the Pittsburgh Sleep Quality Index (PSQI). The primary objective compared PSQI scores of classes and was evaluated with one-way ANOVA including descriptive statistics. The secondary objective tested the effects of demographics and stress factors on PSQI scores using a correlation matrix with GraphPad Prism. Chi-Square tested for differences in demographics. P-values <0.05 are statistically significant.

Results: Forty-seven students participated in the study. Mean PSQI scores were 6.33 vs 6.33 vs 6.45 for classes of 2021, 2022, and 2023, respectively (p=0.9951). Frequency of PSQI scores $\geq$5 was 67% vs 59% vs 64% (p=0.9142). Positive correlations exist between falling asleep in thirty minutes (r=0.7682), waking up at night (r=0.4404), using the restroom (r=0.3601) and sleep medications (r=0.6695), anxiety surrounding exams (r=0.3848), and the use of electronic devices prior to bed when compared with PSQI scores (p<0.05). Hours of sleep and PSQI scores were negatively correlated [r =-0.5834, CI -0.7457 to -0.3559, p<0.0001].

Conclusion: No differences in sleep quality were observed when comparing students in different graduating classes of WCUSOP, and correlations of specific stressors were identified as significantly affecting PSQI scores. Mitigation of these stressors and their effects on student outcomes should be further evaluated.

92 | Characteristics of Pharmacy Students who Prefer Online versus In-Person Learning

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Introduction: The demand for online learning is at its peak, yet the desire to maintain learning environments that benefit each student learner remains. Studies have been conducted to determine if learning environments affect performance, but few focused on individual student learning modalities. Learning discrepancies from disparate environments placed upon students with various characteristics need to be evaluated. Assessment can inspire scholarship of teaching and learning to optimize curriculum.

Research Question or Hypothesis: Do certain pharmacy student characteristics correlate with their learning environment preferences for activities conducted online or in-person?

Study Design: Prospective, quantitative, voluntary survey

Methods: An anonymous 85-item electronic survey was distributed to William Carey University School of Pharmacy students, classes of 2021 and 2022. The survey assessed students' preferred learning environments for curricular activities and characteristics related to sensory learning, managing distractions, and processing information. The primary objective used Kruskal-Wallis to evaluate student characteristics who prefer online versus in-person learning. The secondary objective used correlation matrix to identify associations between student characteristics and baseline demographics. Analysis used GraphPad Prism and descriptive statistics with statistical significance at p < 0.05.

Results: Sixty-seven responses were included. The primary objective revealed higher percentages of visual (72%), extroverted (54%), random-intuitive (54%), global (84%), and field-independent (84%) characteristics in students preferring in-person learning. Students preferring online learning had higher percentages of visual (86%), introverted (71%), concrete-sequential (71%), global (71%), and field-independent (86%) characteristics. The secondary objective revealed a statistically significant linear correlation between graduation year and both sensory learning (p=0.0353, CI 0.0186 to 0.4689, r=0.2577) and managing distractions (p=0.0227, CI 0.0405 to 0.4858, r=0.2780).

Conclusion: There appears to be characteristic trends among students, however, no statistically significant differences were found in characteristics of students who prefer online versus in-person learning. The relationship observed in the secondary objective suggests variability in class compositions that may assist faculty in development of optimal learning environments.

93 | Assessing Pharm.D. Faculty and Administrators' Knowledge and Attitudes Toward Environmental Sustainability

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Introduction: Healthcare is a significant contributor of waste and environmental pollution. Pharmacists are highly involved in all levels of patient care, and because much of our non-reusable or non-recyclable medical waste is medication-related, pharmacists are favorably positioned to impact this area.

Evidence exists that Pharm.D. Candidates are amenable to formal education on pharmaceutical waste, climate change, and sustainable practices. Despite student receptiveness toward environmental sustainability, no literature exists on how pharmacy educators and administrators engage with this topic.

Research Question or Hypothesis:

1. What is the state of perceived attitudes regarding environmental sustainability in pharmacy education and pharmacy practice among faculty and administrators?
2. What is the current state of environmental sustainability initiatives in pharmacy education?

Study Design: Observational survey study.

Methods: Our target cohort for our survey was current faculty of accredited U.S. colleges of pharmacy. Our sample was a nationally representative email listserv from the American Association of Colleges of Pharmacy (AACP) (n= 1068). The 28-question survey was built using both self-constructed questions and questions from validated surveys used previously in environmental sustainability research.

Results: There were 92 complete responses, yielding a 8.3% response rate

The majority of participants (63.1%), reported moderate or strong agreement that sustainability should be taught as a part of formal pharmacy curricula with 59.1% reporting that they would personally pursue additional education if given the opportunity. In contrast, only 4.3% of participants reported that their college offers a course on sustainability in the context of healthcare systems.

Regarding sustainability in pharmacy practice, only 28.9% agreed that pharmacy practice sites use the most environmentally sustainable approaches possible; however, 62.2% agreed that it would be moderately difficult or very difficult to move pharmacy practice to be more environmentally sustainable.

Conclusion: Pharmacy faculty and administrators believe there is room for growth in formal education and research regarding sustainability.

Emergency Medicine

94 | Comparative Effects of Benzodiazepines & Antipsychotics for Agitation in Elderly Patients in the Emergency Department

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Introduction: Agitation and hyperactive delirium are common presentations among geriatric patients in the emergency department (ED). Pharmacological treatments include benzodiazepines and antipsychotics, both of which carry warnings for use in geriatric patients.

Research Question or Hypothesis: Is there a difference in safety and effectiveness between benzodiazepines and antipsychotics for the management of severe agitation in geriatric ED patients?

Study Design: Multi-site, observational retrospective cohort study.

Methods: Patients aged ≥ 60 years who received either a benzodiazepine or an antipsychotic for agitation in the ED and admitted to the hospital between 7/2018 and 7/2020 were included. Patients were excluded if they received the agent for sedation during a procedure, alcohol withdrawal, seizures, headache, pain, anxiety, or nausea. Safety outcomes included respiratory depression and cardiovascular effects within one hour of medication administration. Effectiveness outcomes examined the need for additional medications and one-to-one observation. For comparisons, we used Chi-square or Fisher's exact test, with P value < 0.05 considered statistically significant.

Results: 684 patients were included in the analysis, with 437 receiving benzodiazepines and 247 receiving antipsychotics. Those who received benzodiazepines were more likely to need intubation (2.7% vs. 0.4%, p=0.031). There was no difference in use of non-invasive mechanical ventilation (0% vs 0.7%, p=0.19) or need for supplemental oxygen (8.1% vs 9.8%, p=0.45). There were no differences in the incidence of QT prolongation (16.7% vs 18.4%, p=0.82) or hypotension (6.9% vs 8.2%, p=0.52). Need for additional medication dosing was similar (19.8% vs 20.6%, p=0.81). There was a higher need for one-to-one observation in the antipsychotic group (93.1% vs 86.3%, p=0.007).

Conclusion: Those who received benzodiazepines for agitation were more likely to be intubated. There were no other significant differences in effectiveness and side effects. Risks and benefits of medication therapy should be considered on an individualized basis as there is currently limited data to support use of one agent over another.

95 | Assessment of Antibiotic Congruence During Transitions of Care Between Emergency Department and Medical Ward

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Introduction: The emergency department (ED) is a high antibiotic usage area. Currently, there is inadequate implementation of antimicrobial stewardship programs (ASP) within the ED throughout the United States. Limited studies have been conducted to assess the appropriateness of antibiotic administration within the ED, particularly in patients who are hospitalized from the ED. Additionally, there is no current literature evaluating congruence of antibiotics from the ED to hospitalization.

Research Question or Hypothesis: What is the rate of antibiotic congruency during transitions of care between the ED and hospital admission?

Study Design: This was a single-site, retrospective, observational study of adult patients who received any antibiotic in the ED and were subsequently admitted to an inpatient team between January 1, 2018 and December 31, 2018.

Methods: The primary outcome was the rate of congruence between antibiotics administered in the ED and immediately following hospitalization. Secondary outcomes included the rates of escalation, de-escalation, and discontinuation of antibiotics following hospitalization; congruence between ED and initial admitting team diagnoses; and congruence of ED and admitting team antibiotic regimens with clinical guidelines. Descriptive statistics including median, standard deviation, and percentages were used for all outcomes.

Results: Two hundred eligible patients were assessed. The ED and the initial antibiotic regimen following hospitalization were congruent in 83 patients (42.5%). Of the 117 patients who received incongruent regimens, antibiotics were escalated in 21 patients (17.9%), de-escalated in 64 patients (54.7%), and discontinued in 32 patients (27.4%). The ED and initial admitting team diagnoses were congruent in 131 patients (65.5%). The initial admitting team antibiotic regimen was congruent with clinical guidelines more often than the ED regimen (84.9% vs. 66.9%).

Conclusion: Antibiotic regimens in the ED and initially following hospitalization differ in the majority of patients. Admitting team antibiotic regimens followed guidelines more closely than ED regimens. This data supports the need for ASP implementation within the ED.

96 | An Electronic Survey Assessing Pre-hospital Ketamine Practices and Pharmacist Involvement in Pre-hospital Ketamine Protocol Development

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Introduction: Ketamine is a dissociative anesthetic with a variety of potential indications and dosing strategies in the pre-hospital setting. The versatility of ketamine offers an opportunity for clinical pharmacists to apply expert knowledge to optimize pre-hospital dosing protocols including this agent. However, current pre-hospital ketamine practices and pharmacist involvement in pre-hospital protocols are not well described.

Research Question or Hypothesis: This study quantified pre-hospital, protocolized ketamine practices and assessed pharmacist involvement in the development of pre-hospital protocols involving ketamine.

Study Design: International, electronic cross-sectional survey administered to emergency medicine pharmacists.

Methods: The 40-item survey was developed and distributed to members of the American College of Clinical Pharmacy (ACCP) Emergency Medicine Practice and Research Networks (EMED PRN) listserv.

Results: Overall, 21 pharmacists from the ACCP EMED PRN listserv completed the survey, 52.4% of which were employed at a non-profit community hospital. Of the respondents, 47.6% indicated that three or more of the Emergency Medical Services (EMS) organizations transporting to their institutions utilized protocols to direct pre-hospital use of ketamine. The most common method of administering ketamine for any indication was via the intramuscular route. However, the most frequently reported indication for ketamine was "excited delirium / agitation", using 1 or 2 mg/kg/dose, prepared as an undiluted IV syringe. The majority of pre-hospital protocols required patient-specific monitoring following ketamine administration. Ten respondents reported a patient encounter in which pre-hospital ketamine was a likely cause of an adverse patient event occurring upon hospital arrival. Only 38% of respondents affirmed involvement in the drafting, designing, or reviewing of EMS medication administration protocols involving ketamine.

Conclusion: Pre-hospital ketamine practices vary across EMS agencies. Less than half of the respondents reported pharmacist involvement in the development of pre-hospital protocols containing ketamine. Results indicate that pre-hospital protocol development is a potential area for clinical pharmacist collaboration.

97 | Implementation and evaluation of a pharmacist scoring tool in the emergency department

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Introduction: The emergency department (ED) is an unpredictable environment, leading emergency medicine pharmacists (EMPs) to depend on electronic medical record (EMR) review, overhead alerts, and communication from providers and nurses to prioritize patient care activities. Pharmacist scoring tools in the inpatient setting have been shown to reduce time to intervention; however, scoring tools for EMPs have not been studied. The objective of this study is to implement and evaluate a scoring tool to better identify pharmacist interventions in the ED.

Research Question or Hypothesis: We hypothesize that implementation of a scoring tool for EMPs will enhance activity prioritization, thereby increasing the total number of interventions.

Study Design: This was a single-center, retrospective, descriptive study at an urban academic medical center.

Methods: A steering team of EMPs and informatics pharmacists was formed to implement an EMP scoring tool. The tool utilizes rules that flag a specific priority score based on objective EMR data. The primary outcome was the total number of EMP interventions in the pre-implementation and post-implementation phases. Interventions were manually documented in the EMR via progress notes or intervention records. Secondary outcomes included intervention category and shift of the intervention; EMP staffing; NEDOCS score prior to intervention; ED length of stay; ED visits and admissions; and emergency response volumes.

Results: The EMP scoring tool was implemented in February 2021. EMP interventions were significantly higher in the post-implementation phase (509 vs. 622 interventions, p<0.001). Mean (±SD) daily ED visits were higher in the post-implementation phase (183 ±25 vs. 195 ±18, p=0.032); however, admissions and emergency responses were similar among both groups. The mean NEDOCS score was similar in both groups (138 ±47.3 vs. 130 ±40.6).

Conclusion: An automated, pharmacist-driven patient scoring tool was successfully implemented into the EMR. EMP interventions significantly increased in the post-implementation phase with similar ED admissions, emergency responses, and visits.

98 | Impact of Emergency Medicine Clinical Pharmacists (EMCPs) on Timing and Titration of Post-Intubation Sedation and Analgesia

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Introduction: The Society of Critical Care Medicine recommends adequate sedation and analgesia in patients receiving neuromuscular blockers. However, national estimates of Emergency Department (ED) patient visits in United States indicate less than 50% of patients are given post-intubation sedatives and analgesia.

Research Question or Hypothesis: Evaluate time from rapid sequence intubation (RSI) to sedation and analgesia initiation in the ED without and with an EMCP present.

Study Design: Retrospective, single center, chart review.

Methods: ED patients who received neuromuscular blockade for RSI were included. Primary outcome was difference in time from first induction medication to first sedative and analgesic medication. Secondary outcomes included post-intubation cumulative proportion of patients who received sedatives and analgesics at each 5-minute increment up to 30 minutes, and sedative and analgesic infusion rate titrations 0-30 minutes and 31-60 minutes. Comparisons were made with Wilcoxon Rank Sum and Chi-square analyses.

Results: A total of 100 patients were included (55 without EMCPs and 45 with EMCPs). There was a similar timing of sedation (13 vs 12 minutes, $p = 0.91$) and analgesia (47 vs 23 minutes, $p = 0.09$). No difference in the cumulative proportion of patients received post-intubation sedation was observed in the 5-minute increment of the first 30 minutes. Cumulative proportion of patients received sedative infusion rate increases at 0-30 minutes and 31-60 minutes post-intubation was 65% vs 52% and 95% vs 80% without and with EMCPs respectively ($p = 0.22$). Cumulative proportion of patients received analgesic infusion rate increases at 0-30 minutes and 31-60 minutes was 18% and 45% with EMCPs; analgesic titration did not occur without EMCPs.

Conclusion: There were no statistically significant differences in timing from RSI to post-intubation sedation and analgesia without and with EMCPs. Titration of analgesia was only observed in the presence of EMCPs.

99 | Sugammadex Administration Outside of Perioperative Settings: A Single-Center's Clinical Experience

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Introduction: Sugammadex is indicated for reversal of rocuronium or vecuronium neuromuscular blockade and used for postoperative recovery from anesthesia. Dose recommendations range from 2-16 mg/kg depending on the degree of neuromuscular blockade. Despite limited evidence to support its role and optimal dosing, sugammadex utilization outside the operative setting has increased. Sugammadex is often used following rapid sequence intubation (RSI) in non-operative areas, particularly in patients necessitating a timely neurologic exam.

Research Question or Hypothesis: This study evaluated the efficacy and safety of sugammadex when administered in the emergency department (ED) or intensive care unit (ICU).

Study Design: Single-center retrospective chart review.

Methods: This study included patients who received sugammadex for rocuronium reversal in non-operative settings over a six-year period. Patients receiving intra-operative neuromuscular blockade or any other neuromuscular blocking agent aside from rocuronium were excluded. Efficacy was defined as reversal of paralysis and determined through clinical documentation, train of four assessment, or change in Glasgow Coma Scale. Documented adverse effects to sugammadex were reviewed for the safety analysis. Descriptive statistics were reported and continuous variables were compared using Student T-test or Mann Whitney Rank Sum test, as appropriate.

Results: Thirty-eight patients were included and 50% received sugammadex in the ED setting. The primary indication for paralytic

was RSI in 37 (97.4%) patients and 32 (84.4%) patients were reversed for neurologic assessment. The median (IQR) dose of sugammadex was 3.5 (2.8-4.1) mg/kg administered 83.5 (54.3-134.3) minutes after rocuronium. Successful reversal was documented in 28 of 36 (77.8%) patients who had reversal efficacy documented. The remaining 8 patients had fatal neurologic injuries limiting efficacy assessment. No adverse events were noted.

Conclusion: Sugammadex 3-4 mg/kg was well tolerated and potentially effective for reversal of rocuronium 1-2 hours after paralysis in non-operative settings. Further studies are warranted to assess the full therapeutic potential of sugammadex outside of the perioperative settings.

100 | Location of Vasopressor Initiation in Septic Shock

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Introduction: Septic shock is a life-threatening infectious syndrome characterized by persistent hypotension despite fluid resuscitation. Urgent reversal of hypotension, restoration of perfusion pressures, and optimizing cellular oxygen utilization is paramount to prevent tissue ischemia and multi-organ dysfunction. Although vasopressors are used in this regard, there are insufficient data to guide optimal timing and location of initiation.

Research Question or Hypothesis: Does initiation of vasopressors in the emergency department for septic shock improve days alive and free from organ supportive therapy?

Study Design: This was a retrospective cohort study completed through electronic health record review. Cohort delineation was based on location of vasopressor initiation in the emergency department (ED) vs. intensive care unit (ICU).

Methods: Patients presenting to the Mayo Clinic Emergency Department, Rochester, MN from 2018-2020 with septic shock, using the Sepsis-3 definition, were included. Outside hospital transfers, delayed shock, and other shock syndromes were excluded. The primary outcome was a composite of days alive and free from vasopressors, mechanical ventilation, and renal replacement therapy at 28-days.

Results: A total of 56 patients were included with ED vasopressor initiation in 35 (62.5%) and ICU in 21 (37.5%) patients. There were no significant differences in baseline characteristics and all patients received fluid resuscitation and empiric antimicrobials. Days alive and free from organ supportive therapy was 26.6 vs. 24.9 days in the ED vs. ICU ($p = 0.35$). This was mainly driven by fewer days on mechanical ventilation (28 vs. 25.1 days, $p = 0.41$) and vasopressors (26.7 vs. 25.3 days, $p = 0.39$). Secondary outcomes of 24-hour net fluid balance, arrhythmias, shock control, and disposition did not differ between the groups.

Conclusion: In this study of septic shock patients, initiation of vasopressors in the ED did not result in a greater number of days alive and free from organ supportive therapy.

Endocrinology

101 | Sugar, Sugar: Evaluation of Insulin Requirements with Initiation of Glucagon-Like Peptide-1 Agonists and Sodium-Glucose Co-Transporter-2 Inhibitors

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Introduction: Glucagon-like peptide-1 agonists (GLP1a) and sodium-glucose co-transporter-2 inhibitors (SGLT2i) are newer classes of agents used in the treatment of Type 2 Diabetes Mellitus (T2DM) and may provide additional cardiorenal benefits. While there is currently some evidence that insulin dose should be reduced upon initiation of these agents, there is little real-world guidance supporting specific dose adjustments.

Research Question or Hypothesis: The purpose of the study is to describe the insulin adjustments made upon initiation of GLP1a and SGLT2i for T2DM patients in the ambulatory care setting.

Study Design: Multi-center, retrospective, cohort study.

Methods: Adults with T2DM initiated on a GLP1a or SGLT2i while on concomitant insulin therapy and managed by an ambulatory care pharmacist at time of initiation were included in the study. The primary endpoint measured the percent change in total insulin at different time points after initiation of agent. The secondary endpoints were discontinuation of sulfonylurea therapy at 6 months, frequency of HbA1c targets achieved (A1c <8%), change from baseline HbA1c, and adverse effect profile of the agents.

Results: Of the 150 patients included, 123 were initiated on a GLP1a and 27 on a SGLT2i. After 6 months of therapy, GLP1a initiation resulted in an 18.4% decrease ($p<0.001$) in insulin dosages while SGLT2i had a 6.5% increase ($p=0.95$). Of patients initially on a sulfonylurea, it was discontinued in 8/17 patients (47.1%) who were initiated on GLP1a and 4/5 patients initiated (80%) on SGLT2i. HbA1c targets were achieved in 72.4% of patients with GLP1a and 59.3% with SGLT2i. Absolute change in HbA1c was -1.7% for GLP1a and -1.5% for SGLT2i. Hypoglycemia occurred in 21.1% and 11.1% of patients started on GLP1a and SGLT2i, respectively.

Conclusion: GLP1a initiation provided a significant decrease in total insulin dose of 18% after 6 months, whereas total insulin requirements increased after SGLT2i initiation.

Family Medicine

102 | Improving Uncontrolled Hypertension and Diabetes through Population Health Pharmacist Recommendations

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TABLE 1 PHP Recommendation Sent and Implemented by PCPs

Pharmacist Recommendations SENT to PCP	
OVERALL NUMBER	47
Med optimization	60%
Change dose	13%
Add medication	6%
Switch medication	15%
Counsel patient: adherence/lifestyle	13%
Clarify medication/dose	13%
Care Coordination	40%
Reengage patient: appointment	23%
Reengage patient: labs/vitals	9%
Refer to healthcare professional	8%
PCP IMPLEMENTATION	
OVERALL % (implemented/sent)	66%
Med optimization	75%
Change dose	67%
Add medication	33%
Switch medication	57%
Counsel patient: adherence/lifestyle	100%
Clarify medication/dose	100%
Care Coordination	53%
Reengage patient: appointment	55%
Reengage patient: labs/vitals	50%
Refer to healthcare professional	50%

Introduction: Population health pharmacists (PHPs) can play an important role in providing medication-related recommendations to primary care providers (PCPs) to achieve hypertension/diabetes control.

Research Question or Hypothesis: What types of PHP recommendations were made and implemented by the PCPs and what was the clinical impact of implemented recommendations?

Study Design: Retrospective chart review

Methods: A centralized PHP performed targeted medication reviews between 9/2019-11/2019. The PHP electronically sent recommendations to the PCPs who reviewed the recommendations for implementation into patients' care plans.

Eligible patients had both uncontrolled hypertension (systolic blood pressure (BP) between 140-150 mmHg) and uncontrolled diabetes (A1c between 9%-10%). A registry report identified 41 patients at the start of the project.

Results: Table 1 shows 60% of PHP recommendations were for medication optimization and 40% were for care coordination. Of the 47 recommendations sent, 66% were implemented by the PCP, 4% were not implemented, and 30% were still pending at least a month later.

Eight patients had an updated A1c and 6 patients had an updated BP when data collection stopped. Average A1c went from 9.5% to 8.6% within 3 months and average systolic BP went from 146 to 132 mmHg.

Conclusion: PHPs identify appropriate recommendations to optimize medications, as well as identify high-risk patients that require care coordination/reengagement to achieve better control of hypertension/diabetes.

103 | Family medicine physician comfort with screening, diagnosing, and treating substance use disorders

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Introduction: U.S. medical education does not mandate substance use disorder (SUD) curricula despite primary care, including family medicine, being well-positioned to provide care to some of the nation's most underserved, vulnerable populations including patients with SUD. Between 2012-2014, only 26% of opioid overdose survivors in Massachusetts had been dispensed buprenorphine, naltrexone, or methadone within 12 months of overdose. A survey of family medicine physicians identified stigma and lack of adequate training and continuing education as major barriers to providing SUD treatment with buprenorphine. However, access to consultation with an experienced provider may increase willingness to prescribe buprenorphine.

Research Question or Hypothesis: We hypothesize that attendings will demonstrate higher comfort levels and knowledge in screening, diagnosing, and treating SUD than residents.

Study Design: Descriptive survey

Methods: Family medicine attendings and residents were recruited to complete an electronic survey to gauge comfort and knowledge of SUD management. Secondary outcomes included comfort with specific SUD treatments.

Results: Overall response rate was 52.7% (n=38), residents 69.2% (n=18), and attendings 43.5% (n=20). There were no differences between attendings and residents in SUD knowledge and comfort. Most respondents (94.7%) felt patients with SUD are best treated by interprofessional teams. Less than half of respondents knew appropriate screening and diagnostic tools for common SUDs (47.3%) or differences in SUD screening and treatment in special populations (7.9% and 28.9%, respectively). Despite only 39.4% of respondents feeling confident managing patients with opioid use disorder (OUD), 60.5% felt they can help someone manage OUD. Respondents were most comfortable with non-pharmacological SUD treatment like counseling, Narcotics Anonymous, and inpatient and outpatient psychiatry. Respondents were most comfortable with ibuprofen, naloxone, dicyclomine, and sublingual buprenorphine/naloxone for treating SUD.

Conclusion: Family medicine attendings and residents demonstrated similar rates of low comfort and knowledge in SUD treatment which may demonstrate a need for additional education and training including incorporation of clinical pharmacists into interprofessional teams.

104 | Assessing Primary Care Team Perceptions of an Interprofessional Diabetes Intervention in an Academic Family Medicine Setting: A Mixed-Methods Study

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Introduction: Primary care practices are facing pressure to meet quality metrics in value-based models. Suboptimal number of patients reach their diabetes-related goals, with one attribution being a lack of optimized pharmacotherapy. Clinical pharmacist services in the interprofessional setting can be utilized to ensure appropriateness, effectiveness, safety, and tolerability of diabetes medications.

Research Question or Hypothesis: To assess perceptions and outcomes of implementing an interprofessional diabetes-focused intervention in an academic family medicine setting.

Study Design: Mixed methods utilizing a 75-item provider evaluation survey supported by a retrospective, interventional, controlled cohort study utilizing pre- and post-intervention data.

Methods: A 75-item survey was used to engage providers involved in the service to obtain feedback and perceptions. The study utilized a retrospective chart review to determine the impact of a pharmacy team's diabetes-focused interprofessional intervention. The intervention group was matched 1:1 to a control group to detect effectiveness of the intervention based on age, gender, and pre-intervention A1C. Analysis included descriptive statistics with paired t-tests for continuous data.

Results: A total of 17 provider responses (61%) were collected. Twelve (70.6%) agreed that interventions by the pharmacy team were an effective way to adjust pharmacotherapy regimens. All respondents agreed that interprofessional collaboration had a positive impact on their patients. Patients (N=226) were intervened with matching controls. A total of 241 (71%) pharmacist recommendations were approved and implemented. Pre-A1C values for intervention and control are Intervention:8.6±1.9%; Control:8.5±1.7%. Statistical differences were seen in mean reductions for Pre and Post A1C values for each group (Intervention:0.45;CI:0.18-0.71; p<0.0012; Control:0.51;CI:0.20-0.82;p<0.0015). Intervention group patients in comparison were on less metformin (Intervention:17%; Control:73%) and more DPP4i's (Intervention:16%; Control:5%) to control.

Conclusion: Integration of an interprofessional diabetes-focused intervention in an academic family medicine setting proved efficient and impactful. Further research is needed to measure practice wide impact of intervention.

105 | Chronic Care Management Effort and Revenue by Pharmacists and Student Pharmacists Compared to other Health Care Professionals in a Family Medicine Clinic

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Introduction: Chronic care management (CCM) is a billable patient care service for Medicare patients with ≥2 chronic conditions who reside in the community setting. Pharmacists are often members of the CCM care team in ambulatory clinics. The relative contribution of pharmacists to CCM billing in comparison to other team members is not well described.

Research Question or Hypothesis: What is the CCM work effort and billing revenue for clinical pharmacists in a Family Medicine clinic relative to other CCM team members?

Study Design: A retrospective analysis of CCM care team billing in a Family Medicine clinic from 7/1/17 to 6/30/20.

Methods: A timer embedded within the clinic electronic health record (EHR) recorded each minute of CCM care provided. Clinic staff who provided CCM care were categorized according to work position. The number of work-months was calculated for each job category. CCM revenue was apportioned according to the amount of CCM time recorded for each category.

Results: Clinic work categories included: clinical pharmacists (N=2), pharmacy residents (N=3), student APPE pharmacists (N=31), faculty physicians (N=7), resident physicians (N=37), RN/CMA (N=18), and other (N=15). There were a total of 6085 CCM service hours recorded which resulted in 5959 claims submitted. Total net CCM revenue was $228,917. Total net CCM revenue per category was: clinical pharmacists ($21,673), pharmacy residents ($4,988), student APPE pharmacists ($9,931), faculty physicians ($18,676), resident physicians ($27,188), RN/CMA ($103,489), and other ($42,971). Total net CCM revenue per work-month was: clinical pharmacist ($301), pharmacy resident ($139), pharmacy APPE student ($279), faculty physician ($100), resident physician ($41), RN/CMA ($278), and other ($92). Clinical pharmacists, pharmacy residents, and pharmacy APPE students were responsible for 16% of clinic CCM revenue despite contributing only 7.8% of total clinic work-time.

Conclusion: Clinical pharmacists and student APPE pharmacists make significant contributions to ambulatory clinic CCM billing. Clinical pharmacists generated more CCM revenue per work-month than other work positions.

Gastroenterology

106 | Evaluation of the impact of vitamin K administration on elevated international normalized ratio in chronic liver disease

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Introduction: Limited studies assess the efficacy of vitamin K administration in patients with chronic liver disease (CLD). However, vitamin K is commonly used to treat international normalized ratio (INR) elevations in these patients with the intention to reduce bleeding risk.

Research Question or Hypothesis: What is the impact of vitamin K administration on INR in patients with CLD?

Study Design: Retrospective cohort study

Methods: Patients ≥ 18 years with a diagnosis of CLD and receipt of vitamin K between 9/1/2009 and 10/31/2020 were included. Patients receiving anticoagulation or fresh frozen plasma surrounding time of INR monitoring were excluded. The primary outcome was absolute change in INR from baseline to 24-48 hours after last vitamin K administration. Secondary endpoints included subgroup analyses of the primary outcome by route of administration and single versus multi-dose administration, incidence of in-hospital venous thromboembolism (VTE), and incidence of in-hospital major bleeding. Statistical analysis included Fisher's exact for categorical data and Student's t-test for continuous data.

Results: Eighty-five patients were included. The majority of patients were males (71.8%) with Child-Pugh class C (76.5%) and a baseline INR of 1.9 ± 0.5. Most common routes of vitamin K administration included oral (72%) and intravenous (26%) with a mean daily dose of 8.5 ± 2.3 mg. The absolute change in INR was -0.07 ± -0.35 following vitamin K administration. There was no difference in absolute INR change between single versus multiple-dose administration (-0.16 ± -0.35 and -0.03 ± -0.35; p=0.08) or between oral versus intravenous administration (-0.06 ± -0.23 and -0.18 ± -0.48; p=0.13). The incidence of in-hospital VTE and major bleeding were 2.4% and 3.5%, respectively.

Conclusion: Administration of vitamin K in patients with CLD resulted in minimal INR change, suggesting this intervention may not have the intended benefit of reducing bleeding risk. Larger studies are needed to evaluate the impact of vitamin K on clinical outcomes.

Geriatrics

107 | An urban expansion of the SAFE-HOME program: a naloxone awareness initiative for older adult home health workers

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Introduction: Between 1995-2010, opioid prescribing for older adults increased 9-fold. Opioid overdose and mortality can be mitigated with naloxone. The SAFE-HOME Naloxone Awareness Initiative pilot program utilized home health care coordinators in rural settings to effectively educate older adults prescribed opioids on safe access and use of naloxone. This project represents an urban expansion of the SAFE-HOME program to prepare home health workers to educate older adults on opioid risks, opioid overdose, and life-saving naloxone.

Research Question or Hypothesis: We hypothesize that synchronous online educational sessions will increase home health workers' knowledge of the risks of opioids, signs and symptoms of opioid overdose, and the benefits of naloxone.

Study Design: Prospective, interventional cohort design

Methods: Home health workers were recruited from the Coordinated Care Alliance, a statewide network of community-based organizations in Illinois that provide coordination and care transition support to at-risk populations, to attend a 60-minute synchronous virtual educational session on risks of opioids in older adults, signs and symptoms of opioid overdose, and benefits and access to naloxone. Outcomes included baseline knowledge level and change in knowledge level post-education measured via pre-developed knowledge questionnaire in a repeated measure model. Utilizing SPSS v26, paired and independent t-tests were used for paired and unpaired pre- and post-knowledge assessments to evaluate the difference in scores pre- and post-intervention.

Results: Six educational sessions for a total of 154 participants. The average pre- and post-education knowledge levels were 62.3% (n=107) and 85.0% (n=81), respectively. Of the 69 participants who completed both pre- and post-questionnaires, the average change in score was +19.6% (p<0.00001). At baseline, home health workers were competent on opioid risks, but lacked knowledge on naloxone access, use, and legal ramifications.

Conclusion: Providing educational sessions to home health workers effectively increases their opioid and naloxone knowledge in preparation for educating their older adult patients.

108 | Utilization of the Polypharmacy VIONE Tool for Deprescribing in Geriatric Veterans

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Introduction: VIONE (**V**ital, **I**mportant, **O**ptional, **N**ot indicated, **E**very medication has an indication) is a deprescribing tool created at the Central Arkansas Veterans Affairs (VA) to help clinicians decrease polypharmacy and potentially inappropriate medication use among older

adults, as they are at an increased risk of experiencing medication-related problems. Results from this study may support VIONE as a standardized approach for pharmacists to successfully reduce polypharmacy in this high-risk population.

Research Question or Hypothesis: How does VIONE impact deprescribing in geriatric veterans seen for primary or palliative care at the Phoenix VA Gold Clinic?

Study Design: Single-center, retrospective, quality improvement project.

Methods: Patients were offered the opportunity to undergo deprescribing with VIONE if age 65 years or older, on at least 15 medications, and seen for primary or palliative care at the Phoenix VA Gold Clinic between November 1, 2019 and February 28, 2021. Data for deprescribed medications and notes documented with VIONE are stored in a national dashboard and were exported to an Excel spreadsheet for retrospective analysis. Outcomes assessed include number and types of medications deprescribed, reasons for deprescribing, and annualized cost avoidance. Descriptive statistics were used for data analysis.

Results: 252 patients underwent deprescribing with VIONE and 771 medications were deprescribed. Mean age was 80 years (SD 8), 244 (96.8%) were male, and 181 (71.8%) were Caucasian. Top deprescribed drug classes were vitamins/supplements (15.0%) and antihypertensives (10.2%). Most common reasons for deprescribing were patient reported no longer taking (51.4%) and medication not indicated (25.3%). Total estimated annualized cost avoidance was $181,951.37, with a median of $29.35 (IQR 10.95-102.20).

Conclusion: The VIONE deprescribing tool is effective in reducing polypharmacy in geriatric veterans seen in outpatient primary and palliative care settings. Additional studies are needed to assess the tool's impact in other healthcare settings and older adult populations.

109 | Impact of Comprehensive Geriatric Assessment (CGA) on Anticholinergic Cognitive Burden (ACB) Scores in Older Adults with Cognitive Symptoms

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Introduction: Comprehensive Geriatric Assessment (CGA) is an interprofessional intervention designed to optimize care for elderly patients. Pharmacists can help improve patient outcomes by participating in medication optimization during CGA. Despite a large body of literature surrounding negative effects of anticholinergic medications in the elderly, utilization rates remain high. Limited research has explored the effect of CGA on anticholinergic burden in patients with cognitive symptoms.

Research Question or Hypothesis: Do patients with cognitive symptoms who undergo Comprehensive Geriatric Assessment experience a decrease in anticholinergic burden?

Study Design: Single center retrospective chart review.

Methods: All patients who received a CGA at Nebraska Medicine Geriatric Assessment Clinic between 1/1/2018 and 6/30/2019 were eligible. Electronic medical records were used to gather patient medication information before and after CGA. Anticholinergic burden scores were calculated using the Anticholinergic Cognitive Burden (ACB) Scale. Changes in ACB scores before and after CGA were evaluated with paired t-tests. Associations between age, gender, residence, medication administration, cognitive diagnosis, and total medication count prior to CGA with ACB changes were evaluated with linear regression.

Results: The study included 264 patients. The mean (SD) ACB score change after CGA was -0.9962 (1.8678) ($p<0.001$). The mean (SD) ACB score change seen in female patients was greater compared to male patients, -1.1582 (0.1507) vs. -0.6782 (1.5211) ($p<0.05$), respectively. ACB scores decreased by 0.10970 points for each additional medication on the pre-CGA medication list ($p<0.001$). Gender and number of medications prior to CGA were significant predictors of ACB score changes.

Conclusion: This study showed that CGA decreased anticholinergic burden as described by the ACB Scale in elderly patients with cognitive symptoms seen at Nebraska Medicine Geriatric Assessment Clinic. Female gender and higher number of total medications prior to CGA were associated with larger reductions in ACB scores. Reduction in anticholinergic side effects may contribute to improved outcomes in this population.

110 | Asthma Medication Adherence and Utilization in Medicare-Enrolled Older Adults Before and During COVID-19: An Observational Analysis of a Medication Therapy Management Cohort

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Introduction: Medication adherence and prescribing among Medication Therapy Management (MTM)-eligible older adults with asthma have not been well studied.

Research Question or Hypothesis: Was adherence among older adults affected by the COVID-19 pandemic? What patient characteristics and medications are associated with adherence and asthma exacerbations?

Study Design: Retrospective observational cohort.

Methods: MTM-eligible older patients with asthma diagnoses were included. Patients with chronic obstructive pulmonary disease were excluded. Proportion of days covered (PDC) determined adherence. High adherence was defined as PDC ≥80%. Medication adherence during January-July 2019 and January-July 2020 was compared. Conditional logistic regression assessed relationships between characteristics and medication use with high adherence to inhaled corticosteroids (ICS) and asthma exacerbations.

Results: Total of 2320 patients studied; 497 were with moderate and 156 with severe asthma. In 2019, proportions were low of

patients with high adherence to controller medications with moderate (38-54%) and severe asthma (46-63%). In 2020, proportions remained low of patients with high adherence with moderate (30-49%) and severe asthma (46-65%). High adherence was associated with higher number of prescribers (Odds Ratio: (OR) 1.4-1.75, p≤0.04), increasing days-supply of systemic corticosteroids (OR: 1.33-1.44, p≤0.03), long-acting-beta-agonists (LABA) use (OR: 1.65, p<0.001) and montelukast (OR: 1.25, p=0.04). Among patients with moderate and severe asthma, high adherence to ICS was associated with asthma exacerbations and LABA use. In this same cohort, exacerbations were associated with increasing short-acting-beta-agonists (SABA) dispenses (OR: 1.62-2.47, p≤0.02) and albuterol nebulizer use (OR: 2.25, p<0.001).

Conclusion: Asthma medication adherence among older adults with moderate and severe asthma was alarmingly low in 2019 and remained low during the COVID-19 pandemic in 2020. Asthma exacerbations among these patients were associated with SABA fills and albuterol nebulizers. MTM programs can electronically identify suboptimal medication use by utilizing these findings to improve outcomes among patients with asthma.

Health Services Research

111 | Effect of an integrated pharmacy and primary care collaborative transition of care program on healthcare utilization

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Introduction: Pharmacist-led transitions of care (TOC) services have emerged as an important step in the care continuum. Currently, limited literature exists evaluating the impact of pharmacist TOC interventions for high-risk patients in primary care settings.

Research Question or Hypothesis: We hypothesize that a pharmacist TOC intervention will be associated with reduced healthcare utilization.

Study Design: Pragmatic clinical trial including three primary care practices randomized (1:2) to the intervention and usual care groups between 2019 to 2021.

Methods: Eligible patients were ≥18 years of age who were at high risk of readmission and being seen at participating primary care clinic. The intervention was multifaceted including comprehensive medication review and direct provider/patient follow-up. Primary outcome was composite rate of unplanned, all-cause hospital readmissions or ED visits within 30 days after discharge. Secondary outcomes included 30-day all-cause hospital readmissions, clinically-related readmissions, and ED visits. Logistic regression models were used to evaluate the relationship between intervention assignment and outcomes, adjusting for relevant baseline characteristics (SPSS Version 27).

Results: A total of 244 subjects were recruited including 209 controls and 35 intervention subjects. 136 recommendations were provided with an 88% acceptance rate. At 30 days post-discharge, 6 (17%) of the subjects in the intervention group experienced a readmission or ED visit compared with 43 (21%) subjects in usual care group (adjusted odds ratio [aOR]: 0.69, 95% CI, 0.26-1.86, p=0.47). No significant differences were found in all-cause readmissions (Int: 14.3% vs. Cont: 13.4%; aOR, 0.93; 95% CI, 0.32-2.70; p=0.89), clinically-related readmissions (5.7% vs. 12%; aOR, 0.39; 95% CI, 0.09-1.77; p=0.22) or ED visits (2.9% vs. 9.1%; aOR, 0.323; 95% CI, 0.04-2.61; p=0.29).

Conclusion: Pharmacist TOC intervention integrated into primary care was not associated with a decrease in overall healthcare utilization. The program did seem to reduce clinically-related readmissions and ED visits, although not significantly, which may support focusing future interventions.

Hematology/Anticoagulation

112 | Measuring the Impact of a Pharmacist-directed Blood Factor Education Program

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Introduction: Pharmacist-driven blood factor stewardship programs have demonstrated significant clinical and cost benefits in the management of bleeding disorders. Dedicated education is a cornerstone of stewardly practices since bleeding disorders are not routinely taught in pharmacy school and residency training. We sought to gain insight into and improve pharmacist competency and comfort with bleeding disorders and factor management through the implementation of an education program at a large non-profit health system with a designated Hemophilia Treatment Center (HTC).

Research Question or Hypothesis: An educational video series and institutional factor guide will enhance pharmacist competency and comfort with blood factor concentrates.

Study Design: Single institution, prospective interventional

Methods: A pre-program survey was administered to pharmacists within our institution. Following survey completion, pharmacists were assigned a series of six short education videos. Topics covered included pathophysiology and management of bleeding disorders, factor product overviews, inhibitors, and the pharmacist's role in factor stewardship. Pharmacists were provided a factor management guide to reference as they complete the education modules. Following the

completion of the education program, pharmacists were assigned a post-program survey.

Results: 382 pharmacists were screened for inclusion, 168 either withdrew consent for participation or did not complete both surveys, and 214 were included in the final analysis. The mean score of the competency assessment significantly improved from 52.83% to 78.33% ($p<0.0001$), with 99% of participants having any degree of improvement. Participants indicated significant improvement in all measures of confidence in bleeding disorders and product verification.

Conclusion: Many pharmacists may not be confident or comfortable with bleeding disorders and working with blood factor concentrates. Providing pharmacists with a series of short educational program on bleeding disorders and blood factor improves competency and comfort on these topics. Such an education program will be beneficial for pharmacist-provided care and is a measure institutions should implement as part of factor stewardship initiatives.

113 | An Evidence-Based Protocol for Warfarin Reversal for Hospitalized Medicine Patients Undergoing an Invasive Procedure or Surgery

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Introduction: It is not uncommon for hospitalized patients receiving warfarin to require an invasive or surgical procedure necessitating anticoagulation reversal. Precision vitamin K_1 dosing strategies are critical as inadequate reversal may result in procedure delays, while excessive reversal may lead to difficulty with warfarin re-initiation and risk for complications of VTE or stroke. The lack of an evidence-based guideline for warfarin reversal in this setting has led to a wide variety of vitamin K_1 and blood product prescribing practices.

Research question: Does a novel standardized periprocedural INR reversal protocol effectively attain INR targets for hospitalized medicine patients requiring non-emergent procedures or surgeries?

Study design: Retrospective chart review

Methods: Patients hospitalized between April 1st, 2018 to December 31st, 2018 (pre-implementation cohort) and between February 14th, 2019 and June 21st, 2019 (post-implementation cohort) and administered vitamin K_1 for warfarin reversal prior to non-emergent procedures and surgeries were reviewed. The primary end point was number of procedures delayed due to elevated pre-procedural INR. Secondary outcomes included administration of a repeat vitamin K_1 dose, percent of pre-procedural INRs at desired goal, and time from vitamin K_1 administration to procedure.

Results: 57 patients were included in the chart review, 25 patients in the pre-implementation cohort and 32 patients in the post-implementation cohort. Five (20%) procedures were delayed due to insufficient INR reversal in the pre-implementation cohort, whereas none were delayed in the post-implementation cohort. Seven (28%) patients were given a repeat vitamin K_1 dose versus 4 (13%) in the pre- and post-implementation cohorts, respectively. More patients were at pre-procedural goal INR in the post-implementation cohort (32% vs 50%) upon first check. Average time from vitamin K_1 administration to procedure was 31 hours.

Conclusions: An evidence-based protocol successfully reversed pre-procedural INRs to goal without delaying time to procedure. Lower doses of vitamin K_1 were shown to be effective in lowering INR to pre-procedural goal.

114 | Impact of a Pharmacist-to-Dose Direct Oral Anticoagulant Protocol on Medication Errors at an Academic Medical Center

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Introduction: Direct oral anticoagulants (DOACs) are considered high-risk medications and pose a serious threat to patients if mismanaged. Medication error rates involving DOACs in the acute care setting range from 25-40%. To reduce medication errors we implemented a pharmacist-driven DOAC protocol at our academic medical center that permitted pharmacists to independently manage DOACs pursuant to a consult order.

Research Question or Hypothesis: What is the impact of a pharmacist-driven DOAC protocol on DOAC-related medication errors?

Study Design: This was a retrospective, single-center cohort study.

Methods: Patients 18 years and older were screened during a 6-month period before (07/2018 - 12/2018) and after (01/2020 - 06/2020) implementation of the protocol. Patients were included if they were receiving a DOAC for atrial fibrillation and/or treatment or prevention of venous thromboembolism. All other indications were excluded. Patients meeting inclusion criteria were then screened for errors in dosing, drug interactions, incorrect timing or transitioning of anticoagulants, or duplications in therapy. The primary outcome was the difference in patients administered at least one DOAC-related medication error before (pre-phase) and after (post-phase) implementation of the protocol. Chi-square test was used to assess the primary outcome.

Results: A total of 502 patients were included in the study (pre-phase=256; post-phase=246). In total, 12.5% (N=63) of patients were administered a DOAC-related medication error. The most common errors were underdosing (N=31) and incorrect timing of administration (N=10). Errors occurred in 41 patients in the pre-phase and 22 patients in the post-phase (16% v 8.9%; relative risk reduction 44%; $p = 0.017$).

Conclusion: The implementation of a pharmacist-driven DOAC protocol was associated with a significant reduction in DOAC-related medication errors. These findings highlight the impact of a protocolized approach to DOAC management, as well as the role of pharmacists in overseeing appropriate DOAC usage and reducing medication errors.

115 | Evaluation of a patient specific, targeted-intensity pharmacologic thromboprophylaxis protocol in hospitalized patients with COVID-19

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Introduction: Patients with COVID-19 are at higher risk of thrombosis due to the inflammatory nature of their disease. A higher-intensity approach to pharmacologic thromboprophylaxis may therefore be warranted.

Research Question or Hypothesis: Does a patient specific, targeted-intensity pharmacologic thromboprophylaxis protocol incorporating severity of illness, weight, and biomarkers decrease incidence of thrombosis in hospitalized patients with COVID-19?

Study Design: Retrospective cohort study

Methods: This study evaluated hospitalized patients with COVID-19 receiving thromboprophylaxis within 48 hours of admission. Exclusion criteria included receipt of therapeutic anticoagulation prior to or within 24 hours of admission, history of heparin-induced thrombocytopenia, extracorporeal membrane oxygenation, pregnancy, or incarceration. Per-protocol patients received thromboprophylaxis according to the institutional protocol involving escalated doses of anticoagulants based on severity of illness, total body weight, and biomarker thresholds. The primary outcome was thrombosis. Key secondary outcomes included major bleeding, mortality, and identification of risk factors for thrombosis.

Results: Of 1189 patients screened, 803 were included in the final analysis. The median age was 54 (42-65) and 446 (55.5%) were male. Patients in the per-protocol group experienced significantly fewer thrombotic events (4.4% versus 10.7%, p=0.002), less major bleeding (3.1% versus 9.6%, p<0.001), and lower mortality (6.3% versus 11.8%, p=0.02) when compared to patients treated off-protocol. Significant predictors of thrombosis included mechanical ventilation and male sex. Post-hoc regression analysis identified mechanical ventilation, major bleeding, and D-dimer ≥ 1500 ng/mL FEU as significant predictors of mortality.

Conclusion: A targeted pharmacologic thromboprophylaxis protocol incorporating severity of illness, body weight, and biomarkers appears effective and safe for preventing thrombosis in patients with COVID-19.

116 | Impact of Pharmacists Led Anticoagulation Clinic Versus Physicians on Efficacy and Safety of Thromboembolic Disorder Management in Saudi Arabia Tertiary Care Hospital

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Introduction: Oral anticoagulants are the mainstay for the treatment and prevention of thromboembolic disorders. However, the safety and efficacy depend on optimal control and monitoring of anticoagulation therapy.

Many studies assessed the role of pharmacists versus physicians in the management of anticoagulation clinics, which demonstrated improvement in clinical outcomes.

Research Question or Hypothesis: The pharmacist-led anticoagulation clinic will improve the safety and efficacy of anticoagulant therapy compared with the physician.

Study Design: A single-center, retrospective cohort study was conducted on King Faisal Specialist Hospital and Research Center- Jeddah.

Methods: All adult patients who attended the anticoagulation clinic between March 2018 and March 2020 on Warfarin, Apixaban, and Rivaroxaban were considered for the study.

The primary endpoints include the percentage of INRs within the therapeutic range (%TTR) for warfarin therapy and the percentage of patients with appropriate DOAC therapy. The secondary endpoints include the percentage of time the INR in the range,major bleeding, or thrombosis events that lead to ER visits or hospital admission.

Results: A total of 264 patients were included. The percentage of TTR was 62 % for the pharmacist group and 70 % for the physician group (P =0.073). The appropriateness of DOAC therapy, including appropriate indication, dose, and duration, was similar between the two groups (p= 0.527, p= 0.555, and p=0.627). However, reporting of minor bleeding and drug interaction was significantly higher in the pharmacist group due to better documentation and use of standardizing notes (12.3 % vs. 2.7%, p< 0.001) and (30.6% vs. 12.2%, p= 0.004), respectively. In addition, more frequent visits characterized the pharmacist group compared with physicians (25.3% vs. 4.5%, p<0.001). As a result, the mean INR level less fluctuated in the pharmacist group.

Conclusion: The pharmacist-led anticoagulation clinic was as effective as the physician. However, the pharmacist has less INR fluctuated and better documentation with higher drug interaction and minor bleeding reporting.

117 | Evaluation of outcomes with apixaban use for venous thromboembolism in hospitalized patients with end-stage renal disease receiving renal replacement therapy

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Introduction: Direct oral anticoagulants (DOACs) have revolutionized anticoagulation therapy over the past decade. While apixaban received expanded labeling for atrial fibrillation for patients with end-stage renal disease (ESRD) based on pharmacokinetic studies and a few clinical outcomes trials, little data exists regarding the use of DOACs in ESRD patients requiring renal replacement therapy (RRT) for venous thromboembolism (VTE). It is important to evaluate clinical outcomes in this distinct, but not uncommon, patient population.

Research Question or Hypothesis: What is the risk for major bleeding in patients with ESRD on RRT and receiving apixaban for VTE?

Study Design: Retrospective, descriptive cohort study conducted at a tertiary academic medical center between May 2016 and September 2020.

Methods: Adult patients with ESRD on RRT and with a VTE diagnosis receiving apixaban prior to or during admission were included. The primary endpoint was major bleeding events within 72 hours of last apixaban dose administration. Data analysis was performed using descriptive statistics.

Results: A total of 68 patients were included in the final analysis. Major bleeding events occurred in 9 of 68 (13.2%) patients receiving apixaban within the last 72 hours. Recurrent thrombosis occurred in 5 of 68 (7.4%) patients receiving apixaban. Forty-one (60%) patients were receiving a non-FDA approved apixaban dosing regimen for treatment or prevention of VTE.

Conclusion: Compared to clinical trials for FDA approval, this descriptive study found an increased risk of major bleeding in patients receiving apixaban for VTE with concurrent ESRD on RRT, which occurred regardless of the dose. Therefore, use of apixaban for VTE in this patient population requires shared decision-making, especially when there is no contraindication to warfarin.

118 | Examination of the effectiveness of direct oral anticoagulants in comparison to warfarin in an obese population

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Introduction: Literature is limited regarding the use of a direct oral anticoagulant (DOAC) in patients with a body mass index (BMI) ≥ 40 kg/m^2. Warfarin is currently recommended in patients with class III obesity or a weight > 120 kg; however, DOACs are commonly prescribed in this patient population.

Research Question or Hypothesis: Are DOACs as effective compared to warfarin in an obese population?

Study Design: Retrospective cohort study

Methods: Following IRB approval, patients with a diagnosis of deep vein thrombosis (DVT), pulmonary embolism (PE), or atrial fibrillation and a BMI ≥ 35 kg/m^2 from August 1, 2015 – August 1, 2020 were included. Patients receiving a DOAC were matched in a 1:2 ratio to warfarin. The primary outcome was a composite of recurrent DVT, PE, or stroke. Secondary outcomes included the individual components of the primary outcome, hospitalization for bleed, and the primary outcome in patients with a BMI ≥ 40 kg/m^2. Statistical analysis included Fisher's exact for categorial data and Student's t-test for continuous data.

Results: A total of 162 patients were included, with 54 and 108 in the DOAC and warfarin groups, respectively. Baseline BMI was similar between groups (45.7 kg/m^2 for DOACs vs. 43.8 kg/m^2 for warfarin) with approximately 70% of patients having a BMI ≥ 40 kg/m^2. The primary outcome occurred in one patient (1.9%) in the DOAC group and two (1.9%) in the warfarin group. The DOAC group had a higher, nonsignificant incidence of bleeding (5.6% vs. 1.9%, p=0.33). There was no difference between groups in incidence of DVT, PE, or stroke in patients with a BMI ≥ 40 kg/m^2.

Conclusion: DOACs may be as efficacious as warfarin in the prevention of recurrent DVT, PE, or stroke in patients with a BMI of ≥ 35 kg/m^2. Prospective, randomized trials are warranted to further assess the efficacy and safety of DOACs in obese patients

119 | Evaluation of Anti-Xa Level Monitoring in Hospitalized COVID-19 Patients on a Targeted-Intensity Thromboprophylaxis Protocol

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Introduction: COVID-19 patients are at increased risk of VTE. It is unclear if adjusting anticoagulant prophylaxis is beneficial. This study

aimed to evaluate anti-Xa levels in relation to thromboembolic and bleeding events in a high-risk subgroup of hospitalized COVID-19 patients on targeted-intensity thromboprophylaxis.

Research Question or Hypothesis: Anti-Xa levels in COVID-19 patients receiving enoxaparin thromboprophylaxis are predictive of thrombotic and bleeding events.

Study Design: Retrospective, single center cohort

Methods: COVID-19 patients hospitalized from March to October 2020 receiving enoxaparin within 48 hours and ≥1 anti-Xa level during admission were included. Institutional protocol recommended enoxaparin at standard doses (40mg/day or 30mg BID) and intermediate doses (40mg BID, 60mg BID, or 0.5mg/kg BID) based on weights of 100 or 150kg and D-dimer of 1500ng/mL. Goal peak anti-Xa was 0.3-0.5IU/mL. Primary outcomes were development of thrombosis, major bleed, or clinically relevant non-major bleed (CRNMB).

Results: Twenty-eight patients (mean age 54 years, BMI 34.4kg/m^2, LOS 24 days, 57% female, 86% critically-ill) were included. Initial enoxaparin doses >40mg daily were used in 36% of patients. All patients on once daily dosing were subtherapeutic and 39% of subtherapeutic patients had doses adjusted. Thrombotic events occurred in 32% (DVT: n=7, PE: n=2), 25% had a major bleed (n=1 critical bleed; n=4 Hgb fall of ≥2g/dL; n=2 requiring ≥2 PRBC), and 25% had a CRNMB. Initial anti-Xa levels were 7% supratherapeutic, 14% therapeutic, and 79% subtherapeutic. Major bleeds occurred in 50% of patients who were supratherapeutic, 50% of therapeutic, and 18% of subtherapeutic patients (p=0.28). Thrombotic events occurred in 0% of supratherapeutic, 25% of therapeutic, and 36% of subtherapeutic patients (p=0.54).

Conclusion: High variability in anti-Xa target achievement was observed in this high-risk subgroup of COVID-19 patients despite targeted-intensity thromboprophylaxis. Although thrombosis rates were higher in subtherapeutic anti-Xa levels and bleeding occurred more frequently in supratherapeutic or therapeutic levels, clear association couldn't be established in this small cohort.

120 | Impact of a Pharmacy Procedure on Direct Oral Anticoagulant Use at an Academic Medical Center

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Introduction: Direct oral anticoagulants (DOACs) are important to the treatment and prevention of venous thromboembolism and in preventing thromboembolic stroke in atrial fibrillation. Anticoagulants are considered high-risk medications by accrediting organizations and proper dosing and monitoring is imperative to ensure effectiveness and optimize patient safety.

Research Question or Hypothesis: Does the implementation of a pharmacy-managed continuous quality improvement procedure (an anticoagulation transition procedure and an electronic anticoagulation order entry form) improve appropriate inpatient DOAC prescribing at an academic medical center?

Study Design: Non-interventional, quasi-experimental study

Methods: Adult patients admitted to a general medicine ward who received DOAC therapy (dabigatran, rivaroxaban, apixaban) during at least one of three different study time periods were eligible for inclusion. The three study time periods included three phases: 1) pre-pharmacy-managed continuous quality improvement procedure [February 1, 2014-January 31, 2015]; 2) post-pharmacy-managed continuous quality improvement anticoagulant transition procedure [February 1, 2015-January 31, 2016]; and 3) post-pharmacy-managed continuous quality improvement anticoagulant transition procedure and electronic order form implementation [September 17, 2019 - September 16, 2020]. The primary outcome was the prevalence of appropriate DOAC prescribing across all three phases of a pharmacy-managed continuous quality improvement procedure. Data was arranged into a 3x2 contingency table of counts with a test of independence applied using SPSS Version 26.0.

Results: One hundred forty-five patients were included in phase 1, 146 in phase 2, and 145 in phase 3. A total of 51%, 64.4%, and 80% of patients received an appropriately prescribed DOAC in each of the three groups, respectively (p<0.001). Improvement in appropriateness of dose (73.1%, 78.8%, 91.7%; p<0.001) and transition (41.7%, 52.6%, 77.5%; p<0.001) both contributed to the clinically significant primary outcome.

Conclusion: The implementation of both a pharmacy-managed anticoagulation transition procedure and an electronic anticoagulation order entry form significantly improved the appropriateness of DOAC prescribing.

121 | Evaluation of an institutional guideline for pharmacist-directed warfarin therapy management on Vizient's INR-based metric performance

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Introduction: In 2017, Vizient introduced a metric that specified an INR greater than or equal to 5 in patients who have received at least three doses of warfarin is associated with an unacceptable risk of bleeding. Adjustment of warfarin therapy is often institution-specific, and few data are available for modifying warfarin following acute INR elevation.

Research Question or Hypothesis: We hypothesized that holding a dose of warfarin and decreasing the weekly dose by 50% after an acute elevation of INR (INR of 2.5 or greater with an increase of at

least 0.6 in the previous 24 hours) would reduce the percentage of patients meeting Vizient's INR-based metric.

Study Design: This was a single-center, retrospective review from April 1, 2019 to September 30, 2019 (pre-cohort) and April 1, 2020 to September 30, 2020 (post-cohort). This project is listed in the University of Florida Quality Improvement Project Registry (QIPR).

Methods: Patients were included if they received three or more doses of warfarin, did not have elevated INR during first two days of admission, and did not receive argatroban. The primary outcome was the number of patients who met Vizient's INR-based metric. Secondary outcomes included time to therapeutic INR, therapeutic interventions following acute INR elevation, and Vizient rank for this metric.

Results: More patients in the pre-cohort experienced an INR greater than or equal to 5 compared to the post-cohort (2% vs. 1.8%, p=0.360). There was no significant difference in the average time the INR was subtherapeutic between groups (3.69 vs. 4.11 days, p =0.380). Patients in the post-cohort experienced a subtherapeutic INR more often than the pre-cohort (43.7% vs. 23.8%, p=0.004). We achieved a lower metric rank amongst our Vizient peers in the post-cohort (17/76 institutions) than in the pre-cohort (24/78 institutions).

Conclusion: A novel acute INR elevation management strategy reduced the percentage of patients who met Vizient's INR-based metric.

122 | Impact of body mass index on the anticoagulation effect of direct-acting oral anticoagulants in patients admitted to an academic medical center: a retrospective cohort study

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Introduction: Treatment guidelines for atrial fibrillation and venous thromboembolism (VTE) now favor the use of direct-acting oral anticoagulants (DOACs) over warfarin. As a result, the number of DOAC prescriptions exceeded that of warfarin in 2013. Yet, data assessing the efficacy and safety of DOACs in patients with obesity versus non-obese patients are limited.

Research Question or Hypothesis: Is there a difference in thromboembolic and bleeding events in patients with obesity compared to non-obese treated with DOACs?

Study Design: Non-interventional, quasi-experimental, retrospective cohort

Methods: This study included patients admitted to an academic medical center between July 1, 2019 and June 30, 2020 who were prescribed apixaban, rivaroxaban, or dabigatran for atrial fibrillation (thromboembolism prophylaxis) or treatment/prophylaxis of VTE. The primary outcome was the difference in the incidence of the composite outcome of thromboembolic events (i.e., VTE, cerebrovascular accident, or transient ischemic attack) and bleeding events (i.e., major, minor, and life-threatening) in patients with obesity versus non-obese receiving DOACs. Difference in composite outcome for patients with Class 1 and 2 obesity versus patients with Class 3 obesity was also examined. Outcomes were analyzed using Chi-square in SPSS Version 26.0.

Results: Two-hundred seventy-six patients were included [obese (n=138), non-obese (n=138)]. No difference in primary outcome between the obese and non-obese groups [23.2% vs 24.6%; P=0.778] was identified. There were no differences in thromboembolic events [3.6% vs 1.4%; P=0.447] or bleeding events [21% vs 23.9%; P=0.586] in the obese versus non-obese groups. There was a difference in the composite outcome for patients with Class 1 and 2 obesity (n=87) versus patients with Class 3 obesity (n=51) [30.7% vs 14.0%; P=0.023].

Conclusion: No significant difference in the composite outcome was identified between groups. While limited by its single center design, this study provides additional information on the safety and efficacy of DOACs in patients with obesity.

123 | Teaching young clinicians new tricks: The Padua Prediction Score for venous thromboembolism (VTE) prophylaxis

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Introduction: American College of Chest physicians recommends risk stratification before prescribing VTE prophylaxis in medicine patients and suggests using a validated risk assessment model, the Padua Prediction Score (PPS). A prior study by Meilan et al. demonstrated pharmacological VTE prophylaxis was overused 35% of the time. This study aims to determine if educating physicians on the PPS can decrease the incidence of overprescribing pharmacological VTE prophylaxis.

Research Question or Hypothesis: Educating physicians on the PPS can decrease incidence of overprescribing pharmacological VTE prophylaxis.

Study Design: This is a prospective two-phase study. Patients were included if they received pharmacological VTE prophylaxis. Patients were excluded if they were intensive care unit, surgical, trauma, or comfort care patients, had coronavirus disease, or were pregnant. Two medical teaching teams were selected to enroll patients with pre-education and post-education study phases and served as their own baseline. The primary outcome was incidence of inappropriate pharmacological VTE prophylaxis defined as >24h of therapy in patients with a PPS <4. Secondary outcomes include portion of hospitalization inappropriately anticoagulated and incidence of bleeding and thrombotic events during hospitalization and 30 days after discharge.

Methods: Data was collected on 88 patients in the pre-education arm and 64 patients in the post-education arm. During the post-education

phase, all medical residents were educated in person on the PPS during the first week of rotation by the primary investigator.

Results: The incidence of appropriate VTE prophylaxis was 71.6% in the pre-education arm and 84.4% in the post education arm (p=0.080). The median portion of hospitalization inappropriately anticoagulated was 12.5% vs 0%, (p=0.12) and bleeding events occurred in 1 and 4 patients (p=0.162) respectively. There were no thrombotic events.

Conclusion: Focused education to the medical teaching teams on the Padua Prediction Score lead towards an increase in appropriate use of pharmacological VTE prophylaxis and improved prescribing of these high-risk medications.

HIV/AIDS

124 | Evaluation of Patients at High Risk of Acquiring Human Immunodeficiency Virus Prior to Implementation of Pharmacists in the Interdisciplinary Pre-Exposure Prophylaxis Service

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Introduction: Patients are referred to the Special Treatment and Research Health Center (STAR) at One Brooklyn Health for pre-exposure prophylaxis (PrEP) initiation to prevent human immunodeficiency virus (HIV). Pharmacists provide care in this ambulatory care setting under a collaborative drug therapy management agreement with physicians. With expertise in pharmacotherapy and medication adherence counseling, incorporating pharmacists into the PrEP interdisciplinary workflow may improve outcomes for patients at risk of HIV acquisition.

Research Question or Hypothesis: What are the gaps in patient care prior to implementation of pharmacists in the interdisciplinary PrEP team?

Study Design: Retrospective cohort.

Methods: Patients ≥18 years-old with high risk of HIV acquisition and ≥1 clinic encounter for PrEP between September 1, 2018 and August 31, 2020 were included. Patients with an HIV diagnosis prior to the study period were excluded. Primary endpoints included negative HIV status and screening rates. Secondary endpoints included newly diagnosed sexually transmitted infections (STI) and screening rates quarterly, patient retention, PrEP medication non-adherence, and care coordination. Descriptive statistics were utilized.

Results: A total of 41 patients were included. The patient population was predominantly African American/Black males engaging in high-risk heterosexual behavior. Average age was 40. Sixty-eight percent had multiple sexual partners and 39% had partners living with HIV. All patients that were screened had a negative HIV result. Patient follow-up for HIV screening decreased from 100% to 19.5% and for STI screening decreased from 97.6% to 2.4% from baseline through 24-month follow-up, respectively. Eight patients tested positive for STIs. Overall patient retention declined from 41 to one patient at the end of 24 months. Twenty-nine percent were non-adherent to their medications and twenty-nine percent followed care coordination.

Conclusion: Baseline evaluation data identified areas for quality improvement to PrEP services. Implementing pharmacists in the interdisciplinary PrEP workflow at the STAR Health Center may improve patient outcomes, retention, and close current gaps in patient care.

125 | Real World Evaluation on the Use of Integrase Transferase Inhibitors and Polyvalent Cations

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Introduction: Integrase Inhibitors (INSTI) are first-line therapy combined with other antiretrovirals (ARVs) to achieve virologic suppression (VS) in people living with HIV (PLWH). Approval studies reported VS may fail when polyvalent cations (PVC) are taken concomitantly with INSTIs due to potential chelation. PVC are commonly found in over-the-counter products that are easily accessible to patients taking INSTIs. Despite educating each patient on this interaction, many patients continue to take INSTI+PVC together. Therefore, it is important to evaluate the effect of this interaction in a real-world setting.

Research Question or Hypothesis: Do patients who are simultaneously taking an INSTI+PVC maintain VS?

Study Design: A retrospective cohort study conducted through medical chart review of adult PLWH occurred between 7/20/2010 and 9/15/2020.

Methods: Patients were included if they were adult inmates with an HIV/AIDS diagnosis, prescribed and received INSTI-based therapy with or without a PVC, and had HIV-1 viral load (VL) data for at least 6 consecutive months. The primary outcome assessed maintenance of VS by patients receiving both an INSTI+PVC simultaneously compared to those receiving an INSTI alone. Statistical analysis included Fisher Exact Test where a p-value <0.05 was considered significant as well as descriptive analysis.

Results: Of 173 patients analyzed, 68 were taking an INSTI+PVC for an average 18 months (range:6-78 months). On average, patients were 42 years old, African American (79%), and male (86%). VS in patients receiving an INSTI+PVC [VL<20 copies/mL:62/68 (91%) and VL<200 copies/mL:67/68 (99%)] did not differ compared to those who were on an INSTI alone [VL<20 copies/mL:91/105 (87%) (p=0.468) and VL<200 copies/mL:103/105 (98%)(p=1.00)]. The most

common PVC was a multivitamin (n=51) which led to deprescribing of PVC in 50 patients (80%).

Conclusion: VS was similar between those taking an INSTI with or without a PVC and led to deprescribing of PVC in PLWH.

126 | Evaluating real-world experience with co-formulated bictegravir/emtricitabine/tenofovir alafenamide as initial therapy or a switch regimen in persons with human immunodeficiency virus

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Introduction: Bictegravir/emtricitabine/tenofovir alafenamide (BIC/FTC/TAF) is a single-tablet regimen (STR) recommended as initial therapy or as a switch option for persons with HIV (PWH). Reasons for regimen switches include reducing pill burden, mitigating toxicities, and minimizing drug interactions. Despite a low pill burden and favorable side effect profile, there is limited data evaluating the safety and efficacy of BIC/FTC/TAF in clinical practice.

Research Question or Hypothesis: How do clinical outcomes among PWH initiated on or switched to BIC/FTC/TAF compare to those in randomized controlled trials and to those on other STR?

Study Design: Institutional review board exempt, single-center, retrospective chart review.

Methods: The primary endpoint was the percent of patients who remained on the same treatment at 48 weeks. Secondary endpoints included rate of virologic control (HIV RNA <200 copies/mL) and reasons for switching therapy. Fisher's exact and Wilcoxon rank sum tests were used for data analysis, and both modified intent-to-treat (mITT) and per-protocol analyses were performed.

Results: A total of 468 patients were included; 61.1% were male and the mean age was 45.3 years. More patients were initiated on BIC/FTC/TAF than another STR (100 versus 43 patients, respectively), while treatment switches were more evenly split (168 versus 157 patients, respectively). In the 48-week mITT analysis, a higher percentage of patients on BIC/FTC/TAF discontinued treatment than those on other STR (10.8% versus 8.5%, p=0.03). This finding was driven by patients who switched to BIC/FTC/TAF versus another STR (75.6% vs. 90.0%, p=0.02). Discontinuation rates were similar in the per-protocol analysis (13.2% versus 9.6%, p=0.34). Virologic control rates were also comparable between groups. Reasons for treatment discontinuation included renal insufficiency, gastrointestinal side effects, and rash.

Conclusion: Real-life tolerability of BIC/FTC/TAF may be less optimal than observed in registrational trials. Continued post-marketing evaluations are warranted to better understand the ever-evolving contributors of antiretroviral success.

127 | Evaluation of bone health in older persons with human immunodeficiency virus (HIV): are we doing enough?

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Introduction: Despite recommendations to screen older and at-risk persons with HIV (PWH) for osteoporosis (OP), it remains unclear whether this prevention strategy has been incorporated into standard practice. The objective of this study was to determine OP screening rates at our clinic and evaluate the utility of a screening tool.

Research Question or Hypothesis: How well does a large clinic screen for and treat bone disease in PWH based on risk factors?

Study Design: Institutional review board-approved, single-center, retrospective chart review.

Methods: The electronic medical record (EMR) and ICD-10 coding was utilized to evaluate PWH >40 years of age receiving HIV care from January 1, 2019 to July 31, 2020. The primary outcome was the proportion of patients with an indicated dual energy x-ray absorptiometry (DEXA) scan performed. Secondary outcomes included: proportion of patients at high risk of OP or fragility fractures based on the Fracture Risk Assessment Tool (FRAX) score, proportion of bone disease, and pharmacological management.

Results: The analysis included 733 patients. DEXA scan screenings were completed for 30 patients (4.1%). Only 25% of females ≥65 years of age had a DEXA scan performed. Of the younger females with additional risk factors, 5% received a DEXA scan. None of the male patients were screened regardless of age or risk factors. In patients with OP, the FRAX score had a sensitivity of 2.78% (95% CI: 0.07-14.53%) and specificity of 99.71% (95% CI: 98.97-99.97%). There were 34 (4.6%) patients that received bisphosphonates, 80 (10.9%) received vitamin D supplementation, and 37 (5.0%) received calcium supplementation as prevention/treatment.

Conclusion: Screening rates for bone disease among PWH at our clinic are extremely low. Performance improvement efforts should be initiated to increase DEXA scan screenings and optimize treatment and preventative therapies. The FRAX 10-year risk diagnostic tool was not a sensitive tool for identifying patients that are at high risk for bone disease.

128 | Evaluating the Impact of a Pharmacy Driven RAPID Start Program on Outcomes in Persons with HIV

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Introduction: RAPID initiation of antiretroviral therapy (ART), defined as within 7 days of diagnosis, has been shown to improve clinical outcomes and retention in care. This resource intensive process has shown promise in select U.S. centers, yet remains to be validated as standard of care outside of these settings.

Research Question or Hypothesis: To determine the impact of RAPID ART initiation, compared to traditional ART initiation on virologic suppression and retention in care at our institution.

Study Design: This is an institutional review board approved, single center, retrospective study at our Ryan White-funded clinic between January 1, 2018 and February 28, 2020

Methods: .The primary outcome of this study is achievement of virologic suppression after 48 weeks of ART among treatment naive patients. Secondary outcomes include retention in care at 12 months, achievement of virologic suppression 90 days after diagnosis, and number of days from diagnosis to ART initiation to undetectable viral load.

Results: Of the 87 patients included, 31 were in the RAPID and 56 were in the TRADITIONAL groups respectively. Virologic suppression after 48 weeks was higher in the RAPID group compared to the TRADITIONAL (82% vs 60%, p= 0.07). At 12 months, 28 (90%) RAPID group and 45 (80%) TRADITIONAL patients were retained in care (p=0.36).

Conclusion: RAPID start may not always yield better retention in care. Further studies warranted to ensure optimal allocation of resources.

Infectious Diseases

129 | Bayesian-Derived Vancomycin AUC_{24H} Threshold for Nephrotoxicity in Special Populations

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Introduction: The 2020 ASHP/IDSA/SIDP/PIDS vancomycin guideline recommends a vancomycin AUC_{24H}/MIC of 400 to 600 to optimize efficacy and minimize nephrotoxicity. However, there are limited studies that investigate the generalizability of using an AUC_{24H} threshold of 600 mg*h/L for nephrotoxicity in special populations.

Research Question or Hypothesis: The study will determine the optimal Bayesian-derived AUC_{24H} threshold to minimize nephrotoxicity in ICU patients, obese patients, amputees, and patients on concomitant nephrotoxins.

Study Design: The study design is a retrospective cohort study at San Joaquin General Hospital in Stockton, CA.

Methods: Patients admitted between June 2019 to May 2020 who were 18 years or older, on vancomycin for at least 48 hours to treat an infection, and had at least one concentration collected were included. Each patient was assessed for nephrotoxicity and the Bayesian-derived AUC_{24H} was estimated using PrecisePK. Using CART analysis, AUC_{24H} thresholds for nephrotoxicity were determined for ICU patients, obese patients, amputees, and patients on concomitant loop diuretics, ACEIs, ARBs, IV contrast dye, aminoglycosides, or piperacillin/tazobactam. The predictive performances of each CART-derived threshold were then compared to the guideline threshold's predictive performances.

Results: 336 patients were included in the study. The AUC_{24H} threshold for nephrotoxicity is 544 mg*h/L for ICU patients (n=116) and 543 mg*h/L for patients on concomitant loop diuretics (n=126). Out of 22 ICU patients with nephrotoxicity, the threshold of 544 mg*h/L significantly identifies more nephrotoxic patients than the guideline threshold: 19 (86.4%) vs. 13 (59.1%), p=0.03. Similarly, out of 22 nephrotoxic patients on concomitant loop diuretics, the threshold of 543 mg*h/L significantly identifies more nephrotoxic patients than the guideline threshold: 20 (90.9%) vs 14 (63.6%), p=0.03. Thresholds for the other special populations of interest are not clinically significant compared to the guideline threshold.

Conclusion: A lower vancomycin AUC_{24H} threshold may be considered to minimize nephrotoxicity risk for ICU patients and patients on concomitant loop diuretics.

130 | Inpatient utilization of micafungin and the impact of infectious disease review and approval

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Introduction: Invasive candidiasis is a life threatening infection with high mortality, and determining appropriateness of antifungal use is challenging. Balancing early treatment against overuse is imperative to positive patient outcomes.

Research Question or Hypothesis: Would requiring infectious disease (ID) consultation improve appropriate utilization of micafungin?

Study Design: Retrospective, cohort study at a multi-hospital system.

Methods: Data were abstracted from each course of micafungin between October 1st 2019 and September 30th 2020. During this time period, ID approval for micafungin was recommended but not required. Data collection included demographics, fungal culture results, and risk factors for candidiasis. Outcome data included 30-day hospital readmission, hospital length of stay, micafungin duration, 60-day survival, and percent appropriate use. Appropriate use was determined using the 2016 IDSA Candidiasis guideline. This included 1) Candida from a blood or CNS culture 2) septic shock with two risk factors 3) septic shock with a positive non-sterile fungal culture or 4) intra-abdominal infection with an abdominal-specific Candidiasis risk factor. Outcomes were compared between orders reviewed by an ID physician and those not reviewed by ID.

Results: Of the 82 courses of micafungin, 45% (n= 37) were approved by Infectious Diseases physicians. Overall appropriate use was 41.5%, and was not statistically different between courses approved by ID and those not approved by ID (44.4% vs 37.8%%, p=0.546). There was also no statistical difference in hospital length of stay, 60-day mortality, or 30-day readmission between the two groups. However, micafungin regimens approved by ID had a statistically lower median duration of treatment (4 days vs 7 days, p=0.018).

Conclusion: Appropriate micafungin use was similar between courses reviewed and approved by infectious diseases and those not reviewed by infectious diseases. Infectious diseases review and approval was associated with shorter courses of micafungin, and could be a possible strategy for antimicrobial stewardship programs.

131 | Vancomycin with Concomitant Piperacillin/Tazobactam vs. Cefepime or Meropenem Associated Acute Kidney Injury in General Ward Patients: A Multicenter Propensity Score-Matched Study

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Introduction: Concurrent administration of vancomycin and piperacillin/tazobactam (VAN+PTZ) may increase the risk of acute kidney injury (AKI) in hospitalized patients. Unfortunately, previous reports were limited by single-center evaluations, small sample sizes, outdated AKI definitions, incomplete characterization of AKI including time to onset, severity staging, duration, and recovery patterns.

Research Question or Hypothesis: The purpose of this study was to compare the incidence of AKI associated with VAN+PTZ compared to either cefepime (CEF) or meropenem (MER) with VAN in adult general ward patients.

Study Design: Multicenter, retrospective, propensity score-matched cohort study

Methods: Included patients were concurrently administered VAN +PTZ or VAN+CEF/MER in the general ward over a 1-year period. Patients developing AKI ≤48 hours following combination therapy were excluded. The primary endpoint was to compare the incidence of AKI between study groups. Multivariable Cox regression modeling in predicting AKI was also conducted.

Results: A total of 3199 patients met inclusion criteria with propensity score-matching conducted in 2913 patients. In matched cohorts, the incidence of AKI in VAN+PTZ and VAN+CEF/MER groups were 16.4% and 7.9%, respectively (p<0.001). Multivariable prediction models showed concomitant VAN+PTZ was identified as an independent risk factor of developing AKI (HR 2.86, 2.17-3.78, p<0.001). The VAN+PTZ group experienced significantly higher rates of severe AKI (stage II or III) compared to controls (30.0% vs. 14.7%, respectively, p=0.014). No differences in the incidence or duration of renal replacement therapy or AKI recovery patterns were found between study groups.

Conclusion: Concomitant administration of VAN+PTZ in adult general ward patients was independently associated with an increased risk of AKI overall. More severe AKI was also associated with VAN+PTZ.

132 | Long-term Safety of Nontuberculous Mycobacterial Infection Treatment at a Community Teaching Hospital in the Southeastern United States

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Introduction: Management of nontuberculous mycobacterial (NTM) infections often require evolving antimicrobial management. While utilizing multiple antibiotics, the risk for adverse drug events (ADEs) increases. Gaps in evidence describing the treatment courses of NTM infections are evident. The primary aim of this study was to evaluate the proportion of antibiotic changes and the associated reasons for change.

Research Question or Hypothesis: What is the proportion of patients requiring at least one antibiotic change during NTM treatment and documented rationale?

Study Design: Retrospective, single-center, cohort study

Methods: Adult patients with a positive culture for NTM species and clinical suspicion of infection were included. Patients were excluded if they had a concurrent positive culture for *M. tuberculosis* (MTB) or monomicrobial culture for *M. gordonae*. Patients were categorized into two groups: favorable versus unfavorable outcome. Favorable outcome was defined as physician-guided therapy cessation due to clinical improvement. Primary endpoint was proportion of patients with an antibiotic change. Secondary endpoints included: reasons for antibiotic change and adherence to guideline-recommended antibiotics for pulmonary NTM treatment.

Results: Seventy-eight patients received treatment and 47 (60.4%) had a favorable outcome with an average time to treatment completion of 289.5 ± 182.4 days. Forty-nine (62.8%) patients had at least one antibiotic change. Common reasons for antibiotic change were: ADEs in 34 (69.4%), change in disease status in 14 (28.6%), and susceptibility results in 12 (26.5%). Common types of ADEs experienced included gastrointestinal intolerance in 14 (41.2%), central nervous system effects in 4 (11.8%), and drug allergy in 4 (11.8%). Thirty-six

(46.2%) patients had pulmonary infection. Of these, 18 (72%) and 2 (18%) individuals were started on guideline-recommended regimen for pulmonary non-cavitary and cavitary NTM infections, respectively.
Conclusion: The majority of patients in this study had at least one antibiotic change due to ADEs. Pharmacists are well-positioned to improve treatment trajectory by minimizing the risk for ADEs and promoting guideline adherence.

133 | Impact of Order Sentence Implementation on Outpatient Antibiotic Prescribing for UTI and SSTI

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Introduction: Due to the high volume of outpatient antibiotic prescribing, The Joint Commission now requires antimicrobial stewardship program (ASP) expansion to ambulatory practice settings. Unfortunately, ASP resources in these settings tend to be scarce.
Research Question or Hypothesis: The purpose of this study was to determine whether the implementation of antibiotic order sentences listing stewardship-driven treatment recommendations within the electronic health record (EHR) would improve antibiotic prescribing for urinary tract infections (UTI) and skin and soft tissue infection (SSTI) within a primary care practice.
Study Design: This retrospective, quasi-experimental study was conducted evaluating patients treated for UTI or SSTI at an outpatient Family Medicine office between February 1, 2020 and January 1, 2021.
Methods: The institution's stewardship team provided in-person education and set order sentence "favorites" for the providers within the EHR. The primary objective was to compare rates of total appropriate antibiotic prescribing before (Pre-ASP) versus after (Post-ASP) implementing guideline-concordant order sentences. Total appropriateness was defined by appropriate antibiotic selection, dose, and duration of therapy in accordance with the institution's outpatient empiric antimicrobial therapy guidelines. Secondary objectives included comparing patient-centered outcomes, such as infection-related re-visits and *Clostridiodes difficile* infections between groups.
Results: A total of 250 patients were included in this study (Pre-ASP n=139, Post-ASP n=121) Total antibiotic appropriateness improved significantly from 24.5% to 39.7% after implementation of order sentences (p<0.0001). Significant improvement was seen for appropriate drug selection (52.5% vs. 66.9%, p=0.081) and duration (47.5% vs.68.6%, p<0.0001). There were no differences observed in patient-centered outcomes between groups, including adverse drug events, treatment failure, *C. difficile* infections, and infection-related re-visits or hospitalizations within 30 days.
Conclusion: Implementing guideline-concordant order sentences within the EHR significantly improved outpatient antibiotic prescribing for UTI and SSTI. Tailoring antibiotic order sentences may be a useful initial tool for ASP expansion into the outpatient setting with limited resources.

134 | Impact of Social Determinants of Health on Length of Stay in COVID-19 patients with Multimorbidity in Southwest Georgia, United States

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Introduction: Inequalities in social determinants of health (SDOH), dictated by social and community context, education and healthcare access and quality, neighborhoods and built environment, as well as economic stability have only added to disparities in COVID-19 morbidity and mortality. Multimorbidity, defined as at least two comorbidities, is associated with longer lengths of stay (LOS) and higher mortality in patients with COVID-19; however, the relationship between SDOH and LOS in multimorbid COVID-19 patients is poorly characterized. Analyzing this relationship can help identify patients at high risk for prolonged hospitalization and allow prioritization of treatment and supportive measures.
Research Question or Hypothesis: What effects do SDOH have on LOS in multimorbid adult patients hospitalized with COVID-19?
Study Design: This was a multicenter, retrospective analysis of multimorbid adult patients hospitalized with COVID-19.
Methods: The primary outcome was to determine overall LOS. The secondary outcome was to evaluate the impact of SDOH on LOS, examined with Poisson regression analyses for individual associations.
Results: Three hundred seventy patients were included with a median age of 65 years (IQR 55-74), of which 57% were female and 77% were African American. Median Charlson Comorbidity Index was 4 (IQR 2-6) with hypertension (77%) being most common, while in-hospital mortality was 23%. Overall, median LOS was 7 days (IQR 4-13). White race (-0.16, 95% CI -0.27 to -0.05, p=0.003) and residence in a single-family home or nursing home/long term care facility (-0.28, 95% CI -0.38 to -0.17, p<0.001 and -0.36, 95% CI -0.51 to -0.21, p<0.001, respectively) were associated with decreased LOS, while Medicare (0.24, 95% CI 0.10 to 0.38, p=0.001) and part-time or full-time (0.35, 95% CI 0.13 to 0.57, p=0.002 and 0.25, 95% CI 0.12 to 0.38, p<0.001, respectively) employment were associated with increased LOS.
Conclusion: Differences in SDOH have observable impact on COVID-19 patient LOS in-hospital.

135 | Duration of anti-pseudomonal beta-lactam therapy effects on *Clostridioides difficile* infections in monomicrobial *Enterobacterales* bloodstream infections at an Academic Medical Center

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Introduction: Prolonged broad-spectrum antibiotic use is well known to increase the risk of *Clostridioides difficile* infections (CDI), with recent emphasis on antipseudomonal beta-lactams (APBL). Early de-escalation of APBLs and impact on CDI has important implications for antimicrobial stewardship (AMS) and is limited.

Research Question or Hypothesis: Does de-escalation within 72 hours of APBL in *Enterobacterales* blood-stream infections (BSI) impact 90-day CDI risk?

Study Design: Retrospective cohort via electronic medical record review at an academic medical center.

Methods: Medical records of patients ≥18 years of age who had a monomicrobial BSI with *Enterobacterales* and received APBL between July 1, 2015 and June 30, 2020 were reviewed. Rates of CDI were then compared between patients who received APBL for >72 hours and <72 hours, followed by comparison between formulary APBL utilized.

Results: 447 patients were included, 292 and 155 patients received APBL for < 72 hours and > 72 hours, respectively. The incidence of CDI for <72 hours compared to >72 hours was 2.4% and 6.5%, respectively (Unadjusted hazard ratio [HR], 2.70, [95% CI, 1.03-7.10]; $P = 0.04$). This was not statistically significant in the adjusted model (HR 2.66 [0.97-7.31 P=0.06]). Meropenem was associated with an increased risk of CDI when compared with all other formulary APBLs [26.7% (4/15) versus 3.0% (13/432); p<0.001].

Conclusion: Utilization of APBLs for > 72 hours was associated with a statistically significant increased incidence of CDI in an unadjusted model and numerically higher in the adjusted model. Meropenem was the formulary APBL that carried the highest risk of CDI. The results of this study further provide evidence supporting active AMS aiming to reduce unnecessary continuation of broad-spectrum antibiotics in attempts to alleviate the burden CDI poses on the healthcare system.

136 | Derivation of a clinical prediction score to identify isolation of *Pseudomonas* in pneumonia

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Introduction: Pneumonia guidelines recommend incorporating locally derived risk factors and historical culture data to optimize empiric therapy. Given the focus of existing models on drug-resistant pathogens as a whole and local risk factors, the application to individual pathogens and other institutions may yield weaker score performance.

Research Question or Hypothesis: This study aims to develop a locally derived clinical prediction model for *Pseudomonas*-mediated pneumonia.

Study Design: This is a retrospective observational study.

Methods: Patients ≥18 years of age admitted to the University of Texas Southwestern (UTSW) Medical Center between July 1, 2010 to July 31, 2020 with a Centers for Disease Control National Healthcare Safety Network (CDC/NHSN) confirmed diagnosis of pneumonia on antimicrobial treatment during the index encounter with a positive respiratory culture were included. Cystic fibrosis patients were excluded. Logistic regression analysis identified the risk factors associated with the isolation of *Pseudomonas aeruginosa* from respiratory cultures within the derivation cohort (n=186), which were then weighted to generate a prediction score that was applied to derivation and internal validation cohorts.

Results: Two hundred and eighty-one patients met inclusion criteria. Five predictor variables were identified and weighted: tracheostomy status (4 points), chronic obstructive pulmonary disease (5 points), enteral nutrition (9 points), chronic steroid use (11 points), and isolation of *Pseudomonas aeruginosa* from any culture in prior 6 months (14 points). At a score of >11, the prediction score demonstrated a sensitivity of 52.4% (95% Confidence Interval [CI], 36.4 to 68) and a specificity of 84.9% (95% CI, 72.4 to 93.3) in the validation cohort (n=95). The overall accuracy of the score was 70.5% (95% CI, 60.3 to 79.4), and the area under the receiver operating characteristics (AUROC) curve was 0.77 (95% CI, 0.68 to 0.87) in the validation cohort.

Conclusion: A local clinical prediction score for identifying *Pseudomonas aeruginosa* in patients with pneumonia was successfully derived.

137 | Characterizing Opportunities for Pharmacist-Initiated Interventions on an Outpatient Parenteral Antimicrobial Therapy (OPAT) Service

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Introduction: Outpatient parenteral antimicrobial therapy (OPAT) is an emerging practice aimed to continue effective parenteral (IV) treatment for patients after hospital discharge. Pharmacists collaborate with outpatient infusion services to ensure safe administration and monitoring of IV antibiotics. The role of pharmacists in an OPAT team has been shown to improve patient outcomes by optimizing

antimicrobial therapy to reduce hospital length of stay and readmissions.

Research Question or Hypothesis: What interventions could an OPAT pharmacist identify and implement to optimize safety and efficacy of antimicrobials?

Study Design: Retrospective Chart Review

Methods: Patients receiving IV therapy via home infusion from 1/4/21 to 3/4/21 were screened for inclusion and excluded if antimicrobials were not prescribed. Infection characteristics and antimicrobial therapy were recorded. Interventions on day of and after discharge including delays due to OPAT-related reasons were noted. Duration of therapy (DOT) was calculated by the difference between start and stop dates of appropriate antibiotics. Continuous and categorical data are expressed as median (IQR) and frequencies (%), respectively

Results: Of 123 patient screened, 77 patients met inclusion criteria. Most patients were treated for bone/joint infections (29/77, 38%). Therapeutic drug monitoring (TDM) was performed in 15/77 (19.4%) patients. Beta-lactam TDM was utilized in 2/15 (13.3%) patients to ensure adequate concentrations prior to discharge. At discharge, 52 opportunities for a pharmacist-initiated intervention were identified with majority being clarifying DOT (19/52, 37%), streamlining or escalating antibiotic (8/52, 15%), and optimizing drug dose (8/52, 15%). A total of 157 days of unnecessary antimicrobials was calculated and preventable by clarifying DOT. OPAT-related discharge delays resulted in 58 additional hospital days. Post-discharge issues (n=56) commonly reported include worsening infection (11/56, 20%), PICC line issues (9/56, 16%), and adverse drug reactions (8/56, 14%).

Conclusion: Implementation of an OPAT service including a dedicated pharmacist may decrease the use of unnecessary antimicrobials, reduce duration of hospitalization, and optimize safety and efficacy of antimicrobials.

138 | COVID-19 Vaccine Confidence and Barriers at a Private University

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Introduction: Limited research is available regarding vaccine attitudes among students in higher education. While pharmacy students play a vital role in vaccine administration, little is known about their attitudes toward vaccination. The Vaccine Confidence Scale (VCS) is a validated scoring system, ranging 0-10 to quantify general confidence, including subscales for harms, benefits, and trust related to vaccination.

Research Question or Hypothesis: To characterize vaccine confidence regarding COVID-19 vaccines in a University population and compare VCS between pharmacy and other students.

Study Design: Cross sectional quantitative survey of COVID-19 Vaccine confidence

Methods: A survey regarding vaccine confidence was available to Drake University's population from January to February 2021 (Phase 1a/1b of vaccine availability). Participants were recruited biweekly through campus-wide email announcements. The survey consisted of 26 questions related to demographics, VCS, and COVID-19 experiences. VCS and subscales were tabulated. Comparisons were conducted in SPSS v25 using ANOVA, t-tests, or chi-square.

Results: Response rate was ~26%. There were 1184 completed surveys; 139 (11.8%) were pharmacy students. Of these, 16.3% had already received at least one dose of a COVID-19 vaccine, 71% planned to receive a COVID-19 vaccine, 7.1% planned not to, and 5.6% were unsure. Mean VCS scores were higher among those that had received or planned to receive a vaccine, than those that were unsure, or would not receive a vaccine (8.88 vs 7.30 vs 5.55, P<0.001). Pharmacy students were more likely than other students to have received or plan to receive a vaccine (96.4% vs 85.2%, P=0.002). VCS was higher among pharmacy students than others (8.71 vs 8.52, P=0.05). Harm and Trust subscores were not different, but Benefits subscores were higher among pharmacy students (9.17 vs 8.79, P<0.001).

Conclusion: Vaccine confidence was high at private university early in COVID-19 vaccine rollout. Pharmacy student VCS was slightly higher than other students with higher impact of vaccine benefits.

139 | Readmission rate post bamlanivimab/etesevimab administration for the treatment of COVID-19

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Introduction: Bamlanivimab/etesevimab is a combination of two anti-spike neutralizing monoclonal antibodies used for the treatment of mild to moderate COVID-19 under FDA Emergency Use Authorization (EUA). The utility of this combination is to reduce both viral load in patients with COVID-19 and hospital admissions.

Research Question or Hypothesis: The primary objective of this study was to assess hospitalization within ten days of patients receiving bamlanivimab/etesevimab intravenous infusion. The secondary objectives included adverse effects related to the infusion and utilization of the drug based on the EUA criteria.

Study Design: A multicenter, retrospective chart review was conducted in patients who received bamlanivimab/etesevimab infusion in an outpatient setting for the treatment of mild to moderate COVID-19 from April 1, 2021 to May 14, 2021.

Methods: A retrospective chart review was conducted using institutional electronic medical records. The encounter dates were reviewed

to assess hospitalizations. All documented notes were reviewed for infusion site reactions and adverse drug reactions. Patient demographics, past medical history, and electronic laboratory results were used to assess appropriate candidacy. Patients who were hospitalized during the same visit after receiving the medication in the emergency department were excluded from the study. Additionally, patients who tested positive for COVID-19 but were admitted for non-COVID-19 reasons and received bamlanivimab/etesevimab were also excluded.

Results: Among 220 patients receiving bamlanivimab/etesevimab (mean age = 61; 50.45% female (n=111)), the hospitalization rate within ten days of bamlanivimab/etesevimab infusion was 4.54% (n=10) of which two patients was admitted for non-COVID-19 reasons. This study was unable to assess hospitalizations in patients admitted outside this multi-hospital health-system. No major adverse effects were reported during and after the infusion. 98.6% (n = 217) met the EUA criteria.

Conclusion: Bamlanivimab/etesevimab appears to be effective in preventing hospitalizations related to COVID-19. These results are comparable to the BLAZE-1 study.

140 | Impact of probiotic use on the incidence of diagnostic testing in patients receiving fluoroquinolones

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Introduction: Prevention of *Clostridioides difficile* infection (CDI) is of interest due to significant morbidity and mortality, including high rates of recurrence. Fluoroquinolone exposure is one of the highest risk factors for CDI development. Probiotic administration has been shown to reduce risk of gastrointestinal side effects commonly seen by antimicrobials but effects on overall diagnostic stool testing are unknown.

Research Question or Hypothesis: Does probiotic administration in patients receiving fluoroquinolones decrease rates of diagnostic stool testing?

Study Design: Multi-center, retrospective cohort

Methods: Adult patients admitted to two hospitals from August 1, 2018 to August 31, 2020 who received > 3 days of fluoroquinolone monotherapy within 72 hours of admission were included. Patients were divided into two groups: patients who received at least one dose of a probiotic and patients who did not receive any probiotics. The patients were randomized to include 100 participants per group. Patients with a history of CDI, antimicrobial use within 90 days of hospitalization, or co-administration of systemic antibiotics for > 24 hours were excluded. The primary outcome was rates of initial CDI diagnostic testing. Secondary outcomes included costs of CDI testing and incidence of additional gastrointestinal diagnostic testing.

Results: Patients on fluoroquinolones who received probiotics had significantly less CDI testing performed compared to patients who did not receive probiotics (4% vs. 15%, p=0.008). Costs of CDI diagnostic testing were significantly less in the probiotic group ($700 vs. $3535; p=0.002). Patients receiving probiotics also had fewer additional diagnostic tests ordered compared to those without (4% vs. 10%, p=0.096).

Conclusion: Administration of probiotics to patients receiving fluoroquinolone monotherapy may lead to a reduction in unnecessary CDI and other gastrointestinal diagnostic testing. Larger studies are needed to confirm these potential benefits.

141 | Pharmacy students' knowledge and confidence of COVID-19 following an interactive didactic class.

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Introduction: Pharmacists play an important role in COVID-19 management and prevention. Therefore, it is important to provide education and prepare pharmacy students in this area. However, educational preparation and instruction during pharmacy school is unclear. Thus, we sought to evaluate the impact of an interactive didactic class focused on COVID-19 on pharmacy students' knowledge and confidence.

Research Question or Hypothesis: Do pharmacy students' knowledge and confidence regarding COVID-19 improve following an interactive didactic class?

Study Design: Multicenter, cross-sectional survey.

Methods: An anonymous, voluntary, electronic survey was distributed to 85 pharmacy students before and after an interactive didactic class on COVID-19 at two schools of pharmacy. The pre- and post-survey contained the same ten COVID-19 knowledge-based questions and multi-step, 5-point Likert scale statements related to confidence with COVID-19. The pre- and post-survey were distributed prior to and after class, respectively. Before class, students worked in groups to review information and primary literature on an assigned COVID-19 therapeutic. During class, student groups presented on their assigned COVID-19 therapeutic followed by a brief instructor-led lecture on COVID-19 management and clinical cases to assess students' COVID-19 management strategies. Descriptive statistics were performed, and the paired t-test was used to compare pre- and post-survey responses.

Results: 60 surveys were completed resulting in a survey response rate of 70.6%. Mean COVID-19 knowledge scores increased overall (6.93 versus 9.64; p<0.001). In particular, knowledge scores increased considerably for questions including, but not limited to appropriate

use of dexamethasone (41% versus 85%; p<0.001), remdesivir (46% versus 77%; p<0.001), baricitinib (39% versus 89%; p<0.001), monoclonal antibodies (18% versus 70%; p<0.001), and COVID-19 vaccines (80% versus 95%; p=0.03). No significant differences were observed for appropriate use of tocilizumab or identification of remdesivir as an antiviral. Pharmacy students' mean COVID-19 confidence scores also improved (2.66 versus 4.03; p<0.001).

Conclusion: Pharmacy students' knowledge and confidence of COVID-19 improved following an interactive didactic class.

142 | Treatment Rates and Outcomes for Chronic Hepatitis C Upon Implementation of Pharmacist-Led Direct Acting Antiviral Management at a Federally Qualified Healthcare Center

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Introduction: Direct acting antivirals (DAA) for treatment of chronic hepatitis C (HCV) have facilitated management of HCV in primary care settings. However, treatment initiation, completion and follow-up remain challenging. This is especially true for underserved patients treated at federally qualified health centers (FQHC). Pharmacists can help address these barriers, but data on the effectiveness of a pharmacist-led DAA management service on treatment rates and outcomes in a FQHC setting is limited.

Research Question or Hypothesis: How do HCV treatment rates and outcomes with pharmacist-led DAA management compare to management by other providers?

Study Design: Retrospective cohort study of patients seen by FQHC providers from 2014 to 2019 using electronic health record data.

Methods: Included patients were adults (age 19+ years) with at least one office or clinical pharmacist visit and a positive HCV viral load (VL) test during the study period. Patients referred to pharmacist management were identified through pharmacist documentation. Primary outcomes included percentage of patients with DAA prescription orders and percentage with undetectable VL after treatment orders.

Results: A total of 268 patients with a positive HCV VL result were included. Of n=170 referred to pharmacist HCV management, n=98 (57.6%) had at least one DAA order. Of these, n=58 (59.2%) had viral load test results after the DAA order of which n=57 (98.3%) had an undetectable VL. Of n=98 not referred to pharmacist management, n=9 (9.2%) had a DAA order; none with orders had subsequent viral load test results.

Conclusion: A pharmacist-led HCV management service was effective at treating HCV in a FQHC primary care setting. DAA treatment and follow-up viral load testing rates were higher for patients referred to pharmacist management than for those who were not. A study limitation is that initiation and completion of treatment after DAA order could not be confirmed for non-pharmacist managed patients.

143 | Association Between Comorbidity Treatment Status and In-Hospital Mortality Among COVID-19 Patients In Southwest Georgia, U.S.

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Introduction: Pre-existing comorbidities increase the risk of poor outcomes in COVID-19 patients. However, there are insufficient data to determine whether control of comorbidities impacts outcomes. The purpose of this study was to determine whether pharmacologic treatment for common comorbidities influences in-hospital mortality.

Research Question or Hypothesis: Does in-hospital mortality differ between hospitalized COVID-19 patients based on pharmacologic treatment status for pre-existing comorbidities?

Study Design: Multicenter, retrospective study of hospitalized patients with COVID-19.

Methods: This study included adult patients with diabetes, hypertension, and/or dyslipidemia who were hospitalized with COVID-19 in Southwest GA, U.S. Patients were divided into two groups based on treatment status, where treated had documentation in the electronic medical record of outpatient pharmacologic therapy indicated for that specific comorbidity while untreated had no record of pharmacologic therapy for one or more comorbidity. The primary outcome was to compare in-hospital mortality between treated and untreated patients. Secondary outcomes included length of hospital stay and in-hospital complications.

Results: Of 360 patients, most were African American (83%) and female (61%). Median age was 66 years (IQR 56-75) and median Charlson Comorbidity Index was 4 (IQR 2-6). Hypertension, diabetes, and dyslipidemia were present in 91%, 55%, and 45% of patients, respectively, of which 76% were treated. Mortality was similar between treated and untreated patients (25% vs 20%, p=0.304). Average length of stay was 9.5 days (SD 8.7) in treated patients compared to 10.6 days (SD 9.1) in untreated patients (p=0.302). No differences were observed in the rates of thrombosis (3% vs 4%, p=0.765), receipt of vasopressors (23% vs 21%, p=0.741), or mechanical ventilation (31% vs 27%, p=0.450).

Conclusion: Hospitalized COVID-19 patients receiving outpatient pharmacologic treatment for hypertension, diabetes, and/or

dyslipidemia have similar rates of COVID-19-associated morbidity and mortality versus untreated patients. Further research is needed to determine whether degree of control of chronic comorbidities impacts COVID-19 outcomes.

144 | Defining Antibiotic Inertia: Application of a Focused Clinical Scenario Survey to Illuminate A New Target for Antimicrobial Stewardship During Transitions of Care

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Introduction: Current antimicrobial stewardship techniques do not translate across transitions of care. The impact of emergency department (ED) provider antibiotic selection on inpatient antibiotic choice is unknown. If inappropriate selection by the ED provider results in a greater likelihood of inappropriate selection by inpatient providers, this could represent a novel target for antimicrobial stewardship efforts.

Research Question or Hypothesis: Does the choice of antibiotic by ED providers impact the selection of antibiotics by inpatient providers?

Study Design: Two phase survey in a quaternary academic medical center of fully licensed providers in the ED, intensive care unit, and general medicine wards.

Methods: Four infection types (pneumonia, cellulitis, genitourinary, and sepsis) were included, each with 2 scenarios (one where broad- and one where narrow-spectrum antibiotics were appropriate). ED providers were surveyed in phase 1 and selected an empiric antibiotic regimen. Their answers were incorporated into the clinical scenarios for phase 2, which was distributed to inpatient providers in 2 groups with 50% correct and 50% incorrect antibiotic selection. Proportion of broad and inappropriate antibiotic categories for individual items were assessed with χ^2. Group comparisons for multiple items were done with logistic regression with generalized estimating equations clustered by individual provider.

Results: 21 ED providers in Phase 1 and 46 inpatient providers in Phase 2 were included. When the ED selected the inappropriate category of antibiotics, inpatient providers were more likely to continue inappropriate antibiotic therapy (OR 2.02; 95% CI 1.35-3.03, $p < 0.001$) than if the appropriate antibiotics were presented. When the ED selected broad-spectrum antibiotics, inpatient providers were more likely to continue broad therapy (OR 1.8; 95%CI 1.27-2.56, $p=0.001$).

Conclusion: Antibiotic inertia, demonstrated by the tendency of inpatient providers to continue broad-spectrum or inappropriate therapies when selected by the ED, could represent a significant target for antibiotic stewardship efforts as patients transition provider teams.

145 | Vancomycin therapeutic target attainment for patients with obesity: Impact of a collaborative-practice vancomycin dosing protocol

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Introduction: We implemented a Vancomycin Collaborative Practice ("VCP") dosing protocol after quality assurance analyses revealed (i) <45% of patients achieved therapeutic initial troughs (10-20 mg/L) and (ii) obese patients had higher prevalence of troughs >20 mg/L (20%) versus non-obese patients (2.6%). Our VCP protocol is simple and easily-adaptable to patients with various expected PK changes.

Research Question or Hypothesis: Use of our VCP protocol results in similar prevalence of initial therapeutic vancomycin troughs regardless of patient weight.

Study Design: Retrospective review of electronic medical records.

Methods: Inclusion: Adult patients (≥18 years old) admitted between 1/2018–1/2020 who received intravenous vancomycin for ≥2-3 days and who had ≥1 steady-state vancomycin trough concentration were divided into 2 groups: Non-Obese (BMI<30) or Obese (BMI≥30).
Exclusion: Patients admitted to the ICU and/or with renal dysfunction (CLcr<40 ml/min).
A sample size of 240 patients gave 80% power to detect a 20% difference in the prevalence of initial therapeutic troughs between groups. Data were collected following a detailed rubric to assure consistency and accuracy. Summary/comparative statistics were determined using MSExcel, VassarStats, or SPSS.

Results:

TABLE

Demographics:	Non-Obese Patients (n=129)	Obese Patients (n=118)
Male/Female Sex, n	74/55	58/60
Mean age (SD)[a]	62 (20)	55 (15)*
Mean BMI (SD)	24.4 (3.7)	40.4 (8.4)*
CLcr, ml/min (SD)	76 (37)	101 (43)*
Primary Outcome:		
Initial trough therapeutic, n (%)	65 (50)	80 (68)*
Secondary outcomes:		
Initial trough subtherapeutic, n (%)	56 (43)	26 (22)*
Initial trough supratherapeutic, n (%)	8 (6)	12 (10)

[a] – SD = standard deviation
* - significantly different difference ($p<0.05$)

The percentage of patients with initial therapeutic troughs increased for both groups compared to pre-VCP values, but improvement was

most significant for obese patients. This group also had significantly fewer subtherapeutic initial troughs versus non-obese patients.

Conclusion: Our simple VCP dosing protocol improved the initial dosing of vancomycin for all patients in our hospital, particularly obese patients.

146 | Assessing the Connection Between Excess Weight and In-Hospital Mortality in COVID-19 Patients in Southwest Georgia, United States

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Introduction: There are multiple mechanisms for the interconnection between obesity and adverse outcomes in COVID-19. BMI has been used to delineate body fatness, but does not include age, which could influence the relationship between body fat and BMI. Ideal body weight (IBW) equations predict a single IBW, which could allow improved recognition of adults with excess weight at increased risk of COVID-19 mortality.

Research Question or Hypothesis: What effect does excess weight have on mortality in hospitalized COVID-19 patients?

Study Design: Multicenter, retrospective analysis of hospitalized COVID-19 patients.

Methods: Patients were separated in two groups based on the difference between actual body weight (ABW) and IBW (ABW/IBW≤120% and ABW/IBW>120%). The primary outcome was rates of in-hospital mortality. Secondary outcome was length of stay (LOS). Additionally, a subgroup analysis of patients with ABW/IBW>120% was conducted to compare in-hospital mortality between patients with ABW/IBW 121-149%, ABW/IBW 150-199%, and ABW/IBW≥ 200%.

Results: Four hundred forty-five patients were included of which 71% were in the ABW/IBW> 120% group. Patients in the ABW/IBW≤120% group had higher median age (71 [IQR 64-80.5] vs 60 [IQR 50-70] years). Fewer African Americans and females were in the ABW/IBW≤120% than in the ABW/IBW>120% group (65% vs 86% and 35% vs 64%, respectively). There was no difference in the rate of in-hospital mortality between patients in the ABW/IBW≤120% and ABW/IBW>120% group (26% vs 20%, p=0.174). Average LOS was 10.5 days (SD 9.2) for patients in the ABW/IBW≤120% and 9.3 days (SD 9.5) for those in the ABW/IBW>120% group (p=0.227). Among those in the ABW/IBW>120% group, in-hospital mortality was 14%, 23%, and 22% in patients with ABW/IBW 121-149%, ABW/IBW 150-199%, and ABW/IBW≥200%, respectively (p=0.192).

Conclusion: In-hospital mortality and LOS were not significantly higher among COVID-19 patients with excess weight when compared to those with ABW/IBW≤120%.

147 | Predictors for non-therapeutic vancomycin concentrations post-discharge in patients receiving outpatient parenteral antimicrobial therapy

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Introduction: Patients receiving vancomycin as outpatient parenteral antimicrobial therapy (OPAT) should be monitored closely to minimize toxicity and maximize treatment success. Patients may be at risk for non-therapeutic vancomycin concentrations (NTC) early in the outpatient setting. The proportion of patients with NTC at initial outpatient follow-up were assessed, and predictors for NTC post-discharge were analyzed.

Research Question or Hypothesis: What are predictors for NTC in patients receiving vancomycin as OPAT?

Study Design: Retrospective cohort study from January 1, 2017 through February 28, 2021.

Methods: Patients ≥ 18 years of age discharged from a Prisma Health Midlands hospital on IV vancomycin for ≥ 1 week were eligible for inclusion. Patients were grouped by initial vancomycin concentration obtained outpatient as non-therapeutic or therapeutic. NTC were defined as an AUC/MIC outside of the target range (400-600 mg/h*L). Univariable analysis and multivariable regression analysis were used to determine factors associated with initial NTC. Clinical outcomes were assessed and compared between groups.

Results: Sixty-two patients met inclusion criteria; 40 patients (64.5%) had an initial NTC. In the NTC group, 26 (65%) patients were supratherapeutic at initial follow-up. Although not significantly different, patients in the NTC group had their vancomycin dose adjusted an average of 2 days closer to discharge than those with therapeutic concentrations (3.6 vs. 5.7, $p = 0.122$). In addition those with NTCs were numerically more likely to experience emergency department (ED) visits (OR = 2.67, $p = 0.169$) and acute kidney injuries (AKI) (OR = 2.15, $p = 0.371$), with both being more common amongst those with supratherapeutic concentrations.

Conclusion: Non-therapeutic vancomycin concentrations at initial outpatient follow-up are common. While no statistically significant predictors were identified, patients with NTC were more likely to experience ED visits and AKI, stressing the essential value of transitions of care for all patients receiving vancomycin as OPAT.

148 | A Retrospective Analysis of Methicillin-Resistant *Staphylococcal aureus* Pneumonia Treatment Duration (RAMP)

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Introduction: *Staphylococcal aureus* is a commensal organism that commonly colonizes in the nasopharynx predisposing patients to MRSA pneumonia. Guidelines recommend 7-21 days of treatment duration for MRSA pneumonia and landmark pneumonia duration trials included minimal MRSA isolates. Currently, there is little clinical guidance regarding which patients qualify for longer versus shorter treatment durations.

Research Question or Hypothesis: Does shorter duration of treatment for MRSA pneumonia lead to higher rates of treatment failure?

Study Design: Retrospective, single-center cohort comparison.

Methods: Patients ≥18 years of age with positive MRSA respiratory culture between January 2017 – October 2020 who received ≥ 5 days anti-MRSA antibiotics were included. The primary outcome was incidence of treatment failure. Secondary outcomes included microbiological recurrence, in-hospital mortality, ICU and hospital length of stay amongst treatment cohorts. Statistical analyses were conducted as appropriate for nonparametric and parametric data using SigmaPlot®.

Results: A total of 250 patients were included, 171 receiving ≤ 8 days and 79 receiving > 8 days of therapy for MRSA pneumonia. Patients in the > 8-day group were younger and were more immunocompromised. Vancomycin was the definitive therapy for 90% all patients. Treatment failure was not different between groups (≤ 8 days; 27 (16%) vs > 8 days; 16 (20%), p=0.46). Patients receiving > 8 days had a non-statistical trend of lower recurrence and higher microbiologic clearance with no effect on mortality (≤ 8 days; 26 (15%) vs > 8 days; 14 (18%), p=0.75). Patients > 8 days therapy had longer ICU and hospital length of stays (≤ 8 days; 13 [6-21] vs >8 days; 17 [9-23], p=0.02 and ≤ 8 days; 14 [7-23] vs > 8 days; 19 [13-29], p<0.001).

Conclusion: This study showed no difference in treatment failure amongst patients who received ≤ 8 days of treatment compared to > 8 days for MRSA pneumonia. Further prospective trials are needed to validate these results.

149 | The Evolution of Empiric Antimicrobial Prescribing Patterns and Patient-Associated Antimicrobial Risk Factors Over Time in COVID-19

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Introduction: Despite low rates of bacterial co-infection in patients admitted with COVID-19, antibiotics are frequently prescribed in acute care settings. Antimicrobial stewardship program (ASP) efforts have evolved during the progression of the COVID-19 pandemic. We sought to evaluate the overall antimicrobial prescribing rate in patients with COVID-19, as well as assess changes to these patterns over time.

Research Question or Hypothesis: What factors are associated with increased empiric antibiotic prescribing in COVID-19, and what is the impact of ASPs on prescribing rates?

Study Design: Retrospective chart review of patients admit to a tertiary care center with symptomatic COVID-19 between March 1st, 2020 and November 30th, 2020.

Methods: Symptomatic adults admitted with a positive SARS-CoV-2 polymerase chain reaction test were included for review and stratified by disease severity. Patient and provider demographics, antimicrobial utilization, and culture data were collected. Poisson regression was used to assess changes in antimicrobial prescribing over time. Logistic regression was used to assess factors associated with the empiric use of antimicrobial agents among patients without an existing positive bacterial respiratory culture.

Results: 654 patients were included for review; 189 with mild, 242 with moderate, and 223 with severe COVID-19. Antibiotics were prescribed in 37.9% of the cohort, with an increased incidence by disease severity (16.9% mild, 29.8% moderate, and 64.6% severe, p < 0.001). 85.1% of antibiotics administered were prescribed within 48 hours of hospital admission. Over the course of the study, antimicrobial prescribing rates decreased by 8.7% per month despite a concurrent increase in COVID-19 admissions. Multivariate analysis found that ICU admission, obtainment of procalcitonin, intubation, heart failure, hemodialysis, and nursing home residence were associated with empiric antimicrobial prescribing.

Conclusion: ASPs should take an active role on intervening in unnecessary antimicrobial use targeting populations most at risk for unnecessary exposure. The application of ASP techniques appear to impact antimicrobial use trends even during the COVID-19 pandemic.

Managed Care

150 | The psychological impact of COVID-19 on seeking medical care for patients with chronic diseases

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Introduction: Patients with many comorbidities and chronic conditions have been severely affected by the outbreak, as their outcomes are the worst. Their routine of seeking medical care during Covid-19 is thought to be changed, in addition to the psychological impact of the pandemic.

Research Question or Hypothesis: Patients with chronic conditions may suffered from anxiety, depression, and stress during covid-19, which their pattern of seeking medical care was changed

Study Design: cross-secttional study

Methods: In March 2021, a cross-sectional, web-based survey of patients with chronic diseases was conducted. 1037 eligible patients were assessed for psychological disorders, primarily depression, stress, and anxiety, using the DASS-21 scale, as well as their pattern of receiving medical care during Covid-19.

Results: Diabetes and hypertension accounted for 62.5 percent of patients with chronic diseases, 17.8 percent for hypertension alone, 8.6 percent for diabetes, and 11.6 percent for other chronic diseases. During the pandemic, 52.5 percent of patients with chronic diseases were depressed, 57.9 percent were anxious, and 35.6 percent were stressed.

Patients with chronic disease who had moderate to severe depression, moderate to severe anxiety, or moderate to severe stress were significantly more likely to have no follow-up for their chronic conditions (34.9 percent vs. 45.1 percent p=0.001), (43.6 percent vs. 53.8 percent p=0.001), and (14.9 percent vs. 34.8 percent p=0.001), respectively

Conclusion: Patients with chronic conditions experienced significant anxiety, depression, and stress during covid-19, which changed their pattern of seeking medical care, and the majority of them receiving no follow-up for their chronic condition.

Medication Safety

151 | Assessing the Impact of Medication Safety Reviews Using an Advanced Clinical Decision Support System on an Existing Pharmacist- and Nurse- Led Transitions of Care Model

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Introduction: Adverse drug events (ADEs) and inappropriate use of medications lead to hospitalizations and medication-related morbidity. Pharmacist interventions reduce readmission rates and improve medication safety.

Research Question or Hypothesis: This study aimed to evaluate use of a novel medication safety review system to identify medication safety-related problems (MRPs) and reduce readmissions in an existing transitions of care (TOC) model.

Study Design: This retrospective comparator group study assessed MRPs and readmission rates for patients discharged from a hospital between January and December 2020.

Methods: Participants were included in the study if they were 18 years of age or older, referred to the pharmacist for TOC services, and received a consultation within one-week post discharge. Patients were categorized into two groups: participation in the novel service using an advanced clinical decision support system (CDSS) (intervention); or traditional service [usual care (UC)].

Results: Of 164 participants, most were male (57%) and had an age ranging between 70 – 79 years of age. More MRPs were identified in the intervention group *vs* UC for those who were readmitted (Wilcoxon-signed rank test), including: drug-drug interactions (DDIs) (3.7±1.5 vs 0.9±0.6, p<0.01); drug-disease interactions (1±1 vs 0.2 ±0.4, p>0.05); and high-risk medications (HRM) (1.3±0.6 vs 0.9±1, p>0.05). Of those not readmitted, more DDIs (0.5±0.7 vs 0.4±0.6, p>0.05); drug-disease interactions (0.5±0.7 vs 0.4±0.6, p>0.05), ADEs (0.4±0.7 vs 0.2±0.4, p>0.05), and HRM (0.9±0.7 vs 0.8±0.9, p>0.05) were identified in the intervention group *vs* UC. The intervention group identified fewer dose-related concerns (p>0.05). A relative 30% decrease in readmissions was observed in the intervention vs UC group (9% vs 13%; p=0.767). Usual care had more readmissions for medication-related ADE (17%), renal failure/injury (17%), and angina (12%).

Conclusion: Integration of a medication risk prediction score and use of an advanced CDSS into an existing TOC model identified more MRPs and reduced readmissions compared to usual care.

152 | Clinical Decision Support for Medications Known to Evoke Torsades de Pointes and the Clinician's Responses to an Advisory

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Introduction: Torsades de pointes (TdP) is a serious cardiac arrhythmia that is often medication-induced. Clinical decision support (CDS) that uses the Tisdale QT risk score may identify patients at risk of TdP and provide useful management options.

Research Question or Hypothesis: We sought to determine the frequency of medications evoking a CDS advisory for TdP and evaluate clinician responses to a TdP advisory.

Study Design: Retrospective review of TdP advisory firings.

Methods: CDS for TdP was implemented in a health system comprising 29 hospitals. The advisory appears when clinicians attempt ordering medications with a known risk of TdP for patients with a Tisdale QTc risk score ≥12. The advisory presents the patient's risk factors contributing to the score and relevant 1-click management options. Data on advisories from April 2020 to December 2020 were collected retrospectively. We evaluated frequencies of medications evoking the CDS, and compared clinician responses to the advisory, separated by drug class.

Results: A total of 7794 advisories were evaluated, with the most common incoming order being for antibiotics (33%), followed by ondansetron (32%), antiarrhythmics (13%), other medications (12%), antipsychotics (6%), and antifungals (4%). The percentage of incoming medication orders cancelled differed among drug classes, including 7% for antibiotics, 18% for ondansetron, 5% for antipsychotics, 7% for antifungals, 7% for antiarrhythmics, and 4% for other medications ($p<0.0001$). The most frequent action taken was ordering a routine electrocardiogram (ECG), ranging from 13.9% to 24.2% ($p<0.0001$) depending on drug class, followed by ordering of potassium replacement (0.68% to 4.23% [$p<0.0001$]), stat ECG (0.8% to 4.1% [$p<0.0001$]), magnesium (0.7% to 2.4% [$p=0.0476$]), and calcium (0.2% to 1.4% [$p<0.0001$]).

Conclusion: Provider actions in response to the TdP advisory varied in frequency depending on the evoking drug class. This advisory with relevant 1-click management options yields a high action rate.

153 | Characterization of Enteral Administration of Medications that Should Not Be Crushed in Critically Ill Patients

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Introduction: Critically ill patients often require enteral access due to the inability to intake nutrition or medications orally. Crushing extended-release or NIOSH medications may lead to patient or clinician harm. This study looks to characterize the rate of inappropriate medication administration via enteral tube access for medications that should not be crushed.

Research Question or Hypothesis: Describe the rate of inappropriate medication administration via enteral tube access for medications that should not be crushed in hospitalized patients.

Study Design: IRB approved, retrospective, observational study

Methods: Adult patients at an academic medical center were included if hospitalized with an order for a study medication while mechanically ventilated with enteral access from 1/1/2018-12/31/2019. Study medications included extended-release cardiovascular and NIOSH medications. The primary outcome was the frequency of medication administration calculated by dividing total inappropriate medication administration by total medication administration opportunities. Administration opportunity was every scheduled administration whether administered or not. Inappropriate administration was a medication administered via enteral tube. Secondary outcomes included adverse drug effects (ADE) from 4 hours of when medications was administered. ADE were hypotension (SBP <90 mmHg) and bradycardia (<60 BPM). A Naranjo score was calculated with each ADE. Data was analyzed using descriptive statistics using Microsoft Excel.

Results: Eighty-two patients were included in the study with a median enteral access duration of 5.02 (1.97-10.53) days. There was a total of 157 medication administration opportunities, of which 107 were NIOSH and 50 were cardiovascular medications. A total of 43.3% (n=68) of these doses were administered. Six patients (7.3%) experienced bradycardia or hypotension. In four ADE the Naranjo score indicated possible association and in two cases the score indicated probable association.

Conclusion: Approximately one-third of patients received a medication that should not be crushed via enteral access. These results should be used to assess for the use of decision support to assist in prevention of improper medication administration.

154 | Evaluation of preventable causes of hypoglycemia associated with insulin use in hospitalized patients

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Introduction: In 2018, Vizient introduced a new hypoglycemia and insulin use measure into the Safety domain of their Quality & Accountability scorecard. This measure reports the percentage of hospitalized adult patients with a blood glucose concentration of less than or equal to 50 mg/dL after receiving insulin that day or the day prior. Despite the known risk of hypoglycemia with insulin, few data are available about preventable causes of hypoglycemia, specifically causes that a pharmacist can mitigate.

Research Question or Hypothesis: The goal was to evaluate adult patients who met Vizient's hypoglycemia lab-based measure definition during quarters 1 and 2 of fiscal year 2020 (July-Dec 2019) and identify preventable causes of hypoglycemia-related to insulin use at our institution.

Study Design: This study was a retrospective chart review of hypoglycemic patients identified by Vizient for quarters 1 and 2 of Vizient Fiscal Year 2020 (July-Dec 2019). This project is listed in the University of Florida Quality Improvement Project Registry (QIPR).

Methods: Vizient's Clinical Data Base was used to acquire hypoglycemia event data. Data elements obtained from our electronic health record included patient demographic information, most recent HgA1c %, relevant past medical history, home diabetic regimens, inpatient doses of insulin within 24 hours of the hypoglycemic event, nutritional intake, blood glucose trends, and other inpatient medications associated with hypoglycemia. Outcomes of preventability were further classified with the data elements that were collected. We also evaluated opportunities for pharmacist intervention.

Results: There were 102 hypoglycemic events, with 41 (40.2%) determined to be preventable and 61(59.8%) non-preventable events. The most common category of preventability was "insulin dose too aggressive" (n=22, 53.7%). In addition, we identified opportunities for pharmacist interventions for 10% of preventable hypoglycemic events.

Conclusion: Pharmacists must closely collaborate with other members of the patient care team to identify and prevent hypoglycemia related to insulin therapy in hospitalized patients.

Nephrology

155 | Meropenem and Piperacillin/tazobactam Dosing Recommendations in Asian Critically Ill Patients Receiving Continuous Renal Replacement Therapy

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Introduction: Common antibiotic dosing recommendations in patients receiving continuous renal replacement therapy (CRRT) are derived from Western patients. Few data exists to determine whether these dosing recommendations are optimal for Asian patients with smaller body size. This study was to predict optimal meropenem and piperacillin/tazobactam dosing regimens in Asian patients receiving CRRT with varying effluent rates.

Research Question or Hypothesis: Are meropenem and piperacillin/tazobactam dosing recommendations from Western patients receiving CRRT applicable to Asian patients with smaller body size?

Study Design: Prospective *in-silico* study using Monte Carlo simulation

Methods: Mathematical models were developed using published body weights (60 kg±20%) from Asian patients and relevant pharmacokinetic data to predict optimal initial meropenem and piperacillin/tazobactam doses in Asian patients receiving CRRT at the effluent rates of 20, 30, and 40 mL/kg/hr. Various doses were simulated to assess probability of target attainment (PTA) in 5,000 virtual patients. Targets were ≥40% and ≥50% free serum concentrations above 1 or 4 times the minimum inhibitory concentration (*f*T>1× or 4×MIC) for meropenem and piperacillin, respectively to treat *Pseudomonas aeruginosa* infection. Tazobactam target was ≥50% *f*T> the threshold (=4 mg/L). The lowest dose attaining PTA≥90% during the first 48-hours was defined optimal.

Results: Meropenem 1g q12h and 1g q8h infused over 30-min attained PTA≥90% in virtual Asian patients receiving CRRT at the MIC of 2 mg/L and 4×MIC (=8 mg/L) respectively, regardless of effluent rates. Piperacillin/tazobactam 3.375g q6h with 30-min infusion achieved PTA≥90% in those receiving CRRT at all effluent rates if the MIC is 16 mg/L. For 4×MIC of 64 mg/L, however, the highest conventional piperacillin/tazobactam dose 4.5g q6h with 4-hour infusion attained PTA of 88.9%, 86.3% and 80.4% at effluent rates of 20, 30, and 40 ml/kg/hr respectively.

Conclusion: Asian patients receiving CRRT likely require similar meropenem and piperacillin/tazobactam doses used for Western patients despite their smaller body size. Clinical validation is needed.

156 | Probability of Target Attainment of Cefepime and Ceftazidime in Asian Critically Ill Patients Receiving Continuous Renal Replacement Therapy

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Introduction: Antimicrobial resistance prevalence is increasing and common in intensive care units. Recommended dosing regimens in critically ill patients receiving continuous renal replacement therapy (CRRT) are derived from Western population. The average weight of Asian patients is smaller than Western patients and the influence of weight on optimal drug dosing has not been studied.

Research Question or Hypothesis: Cefepime/ceftazidime dosing recommendations will be different in Asian patients.

Study Design: Monte Carlo Simulations (MCS)

Methods: Previously-published pharmacokinetic parameters and Asian demographic data were used to model MCS (5,000-subject). Three effluent rates (Qeff) were modeled: 20, 30, and 40mL/kg/h. Modeled dosing regimens for cefepime were 2g every 24h, 12h and 8h. For ceftazidime, 1g every 12h and 8h, 1.25g every 8h, 2g every 12h, and 1.5g q8h were modeled. The pharmacodynamic target was free concentration ≥4×MIC for ≥60% using a MIC of 8mg/L (*P. aeruginosa* breakpoint) for the first 48h of therapy. The probability of target attainment (PTA) in ≥90% of modeled patients was considered as an acceptable regimen.

Results: PTA for cefepime 2g q24h was 0% for all three Qeff. PTA for 2g q12h were 76% at 20mL/kg/h, 46% at 30mL/kg/h, and 15% at 40mL/kg/h. PTA was >90% for 2g q8h at all Qeff. For ceftazidime, 1g q12h ranged between 2-37% and 1g q8h ranged between 73-89% for three Qeff. PTA for 1.25g q8h were 98% (Qeff 20), 93% (Qeff 30) and 80% (Qeff 40). PTA for 2g q12h were 97% for Qeff 20, 89% for Qeff

30, and 73% for Qeff 40. Lastly, 1.5g q8h reached PTA ≥94% for all Qeff.

Conclusion: The MCS showed that cefepime 2g q8h and ceftazidime 1.5g q8h were necessary to reach the acceptable PTA for all three CRRT effluent rates (20mL/kg/h, 30mL/kg/h and 40mL/kg/h) against *P. aeruginosa*. The size of patients (Asian versus Western) did not influence the dosing recommendation.

157 | Monte Carlo simulation to determine optimal ceftolozane/tazobactam dosing in critically ill patients receiving prolonged intermittent renal replacement therapy

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Introduction: Ceftolozane/tazobactam is a promising cephalosporin/β-lactamase inhibitor combination agent with potent activity against multi-drug resistant gram-negative pathogens including *Pseudomonas aeruginosa* and extended-spectrum β-lactamase producing *Enterobacterales*. Few data exists to guide optimal ceftolozane/tazobactam dosing regimens in prolonged intermittent renal replacement therapy (PIRRT) that is increasingly used in critically ill patients.

Research Question or Hypothesis: What are the optimal ceftolozane/tazobactam dosing regimens in critically ill patients receiving PIRRT?

Study Design: Prospective in-silico study using Monte Carlo simulation (MCS)

Methods: Relevant published pharmacokinetic data was utilized to develop mathematical models to predict ceftolozane/tazobactam disposition in 5,000 virtual patients in two different daily PIRRT settings (e.g. 8-hour hemofiltration with effluent flow rate (Qf) of 5 L/hr and 10-hour hemofiltration with Qf of 4 L/hr). Four conventional ceftolozane/tazobactam dosing regimens (e.g. 750-1,500mg, followed by 150-750mg q8h) administered at the beginning or after a PIRRT session were assessed for the probability of target attainment (PTA). The pharmacodynamic target for ceftolozane was 40% free serum concentrations above the minimum inhibitory concentration (*f*T>MIC). Tazobactam target was 20% *f*T> minimum effective concentration of 1 mg/L. Optimal doses were the ones with PTA of ≥90% during the initial 48 hours of therapy in all PIRRT scenarios.

Results: At the MIC of 4 mg/L targeting a *P. aeruginosa* infection, ceftolozane/tazobactam 750mg, followed by 150mg q8h attained PTA of ≥90% in both 8-hour and 10-hour daily PIRRT settings regardless of the drug administration time in relation to PIRRT. Ceftolozane clearance during an 8-hour and 10-hour PIRRT was estimated to be 92.7 ml/min and 75.5 ml/min respectively.

Conclusion: MCS predicted that ceftolozane/tazobactam 750mg, followed by 150mg q8h would be the optimal initial dose in patients receiving 8-10 hour daily PIRRT. Clinical validation is warranted to confirm these findings.

158 | Determining the Effects of Health Literacy on the Hispanic Community's Perception of Acquiring Chronic Kidney Disease

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Introduction: The Hispanic community's awareness of prevalent chronic diseases such as diabetes and hypertension has been shown to be low in several studies. Hispanics are 1.3 times more likely to progress onto end-stage renal disease and are 1.47 times more likely to initiate dialysis. Assessing which factors may influence this population's overall awareness and perception toward acquiring chronic kidney disease (CKD) is imperative in minimizing the long-term, terminal complications associated with this disease.

Research Question or Hypothesis: How does health literacy impact the Hispanic community's risk perception for acquiring CKD?

Study Design: This was a prospective, single-center, survey-based trial.

Methods: This study assessed the effects of patients' health literacy on their risk perception and actual risk for acquiring CKD. A total of 58 patients were included in this study in San Antonio, Texas. Patients were given an iPad that had the survey and consent available in English and Spanish. A scoring system was used to evaluate various patient parameters such as health literacy, risk perception, true risk, CKD knowledge, and control over health.

Results: The one-way ANOVA test reveals that there is no statistically significant difference in risk gap and health literacies ($p=0.414$, 95% CI -0.075–0.105) Patients with increased health literacy were found to generally have a smaller risk gap for acquiring CKD. Knowledge was correlated with perceived control ($p=0.009$, 95% CI 0.030-0.410).

Conclusion: This limited study did not find a strong correlation between health literacy and risk perception, but other related factors may guide future research.

159 | Cefazolin Dosing Recommendations in Patients Receiving Home Hemodialysis using Monte Carlo Simulation

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Introduction: Cefazolin is commonly prescribed in end stage kidney disease patients receiving dialysis. Home hemodialysis (HHD) is increasingly used. Optimal cefazolin doses for HHD patients are likely different from those receiving conventional thrice-weekly hemodialysis. This study sought to predict optimal cefazolin dosing regimens in patients receiving common HHD regimens.

Research Question or Hypothesis: What are optimal cefazolin dosing regimens for patients receiving HHD with various treatment frequencies and durations?

TABLE 1

HHD Type	HHD Duration (Hours/ session)	HHD Frequency (Days/week)	Dialysate Volume (Qd) (L/session)	Optimal Cefazolin Dose
Diurnal	3	4 (Mon-Tue-Thu-Fri)	30 40 50	1g LD-750mg-500mg-750mg post-dialysis
Diurnal	3	5 (Mon-Tue-Wed-Thu-Fri)	20 30	1g LD-500mg post-dialysis 1g LD-500mg-500mg-500mg-750mg post-dialysis
Nocturnal	7	3.5 (Mon-Wed-Fri-Sun)	30 50 60	1g LD-750mg post-dialysis
Nocturnal	7	5 (Mon-Tue-Wed-Thu-Fri)	30 60	1g LD-500mg-500mg-500mg-750mg post-dialysis 1g LD-500mg-500mg-500mg-1g post-dialysis

*LD: loading dose

Study Design: Prospective *in-silico* study using Monte Carlo simulation

Methods: Pharmacokinetic models were built with internal outpatient dialysis patient demographic data and published pharmacokinetic parameters to predict cefazolin disposition in 5,000 virtual patients receiving HHD. Various cefazolin doses were tested to evaluate the probability of target attainment (PTA) in 10 different HHD settings: five 3-hour diurnal HHD occurring either 4x/week (dialysate volume (Qd) of 30L, 40L, and 50L) or 5x/week (Qd of 20L and 30L); five 7-hour nocturnal HHD occurring either 3.5x/week (Qd of 30L, 50L, and 60L) or 5x/week (Qd of 30L and 60L). All cefazolin doses were simulated to be given post-dialysis. Target was ≥60% free serum concentrations above 4 times the minimum inhibitory concentration (*f*T>4xMIC; MIC=8 mg/L for *Staphylococcus aureus*). The smallest doses attaining PTA≥90% during 1-week of therapy were considered optimal.

Results: Optimal cefazolin doses in ten HHD regimens were different based on interdialytic-period (e.g. 1-3 days) and the prescribed Qd (Table 1).

Conclusion: Optimal cefazolin dosing recommendations for HHD patients differ from those for standard thrice-weekly hemodialysis. These dosing recommendations should be clinically validated.

160 | Judging Judgment: A Qualitative Evaluation of Pharmacist Perceptions of Clinical Judgment During Renal Dosing Practices

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Introduction: Dose modification of renally eliminated medications is a foundational component of personalized pharmacotherapy; however, studies suggest that pharmacists differ significantly in renal dosing practices, even given identical patient cases. There are several potential reasons for these differences including disagreement in renal clearance equations and differences in training, but differences in the application of clinical judgment may also play a role.

Research Question or Hypothesis: What are pharmacist perceptions regarding the application of clinical judgment in renal dose modification?

Study Design: Prospective, qualitative analysis

Methods: Pharmacists in the State of Michigan who participated in a randomized controlled trial evaluating renal dosing practices were approached regarding their willingness to participate in a qualitative interview about renal dosing practices. Enrolled pharmacists engaged in a 15 to 30 minute telephonic, semi-structured interview with study investigators. The interview questions covered optimal renal dosing practices, the application of clinical judgment in practice, and oversight of clinical judgment among practitioners. Thematic coding was conducted using a grounded theory approach and interviews were conducted until theme saturation was achieved.

Results: Seven interviews were conducted with pharmacists, of which five interviewees were clinical specialists, one was a generalist, and one was a PGY2 pharmacy resident. Four themes emerged through the interviews: 1) clinical judgment should take precedence over numeric clearance values, especially in populations which weren't represented in clearance equation derivation studies, 2) specialized knowledge and training may be required for providers to apply clinical judgment, 3) providing multiple renal clearance estimates, especially when they vary widely, may lead to deviations from dosing recommendations, 4) oversight of clinical judgment in renal dosing should be conducted via interactive audits.

Conclusion: Pharmacists strongly advocate for the application of clinical judgment in renal dosing practices, especially in understudied populations. However, pharmacists disagree on standard renal dosing processes such as the optimal clearance equation, EMR display, and administrative oversight of renal dosing.

161 | Impact of hospitalization on response to epoetin alfa in chronic hemodialysis patients

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Introduction: Patients on chronic hemodialysis are hospitalized nearly twice per year. Interruption or inappropriate anemia management during transitions of care may contribute to worsening anemia during and/or after hospitalization. There are no guidelines for the management of erythropoiesis-stimulating agents (ESA) during transitions of care.

Research Question or Hypothesis: Hospitalization will contribute to worsening anemia in chronic hemodialysis patients, in part due to insufficient ESA dosing.

Study Design: Cross-sectional, single-center, retrospective study

Methods: Patients on hemodialysis were included if they received chronic ESA therapy and were hospitalized during 2014-2015. Appropriateness of ESA transition was defined by institutional protocol, with inappropriate transitions categorized as dose too high or dose too low. Weekly weight-adjusted ESA dose, hemoglobin, and time in the therapeutic range (TTR) of hemoglobin 10-11g/dL were compared prior to (4-week period), during, and after (4-week period) the index hospitalization. Comparisons between transitions and clinical characteristics for each period were performed using Wilcoxon signed-rank and McNemar tests as appropriate, with alpha=0.05 using SAS v9.4.

Results: The study included 16 patients with 35 hospitalizations, of which 63 transitions were evaluated. During transition from outpatient dialysis clinic to hospitalization, hemoglobin decreased -0.19g/dL (95% confidence interval [CI] -0.51 to 0.13g/dL, P=0.468), time in therapeutic range decreased from 36.8% to 17.6% (P=0.09), and weekly weight adjusted epoetin alfa dose decreased -32.1units/kg/week (95% CI: -99.1 to 34.9units/kg/week, P=0.725). 51.4% of transitions into the hospital were categorized as inappropriate, with 66.7% dose too low. Transitions out of the hospital to outpatient dialysis clinic were appropriate 85.7% of the time. Epoetin alfa doses significantly increased in the post-hospitalization period (77.8units/kg/week, 95% CI: 7.4 to 148.2units/kg/week, P=0.032).

Conclusion: Inappropriate transition of ESA dosing upon hospitalization may contribute to poor hemoglobin response during hospitalization and subsequent escalation of ESA doses once discharged back to the outpatient dialysis clinic. Transitions of care focused on ESA management in hemodialysis patients should be explored.

Oncology

163 | Capecitabine-induced severe enteritis (SE): An institutional analysis

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Introduction: Capecitabine is known to cause severe enteritis (SE), but the data on the incidence and outcome are limited.

Research Question or Hypothesis: What is the incidence and outcome of capecitabine-induced SE?

Study Design: Retrospective review of electronic medical records.

Methods: Patients treated with capecitabine at an academic cancer center over a period of 3 years were included in the analysis. SE was diagnosed if the following features were present: grade 4 diarrhea requiring inpatient admission and signs of enteritis on CT scan.

Results: Among the 428 patients treated with capecitabine, 9 (2.1%) fulfilled the criteria for SE. In this cohort, the median age was 67 years (range 29-80), 7/9 (78%) were female, and all patients were Caucasian. Most patients (7/9, 77%) received single-agent capecitabine, the majority (6/9, 66%) developed SE with the first cycle after a median of 16 days (range, 10-50) and were hospitalized after a median of 21 days (range, 13-51) from the treatment onset. The median hospital stay was 14 days (range, 4-25). The associated adverse effects included: grade 3 abdominal pain in 7 patients (77%), grade 3 nausea in 5 patients (55%), grade 3 vomiting in 3 patients (33%), and grade 1 hand-foot syndrome in 1 patient (11%). All patients developed hypoalbuminemia during their hospital stay, and hypokalemia was present on admission in 8 patients (88%). No patients developed neutropenia or oral mucositis. Stool studies performed in 8 out of 9 patients ruled out infections. Testing for dihydropyrimidine dehydrogenase enzyme deficiency was performed in 3 patients and was negative. All patients were treated with supportive measures, and 2 patients (22%) required total parenteral nutrition. All but 1 patient recovered fully; 1 patient died due to an unrelated complication.

Conclusion: Capecitabine-induced SE is uncommon and generally occurs after the first cycle of capecitabine. Most patients recover fully with appropriate supportive care measures.

164 | Trends in Median Overall-Survival and Overall Progression-Free Survival for FDA-Approved Solid-Tumor Therapy, 1995-2021

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Introduction: FDA approval for cancer therapy has increased over the past two decades. We aimed to characterize trends in the available data regarding these agents.

Research Question or Hypothesis: How has median overall survival (OS) and overall progression free survival (PFS) for FDA-approved solid-tumor therapy changed from 1995-2021?

Study Design: Retrospective analysis of FDA-approved cancer therapy.

Methods: The FDA and the CenterWatch webpages were utilized to identify approvals per indication from December 1995-2021. Median PFS and OS were extracted from Phase 2 and 3 pivotal trials based on which FDA approval was granted. We excluded therapy for non-solid tumors and combination regimens if a monotherapy alternative was enlisted for any of the medications within the combination regimen. Subgroup analysis on lung and breast cancer therapy were performed.

Results: 251 FDA-approved medications from 1995-2021 met inclusion criteria. The most frequent indications were lung (n=56) and breast (n=41). From 1995-2016 (n=130) and 2017-2021 (n=121), 72 and 53 trials reported OS, respectively, whereas 87 and 78 trials reported PFS. Average OS was 15.9 months from 1995-2016 and 16.4 months from 2017-2021. Average PFS was 8.8 and 9.9 months, respectively for both time periods. For lung cancer approvals, OS was 12.9 months from 1996-2016 (n=26) and 15.7 months from 2017-2021 (n=30); average PFS were 8.1 and 9.9 months, respectively. For breast cancer approvals, average OS was 23.5 months from 1995-2016 (n=26) and 20.7 months from 2017-2021 (n=15); average PFS were 11.9 and 8.6 months, respectively.

Conclusion: When broadly assessed, OS and PFS for cancer therapy has increased. OS and PFS have improved for lung cancer therapy but have had varied results for breast cancer therapy. Further research accounting for the heterogeneity of the treatment mix and targeted therapy is needed.

165 | Safety of vaccines against coronavirus disease 2019 (COVID-19) in patients receiving systemic therapy for solid tumors

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Introduction: Coronavirus disease 2019 (COVID-19) adversely affects patients with cancer, underscoring the critical need for vaccination. However, the safety of COVID-19 vaccines in patients with solid tumors receiving systemic therapy is inadequately studied.

Research Question or Hypothesis: Are COVID-19 vaccines safe in patients with solid tumors receiving systemic therapy?

Study Design: Retrospective review of electronic medical records.

Methods: Recipients of COVID-19 vaccines between January 1, 2021 and April 30, 2021, while on systemic therapy for solid tumors, were identified. Data were collected from the electronic clinic notes, and adverse events (AEs) were graded according to Common Terminology Criteria for Adverse Events, version 5.0.

Results: The analysis included 185 patients; the median age was 71 years, and 55% were female. The most common chemotherapy, immunotherapy, and targeted therapy administered were Oxaliplatin (9%) and taxane-based (13.5%) regimens, anti-programmed death 1 agents (17%), and Osimertinib (3%), respectively. Patients received the following vaccines: BNT162b2 from Pfizer (96/185, 52%), mRNA-1273 from Moderna (79/185, 43%), and JNJ-78436735 from Johnson & Johnson (10/185, 5%). At least one AE was observed in 35 patients (19%); the total number of AEs was 56: 48 grade 1 (86%) and 8 grade 2 (14%). Most adverse events occurred after the second dose (33, 59%). The most frequent grade 1 AEs included injection site pain (7,14.6%), fever (7,14.6%), fatigue (7,14.6%), chills (5,10.4%). The most frequent grade 2 AE was fatigue (3, 37.5%). Therapy was delayed because of AEs in 3 patients (1.6%). The following table summarizes the data:

	Chemotherapy	Immunotherapy	Targeted Therapy
Patient number	99	47	39
Median age (years)	72	72	68
Gender (Male/Female)	43/56	27/20	15/24
Vaccine administered (Moderna/Pfizer/Johnson & Johnson)	41/54/4	20/23/4	18/19/2
AEs (Grade 1+2), number (%)	33 (33%)	16 (34%)	7 (18%)
Therapy delayed because of AEs	1	2	0

Conclusion: COVID-19 vaccines caused infrequent and mild AEs in patients with solid tumors receiving systemic therapies.

Other

167 | Assessment of lead level in urine among children in the Eastern Province, Saudi Arabia

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Introduction: lead poisoning is a significant health crisis for all public however, are at the greatest risk of health problems. Lead is a natural substance which can be present in many sources such as air, dust, and water. Moreover, it is utilized in a broad number of daily products. The extensive use of lead causes it to be a worldwide environmental pollutant. Frequent lead exposure may lead to numerous heath issues including neuronal dysfunction, muscle movement and learning disabilities among children. Limited data in Saudi Arabia is available about the exposure to lead among children. This study aimed to determine the lead levels in the urine samples collected from children in the Eastern region of Saudi Arabia.

Research Question or Hypothesis: Estimation of lead levels in urine among children in Saudi Arabia and investigating the factors influencing the exposure to lead.

Study Design: Cross sectional study.

Methods: Collecting information from the participants by face-to-face interview using Self-administered questionnaire. After getting consent from their parents, urine samples were collected in sterile polyethylene bottles from children aged between 1-10 years and directly analyzed in the lab. After sample preparation with nitric acid digestion, inductively coupled plasma-mass spectrometry (ICP-MS) was used for the analysis.

Results: The concentration of lead was within the normal limit for all samples, however it was high in one sample gathered from a child who resides in a rural area. This may be due to the exposure to a variety of sources such as contaminated food, water, or soil.

Conclusion: Alerting people about exposure to lead and its safety measures is much needed. The results of this study will deliver insights when planning future interventions to promote specific messages to improve knowledge and enhance awareness regarding lead exposure.

168 | Evaluation of Student Pharmacists' Attitudes Towards Homelessness Before and After Completion of a Homeless Clinic Elective

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Introduction: Homelessness is an increasingly urgent public health issue and the number of individuals experiencing homelessness continues to rise in the United States, especially in major cities such as San Francisco. Healthcare insecurity is one of the biggest challenges due to poor access to care, limited ability for follow-up, delayed clinical presentation, and higher rates of hospitalization often for preventable conditions. These unmet needs illustrate how vital it is that health professionals understand how to effectively and empathetically address the needs of this population. The "Provision of Pharmacy Services in a Homeless Clinic" elective focuses on the needs and challenges facing San Francisco's houseless population and educates students on providing patient-centered care.

Research Question or Hypothesis: How will attitudes shift after pharmacy students participate in a course focused on those facing housing insecurity and the inequities they experience?

Study Design: UCSF School of Pharmacy (SOP) students enrolled in the elective received a survey addressing attitudes to members of the houseless population before and after completion of the elective. Students were also recruited to participate in an interview regarding their experiences in the elective.

Methods: This study was conducted using a Qualtrics survey with 21 validated questions. Quantitative data was analyzed via Stata using a paired t-test analysis. Qualitative data was analyzed using ATLAS.ti 8.

Results: 18 pre- and post- survey responses from students in the SOP were received. Five questions showed a statistically significant difference in attitudes between responses taken before and after the elective. Themes that were highlighted in the seven completed interviews included: the elective increased students' awareness of challenges the houseless population faces and impacted the way they will approach patient care with this population.

Conclusion: In order to provide patient-centered care to the houseless population, it may be beneficial to incorporate content that addresses the needs of people experiencing homelessness within pharmacy education.

169 | Impact of COVID-19 on Library Services in US Pharmacy Programs

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Introduction: The COVID-19 pandemic resulted in many academic libraries closing physical spaces and the reduction of personnel due to quarantine measures. The potential reduction in library services could have a negative impact on research by pharmacy faculty.

Research Question or Hypothesis: The COVID-19 pandemic led to a decrease in library services offered to researchers.

Study Design: Cross-sectional online survey of librarians and pharmacy faculty at US pharmacy schools

Methods: A survey was designed to assess library services offered at US pharmacy schools and the impact of the COVID-19 pandemic on those services. The survey was distributed to both librarians and faculty via AACP and MLA listservs.

Results: 39 surveys were completed and analyzed. Most of the surveys were completed by librarians (58%), followed by faculty members (25%). Common services provided by librarians included literature searches, systematic reviews, article retrieval, and instruction. COVID-19 affected library services at most (76%) institutions, although many institutions (58%) did not have to reduce library staffing. As a result, most respondents (73%) did not feel that COVID-19 negatively impact their

ability to conduct research. For those who felt that their research was negatively impacted, the delay in library services was the most common reason. Most respondents reported their research efforts were not negatively affected due to the presence of online resources and services, which did increase at several institutions during the pandemic.

Conclusion: While COVID-19 affected many aspects of pharmacy education, the effects on library services appeared to have little negative impact on faculty's ability to conduct research. This is most likely due to the availability of online and digital resources. The results of this study are limited by the low response rate, the low number of non-librarians who completed the survey, and the possibility that multiple respondents were from the same institution, which could have skewed the results.

170 | CMM via telehealth: Is it feasible and effective?

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Introduction: Patients with uncontrolled diabetes living in rural and underserved communities experience many challenges, including lack of access to needed health and medication management services. Telepharmacy has been identified as a promising approach for addressing this gap. This presentation describes early insights into the implementation and effectiveness of a Comprehensive Medication Management (CMM) service as part of primary care clinics in North Carolina and Arkansas. The CMM service involved pharmacists meeting remotely with patients in their homes to identify and resolve Medication Related Problems (MTPs).

Research Question or Hypothesis: The purpose of this presentation is to report on (1) early lessons learned and (2) preliminary effectiveness results.

Study Design: This exploratory mixed methods study uses a pre-post design, as well as qualitative information. Data sources include surveys, qualitative interviews, administrative data, and medical records (e.g., MTPs, A1Cs) collected as part of the first three months of a 1-year implementation period. During this time period, two part-time pharmacists were delivering CMM to patients as part of seven rural primary care clinics.

Methods: Lessons learned were identified through qualitative interviews with six clinic liaisons, review of pharmacists' observations, and open-ended survey questions with clinic staff and providers. Early service effectiveness was informed by MTP resolution rates and changes in patients' A1C levels.

Results: Key insights centered on the perceived benefits of the service for patients and clinics, the importance of patient outreach and engagement, access to implementation support strategies (e.g., workflows and technical assistance calls), and the need to adapt the CMM service and implementation strategies to local context. The MTP resolution rate averaged 88% across pharmacists. There was a significant decrease in A1Cs in participating patients as a result of the service.

Conclusion: Although preliminary, these results support the value of a pharmacist-led medication optimization service through remote delivery for complex patients with uncontrolled diabetes.

171 | Comparison of Burnout in Pharmacy Students Before and During a Pandemic

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Introduction: Burnout syndrome can occur among individuals who work with people. Symptoms impact job satisfaction, physical manifestations, and substance use. Those with burnout appear irritable, withdrawn, and inattentive to work. The Maslach Burnout Inventory (MBI), a nationally validated scale that measures burnout, exists in various versions including the General Survey for Students [MBI-GS(S)]. Little evidence exists regarding burnout among pharmacy students, particularly prior to and during a pandemic.

Research Question or Hypothesis: How does a pandemic impact burnout in pharmacy students?

Study Design: Cross-sectional

Methods: The MBI-GS (S) was administered anonymously to second-year student pre-pandemic and to second- and third-year pharmacy students mid-pandemic. Demographics questions and a reporting of the respondent's known Myers-Briggs Type Indicator were included. The MBI-GS(S) was used to determine self-reported levels of burnout. Respondents were categorized as either Engaged, Over-extended, Disengaged, Ineffective, or Burned out.

Results: There were 114 surveys distributed in Fall 2019 with 58 responses analyzed (51% response rate). In Spring 2021, 235 surveys were distributed with 87 responses analyzed (37% response rate). The majority for each survey were females with a college degree. The survey results for Fall 2019 and Spring 2021 were analyzed individually and then compared by looking at the percentage of respondents that fell into each category. These results were as follows: Engaged (Fall 2019: n=16, 29.1% vs. Spring 2021: n=29, 35.37%), Over-extended (Fall 2019: n=16, 29.1% vs. Spring 2021: n=25, 30.49%), Disengaged (Fall 2019: n=2, 3.6% vs. Spring 2021: n=1, 1.22%), Ineffective (Fall 2019: n=16, 29.1% vs. Spring 2021: n=15, 18.29%), and Burned out (Fall 2019: n=5, 9.1% vs. Spring 2021: n=12, 14.63%).

Conclusion: After performing a statistical analysis, it was determined that the increase in burnout prevalence was not statistically significant

(p=0.1609, z-score= -0.9909). Therefore, we cannot conclude that a pandemic worsens pharmacy student burnout.

172 | Knowledge of COVID-19 Vaccines among Healthcare Workers and Students

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Introduction: Widespread uptake of COVID-19 mRNA vaccines are key to decreasing the morbidity and mortality associated with COVD-19. All healthcare professionals play a role in influencing COVID-19 vaccine uptake given their role in patient education and administration of vaccines. Thus, it is pertinent for all healthcare professionals to be knowledgeable regarding COVID-19 vaccines in order to ensure they are safely and effectively administered to the community.

Research Question or Hypothesis: The purpose of this study is to assess knowledge regarding COVID-19 mRNA vaccines among healthcare professionals and trainees within a health sciences university.

Study Design: This study was an IBR exempt Qualtrics survey.

Methods: Healthcare professionals and students within a health sciences university were sent a link to a 14 question anonymous Qualtrics survey that assessed their knowledge of COVID-19 mRNA vaccines. The specific items that were assessed include vaccine FDA approval status, mechanism of action, dosing schedule, precautions and contraindications, adverse drug reaction reporting and monitoring, and COVID-19 testing in vaccinated individuals.

Results: A total of 119 participants completed the survey. Most respondents were knowledgeable regarding FDA emergency use authorized (EUA) status (81.5%), the vaccine mechanism of action (88.24%), and dosing schedule for both Pfizer and Moderna vaccines (88%). There was uncertainty in regards to the use of COVID-19 vaccines among cancer patients (36.44%), vaccine usage in patients taking immunosuppressive medications (40.34%), and utilization and purpose of V-safe (25.4%).

Conclusion: There was a clear understanding of the approval status and mechanism of action for COVID-19 mRNA vaccines among healthcare professionals and students. However, more education is needed regarding precautions and contraindications for COVID-19 vaccines. Strategies to address this knowledge gap need to be identified in order to provide optimal patient education and ensure safe vaccine administration in the community.

Pediatrics

173 | Efficacy and Safety of Tacrolimus for the Treatment of Pediatric Noninfectious Uveitis

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Introduction: In pediatric noninfectious uveitis patients unresponsive to traditional therapies, tacrolimus is used for rescue therapy due to its favorable adverse effect profile compared to other refractory therapies. To date, there is no literature available evaluating the efficacy and safety of tacrolimus in patients with pediatric noninfectious uveitis.

Research Question or Hypothesis: Evaluate the efficacy and safety of tacrolimus for the treatment of pediatric noninfectious uveitis

Study Design: Single health system, retrospective review of electronic medical records

Methods: A chart review of patients < 18 years old diagnosed with noninfectious uveitis who were intolerant to or failed conventional systemic immunosuppressants seen by Children's Hospital Colorado Ophthalmology and Rheumatology or University of Colorado Hospital Ophthalmology between January 2014 – January 2021 was completed. The primary outcome was the incidence of improvement in inflammation. Secondary outcomes included incidence of tacrolimus treatment failure and need for dose reduction or discontinuation due to adverse effects. Descriptive statistics were used to analyze the data. This study received IRB approval.

Results: Ten patients (40% female; mean age: 12.9 years) were included. The most common previously failed treatments were methotrexate (n = 10) and biologics (n = 4). Uveitis was secondary to systemic autoimmune diseases in 40% of patients. Tacrolimus was initiated a mean of 3.9 years after onset of uveitis with 9 patients requiring concomitant immunosuppressants. Of the 6 patients with an established goal tacrolimus trough range, 83% reached therapeutic goal at an average of 320.6 ± 205.6 days. Treatment failure requiring alternative therapies occurred in 20% of patients. Laboratory abnormalities were observed in 7 patients; however, dose reduction was only required in 3 patients with no discontinuation of therapy.

Conclusion: In this small cohort of patients who previously failed traditional systemic immunosuppressants, it was effective in reducing inflammation in 80% of patients. Tacrolimus was generally well-tolerated and did not require discontinuation of medication.

Peri-Operative Care

174 | Prothrombin complex concentrate vs. recombinant factor VII for perioperative bleeding in cardiothoracic surgery

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Introduction: Current guidelines support institutional transfusion algorithms in cardiothoracic surgery (CTS), including the use of goal-

directed coagulation factor concentrates in refractory bleeding. No singular pathway or factor product has been validated as the preferred approach, however, creating a need for factor product-based treatment algorithm evaluation.

Research Question or Hypothesis: In CTS patients with perioperative bleeding, is changing the preferred factor product from recombinant activated factor seven (rFVIIa) to four-factor prothrombin complex concentrate (4F-PCC) as part of a comprehensive treatment algorithm associated with differences in-hospital mortality, morbidity, or drug costs?

Study Design: Retrospective cohort study

Methods: We pursued a retrospective cohort study assessing approximately one year before and after a new institutional treatment algorithm for refractory bleeding in CTS was made available, which included a significant practice change in the preferred factor product from rFVIIa to 4F-PCC. All CTS patients at our two large community hospitals who received 4F-PCC or rFVIIa during calendar years 2019-2020 were included. Patients were excluded if they received both factor products. The primary outcome was all-cause in-hospital mortality. Additional outcomes include hospital length of stay (LOS), discharge disposition, and coagulation factor product charges.

Results: We identified 54 patients meeting inclusion criteria and excluded 3 patients, yielding 36 patients in the 4F-PCC group and 15 in the rFVIIa group (total n=51). Mortality was lower in the 4F-PCC group (8.33% vs. 26.67%), though LOS was longer (median 12.28 vs. 9.7 days) and more patients exhibited disability at time of discharge (13.89% vs. 6.67% discharged to inpatient rehabilitation center). Average factor product charge per patient was lower ($11,992 vs. $50,181).

Conclusion: The use of 4F-PCC over rFVIIa for refractory bleeding in perioperative CTS patients, in the setting of other practice changes incorporated into a new institutional treatment algorithm, was associated with lower mortality and medication costs at the expense of greater hospital LOS and disability at hospital discharge.

175 | Changes in postoperative opioid utilization after pharmacist-led order set standardization and education for total knee and hip arthroplasty at an academic medical center.

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Introduction: Opioid analgesics are often overprescribed after orthopedic procedures. Multimodal pain control was designed to reduce the need for opioids while maintaining optimal pain control. Standardized order sets and default discharge prescription quantities are strategies to encourage opioid prescribing best practices.

Research Question or Hypothesis: Does a multimodal order set, de-emphasizing opioids and discharge quantities with education by a pharmacist, change opioid utilization up to 6 months after total knee or total hip arthroplasty (TKR/THR) at an academic medical center.

Study Design: Retrospective, single-center study.

Methods: Adults (≥18 years old) who underwent TKR/THR from August 2019 through March 2020 were eligible. Patients with postoperative stay ≥7 days or incarcerated were excluded. Order standardization and education was implemented in December 2019. Patients were assigned to pre- (August 2019-December 2019) or post- (January 2020-March 2020) intervention period based on discharge date. Outcomes included discharge morphine milligram equivalents per day (MME/day), opioid tablets, and pain scores, and inpatient opioid and non-opioid medication use. Descriptive statistics compared changes in outcomes from pre- to post-intervention.

Results: There were 54 patients pre- and 59 patients post-intervention. At discharge, median MME/day fell 16.7% after the intervention (60 vs. 50; p<0.05), and median tablets prescribed decreased 14.0% (70 vs. 60; p=0.03). After the intervention, inpatient opioid exposure fell 50.5% (38.8 MME/day vs 19.2; p<0.05), and concurrent use of benzodiazepines (14.8% vs. 1.7%, p=0.01) and gabapentin (79.6% vs 13.6%, p<0.05) with opioids also decreased. Median postoperative pain scores did not significantly differ (5.3 vs 4.3; p=0.93).

Conclusion: Pharmacist-led order standardization resulted in reduced utilization and prescribing of opioids, and decreased concurrent use of high-risk medications without affecting pain control. More work is needed to lower prescription quantities and match inpatient requirements.

176 | Surgical Opioid Avoidance Protocol (SOAP) Following Kidney Transplant

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Introduction: The opioid epidemic is a national public health crisis and the post-operative setting is a major area of opioid exposure. In May 2019, our center's post-operative pain management transitioned from opioid minimization to opioid avoidance with a novel strategy entitled Surgical Opioid Avoidance Protocol (SOAP). SOAP includes a multimodal analgesic regimen consisting of scheduled IV/PO acetaminophen, topical lidocaine patch, tramadol as needed, and breakthrough options including single-dose IV morphine and ketamine infusion.

Research Question or Hypothesis: SOAP will reduce opioid utilization following kidney transplant.

Study Design: Retrospective, observational, before and after study.

TABLE 1 Baseline Characteristics*

	Pre-SOAP(n= 88)	Post-SOAP(n=123)
Age, years, average(SD)	53.1 (13.3)	50.1 (12.3)
Male Gender, n(%)	49 (55.7)	76 (61.8)
Race, n(%)		
Caucasian	12 (13.6)	28 (22.8)
Black	43 (48.9)	57 (46.3)
Asian	3 (3.4)	3 (2.4)
Hispanic	30 (34.1)	34 (27.6)
Other	0 (0)	1 (0.8)
BMI, kg/m2, (SD)	33.5 (10.4)	32.6 (8.6)
Robotic Surgery, n(%)	20 (22.7)	31 (25.2)
Chronic Pain Diagnosis on Transplant Admission, n(%)	8 (9.1)	15 (12.2)
Opioid Use 3 mos pre-txp, n(%)	7 (8)	11 (8.9)
Daily Morphine Equivalent Use Prior to Admission, median	0	0

*all p-values > 0.05

Methods: Patients were divided into pre-SOAP and post-SOAP groups for analysis. Baseline characteristics were collected and compared for each group. Post-operative opioid usage, morphine milligram equivalents (MME) from the time of post-transplant extubation until discharge from transplant index admission, was compared as the primary endpoint. Secondary endpoints included average pain score during the transplant admission.

Results: The pre-SOAP and post-SOAP groups consisted of 88 and 123 patients, respectively. Baseline characteristics were comparable (Table 1). During transplant admission, median (IQR) MME was higher in pre-SOAP group compared to post-SOAP group (39MME (22.5-62.1) vs. 20MME(10-35); p=0.001). Average pain score was higher in the pre-SOAP group compared to the post-SOAP group (2.7 (+/-1.6) vs. 2(+/-1.3); p=0.002).

Conclusion: SOAP following kidney transplant is associated with significantly less MME. Despite less opioid use, patients in the post-SOAP group had significantly lower average pain scores.

Pharmacoeconomics/Outcomes

177 | Cost Analysis of Rivaroxaban versus Enoxaparin for Prophylaxis of Venous Thromboembolism in Acute Medical Ill Patients

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Introduction: Acute medically ill patients are at high risk for venous thromboembolism (VTE). Subcutaneous enoxaparin is the 'gold' standard therapy in these patients. Recently, one direct oral anticoagulant has been approved for this indication by the FDA; rivaroxaban (2019).

Research Question or Hypothesis: The aim of this study was to perform a cost analysis of rivaroxaban versus enoxaparin for VTE prophylaxis.

Study Design: Cost-comparative/effectiveness/utility/benefit analysis

Methods: Cost estimates of rivaroxaban and enoxaparin were obtained from publicly available sources (CMMS, Drugs.com). Cost estimates for clinical outcomes were garnered from literature and public databases (CMMS). Data from a key trial (rivaroxaban: MAGELLAN) was utilized to determine probabilities of potential clinical outcomes. A decision tree model was constructed (TreeagePro®) for analysis of the therapy relative to enoxaparin. Doses/regimens were consistent with approved labeling. Costs were reported in 2019 United States currency (USD) and the study was performed from a societal perspective. Discount rate was 5%. Monte Carlo (probabilistic sensitivity) analyses was performed. Results are expressed as expected value (EV) or the average cost for each treatment strategy. Two-way sensitivity analyses using 50% to 200% of the key VTE clinical outcomes were performed.

Results: The EV or lowest cost strategy, for the comparison of enoxaparin to rivaroxaban favored enoxaparin ($1,271 versus $1,650; 22.3% difference) using probabilities from the MAGELLAN study.

Conclusion: In acute medically ill hospitalized patients at risk for VTE, the EV of enoxaparin was more optimal than rivaroxaban based upon clinical trial results. These results are valuable in guiding effective clinical decision making and assessments for formulary inclusion. As further clinical outcome data becomes available, it is recommended that similar analyses should be repeated to better model real-world settings.

178 | Trends in Healthcare Expenditure in United States Adults with Chronic Kidney Disease: 2014-2018

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Introduction: Chronic kidney disease (CKD) is a leading cause of significant morbidity and mortality in the United States. Previous research demonstrated CKD contributed substantially to a patient's economic burden between 2002 and 2011. The objective of this study was to determine the economic burden of CKD using recent data from 2014-2018.

Research Question or Hypothesis: We hypothesized that adults diagnosed with CKD have significantly greater economic burden in their healthcare expenditure than those without CKD.

Study Design: This was a retrospective, cohort study that investigated healthcare expenditures collected through the Agency for Healthcare Research and Quality's (AHRQ) Medical Expenditure Panel Survey (MEPS).

Methods: Data from 2014 to 2018 for individuals aged ≥18 was used. Patients were excluded if they were not in scope for the entirety of their survey year or had inapplicable data for covariates of interest. CKD was identified based on ICD-9 (2014-2015) and ICD-10 (2015-2018) codes. Two-part models were used to estimate expenditures (first part probit,

second part generalized linear model with log-link function and gamma distribution). We adjusted for demographic variables and comorbidities.

Results: We included 98,858 adults between 2014 and 2018. Of those, 230 adults had CKD, and after applying survey weights, represented approximately 2.5 million US patients. CKD was more likely among those ≥65 years, Non-Hispanic Whites (NHW), Southern residents, married, and with high income. Unadjusted analysis for mean total expenditure for CKD vs. no CKD was $17,999 vs. $7,049. After adjustment for covariates in the two-part model, patients with CKD had $5,179 higher expenditures than patients without CKD. Unadjusted prescription spend was $6,732 and $2,100 for patients with and without CKD, respectively. After adjustment, patients with CKD had $1,762 higher prescription spend compared to patients without CKD.

Conclusion: CKD imposes a significant economic burden on healthcare and future research is needed to lower costs.

Pharmacoepidemiology

179 | Disparities in the use of antidiabetic medications with cardiovascular benefits: An analysis of the National Health and Nutrition Examination Survey 2015-2018

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Introduction: Cardiovascular outcome trials have shown that certain antidiabetic medications can reduce cardiovascular risk in individuals with type 2 diabetes and cardiovascular disease (CVD) or high cardiovascular risk. Pharmacists commonly encounter these medications, and it is important to understand how they are used in clinical practice. This study investigated evidence-based use of these medications, as well as potential disparities in use.

Research Question or Hypothesis: Are cardioprotective antidiabetic medications preferentially used in people with diabetes and CVD, and do disparities in use exist based on socioeconomic factors and healthcare utilization?

Study Design: Cross-sectional study using 2015-2018 National Health and Nutrition Examination Survey data

Methods: Non-pregnant adults ≥20 years old with self-reported diabetes, A1c >6.4%, or fasting glucose >125mg/dL were included. The primary outcome was to compare the use of cardioprotective antidiabetic medications (liraglutide, semaglutide, canagliflozin, empagliflozin) in individuals with and without CVD (defined as coronary heart disease, angina pectoris, myocardial infarction, and/or stroke). Secondary analyses included comparisons based on socioeconomic factors and healthcare utilization. Weighted multiple logistic regression, adjusted for co-variates, was performed to test association of CVD status, socioeconomic factors, and healthcare utilization with the use of cardioprotective antidiabetic medications. Analyses were conducted at alpha of 0.05, using SAS version 9.4.

Results: Use of cardioprotective antidiabetic medications was greater in people with CVD versus without (6.9% vs 2.4%; adjusted odds ratio [aOR] 2.88, 95%CI 1.10-7.50). Among those with CVD, income >3.5 versus ≤1.3 times the poverty level was associated with a higher likelihood of receiving cardioprotective medications (15% vs. 2.8%; aOR 6.42, 95%CI 2.40-17.14). Additionally, use of cardioprotective medications was more common in individuals with ≥2 versus ≤1 healthcare visits in the past year (7.7% vs. 0%; aOR>999.999).

Conclusion: Cardioprotective antidiabetic medications seem to be preferentially used in individuals with CVD, but disparities in use among those with CVD appear to exist based on income level and healthcare utilization.

180 | Acute liver injury following exposure to sulfamethoxazole/trimethoprim

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Introduction: Drug-induced liver injury, although rare, is the leading cause of acute liver failure and has been associated with a variety of medications. The Veterans Health Administration (VHA) Drug-Induced Liver Injury Database Project applied new approaches to identify acute liver injury events following drug exposures using the electronic medical records (EMR). The purpose of this study was to utilize those approaches to deduce acute liver injury (ALI) incidence associated with sulfamethoxazole/trimethoprim (SMZ/TMP) in the real world, as well as to identify risk disparities pertaining to age, gender, and race/ethnicity.

Research Question or Hypothesis: What is the incidence and patterns of ALI in VHA EMR for SMZ/TMP? Is there an association between demographics (age, gender and race/ethnicity) and incidence in SMZ/TMP-associated ALI?

Study Design: This study was a retrospective cohort analysis of data collected via the VHA EMR during the years 1999-2015.

Methods: Incidence of ALI following exposure to SMZ/TMP was computed and analyzed for the association with demographic characteristics using multiple logistic regression models.

Results: Approximately 900,000 patients were exposed to the study drug SMZ/TMP. For SMZ/TMP exposed patients, most patients were male (88.8%), greater than 66 years of age (66.6%) and white (68.7%). Acute liver injury incidence for SMZ/TMP was 0.28% (95% confidence interval 0.27–0.29). In the multiple logistic regression, men, unknown race/ethnicity and ages 56-65 had the highest incidences to develop ALI. Men, American Indian or Alaska Native and ages 46-65 had statistically significant increased odds compared to their reference groups to develop ALI following SMZ/TMP.

Conclusion: This study demonstrated high rates of acute liver injury following SMZ/TMP in comparison to prior literature. Risk disparities

were found in acute liver injury following the exposure to SMZ/TMP. A better understanding of risk disparities for SMZ/TMP will allow for more informed prescribing decisions and monitoring for future patients.

181 | Trends in Opioid, Benzodiazepine, and Co-Prescribing among Adults with Alcohol Use Disorder within New York State

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Introduction: Alcohol use disorder (AUD) is a highly prevalent public health problem with increasing evidence that alcohol is a contributing factor to opioid- and benzodiazepine-related morbidity and mortality. Substance misuse is common, yet there is a general absence of research examining the co-use of alcohol, opioids, and benzodiazepines.

Research Question or Hypothesis: To estimate temporal trends and geographic variation in prescribing of opioids, benzodiazepines, and co-prescribing among individuals with AUD.

Study Design: Serial cross-sectional study using merged data from the NYS Office of Alcoholism and Substance Abuse Services (OASAS) and the NYS Medicaid Data Warehouse (MDW).

Methods: Subjects ≥18 years of age with a first admission to an OASAS treatment program from 2005-2018 and a primary AUD were included. 154,178 eligible cases were matched with Medicaid data; subjects with at least one Medicaid claim during each year were included in the analysis. Prescription claims were identified within the MDW, and co-prescribing was defined as an overlap in an opioid and benzodiazepine prescription by at least 7 days. Geographic regions were defined based on the four major NYS regions. Segmented regression models were used to evaluate changes in prescribing patterns (SAS version 9.4).

Results: Opioid prescribing rates increased from 16.5% to 27.4% between 2005-2012 (β: 1.58; p<0.0001) with a decrease of 25.7% to 16.6% from 2013-2018 (β: -1.87, p<0.0001). Benzodiazepines prescribing rates also increased from 4.5% to 11.9% between 2005-2012 (β: 1.05; p<0.0001) followed by a decrease of 11.9% to 9.17% (β: -0.21; p=0.018). Co-prescribing rates ranged from 1.24% to 3.60% and followed a similar pattern. Most commonly prescribed opioids included hydrocodone (range: 4.82%-14.25%) and oxycodone (range: 1.29%-10.9%). Overall prescribing rates were consistently lower in the NYS metropolitan region as compared to other regions.

Conclusion: Opioid, benzodiazepine, and co-prescribing rates among those with AUD followed similar trends, with prescribing rates peaking in 2012 followed by a steady decline.

182 | An overview of prescribing patterns of drugs treating opioid dependence among patients with comorbid alcohol and opioid use disorders

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Introduction: Alcohol use disorder (AUD) has an association with concurrent opioid use disorder (OUD). Comorbid AUD and OUD are shown to complicate treatment for either condition alone and are associated with increased mortality. Drug therapy serves as the essential intervention to reduce health risks. Reports from drug utilization reviews are important tools employed in the assessment of dual diagnosis of AUD and OUD due to limited data available.

Research Question or Hypothesis: Determine the prescribing patterns of medications treating opioid dependence among in patients with comorbid AUD and OUD.

Study Design: Retrospective repeated cross-sectional study

Methods: The data was drawn from the New York State Medicaid Data Warehouse matched to the Office of Alcoholism and Substance Abuse Services (OASAS) between 2005 and 2018. Patients with dual diagnosis of AUD and OUD and had at least one Medicaid claim in that year at cohort entry and for each subsequent year were included. Linear regression models were performed to examine trends of prescribing patterns of drugs treating opioid dependence including buprenorphine, methadone, naloxone, and naltrexone among patients with comorbid AUD and OUD. All hypothesis testing was two-sided with a significance set at p<0.05 (SAS version 9.4).

Results: There were 14,996 eligible patients included in this study. Overall annual average drug utilization rates of buprenorphine, methadone, naloxone, and naltrexone were 16.64%, 0.81%, 16.38%, and 6.94% respectively. Trends of rates increased from 2005 to 2018 for buprenorphine (2.24% to 21.27%, p<.0001), naloxone (2.24% to 21.45%, p<.0001), and naltrexone (1.34% to 12.15%, p<.0001). Trends of methadone usage did not show significant change (p=0.55).

Conclusion: Overall drug utilization rates of all medications used to treat opioid dependence was low among patients with comorbid AUD and OUD. Trends of rates increased significantly for buprenorphine, naloxone, naltrexone, except the methadone. Low utilization rates for

OUD drugs suggest that that patients did not receive optimal treatment for this condition.

183 | Association between Potentially Inappropriate Medication Prescribing and Health-related Quality of Life among U.S. Older Adults

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Introduction: Potentially inappropriate medications (PIMs) can negatively impact clinical outcomes among older adults. Their impact on health-related quality of life (HRQoL) among U.S. older adults is less well understood.

Research Question or Hypothesis: We hypothesize that exposure to PIMs is negatively associated with HRQoL.

Study Design: Cross-sectional analysis utilizing U.S. nationally representative data from the 2011 to 2015 Medical Expenditure Panel Survey (MEPS).

Methods: Respondents aged ≥65 years were identified within MEPS from 2011-2015. PIM exposure was identified using the 2019 Beers criteria. Primary outcomes included the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores of the 12-Item Short Form Health Survey (SF-12). Mean PCS and MCS scores were compared with t-tests. Linear regression models were used to examine the association of PIM exposure on HRQoL after adjusting for covariates, with a stratification based on age groups. Survey weighted procedures were used throughout (SAS Version 9.4).

Results: Unadjusted analysis showed poorer scores in the PIM exposed group in terms of PCS [aged 65-74: 40.4 vs 46.1; aged 75-84: 38.1 vs 42.0; aged ≥85: 33.2 vs 37.0] and MCS [aged 65-74: 51.0 vs 54.0; aged 75-84: 51.0 vs 52.9; aged ≥85: 47.2 vs 51.3] scores (all p <.0001). In adjusted models, PIM exposure was associated with poorer PCS scores in respondents aged 65-74 years (adjusted regression coefficient: -1.25 [95% CI -1.83, -0.66; p <.0001]) and 75-84 years (adjusted regression coefficient: -1.04 [95% CI -1.89, -0.19; p =.0166]). PIM exposure was also associated with poorer MCS scores in respondents aged 65-74 years (adjusted regression coefficient: -1.61 [95% CI -2.11, -1.11; p <.0001]) and ≥85 years (adjusted regression coefficient: -2.73 [95% CI -3.97, -1.50; p <.0001]).

Conclusion: Our results suggest that patient's exposure to PIMs is associated with poorer HRQoL. Further work is needed to assess whether interventions to deprescribe PIMs may help to improve patient's HRQoL.

184 | The prevalence and trends of opioid use disorder in patients with alcohol use disorder

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Introduction: Alcohol use disorder (AUD) remains a significant health problem in the United States. Individuals with AUD appear to require larger doses of opioids for pain management. Higher doses and duration of opioids may lead to opioid use disorder (OUD). Understanding the prevalence and trends may incentivize improvements, however, the current information is limited.

Research Question or Hypothesis: What is the prevalence and trends over time of OUD occurrence in AUD patients?

Study Design: Retrospective repeated cross-sectional study

Methods: We analyzed data from the New York State Medicaid Data Warehouse matched to the Office of Alcoholism and Substance Abuse Services (OASAS) from 2005 to 2018. Patients who presented with a primary AUD diagnosis and had at least one Medicaid claim in that year at cohort entry and for each subsequent year were included. Prevalence was defined as the number of AUD patients with at least one diagnosis of OUD per year and further stratified by age, gender, and race. Differences in prevalence were assessed by chi-square test. Linear regression was performed to examine the trends and the alpha was set at .05 (SAS version 9.4).

Results: There were 177,685 eligible patients included in this study. Overall annual average OUD prevalence was 8.44% (range 5.75% to 10.77%). The trends of prevalence increased yearly (5.75% to 10.77%, p<.0001). Rates in females were higher than males (8.89% vs. 8.22%, p<.0001). Patients aged 18-35 had the highest prevalence (9.47%), followed by those aged 36-55 (7.95%, p<.0001), and those aged ≥ 56 (6.12%, p<.0001). Prevalence was highest among White Non-Hispanics (9.90%), followed by Hispanic (7.54%, p<.0001), Black (7.03%, p<.0001) and those classified as other (6.34%, p<.0001), respectively.

Conclusion: Overall OUD prevalence in AUD patients increased over time and varied across different sex, age groups and ethnicities. Further research is necessary investigating the predictors of developing OUD among those populations.

Pharmacogenomics/Pharmacogenetics

185 | Projected Clinical Impact of Preemptive Multigene Pharmacogenomic Testing on Medication Prescribing in Percutaneous Coronary Intervention and Bone Marrow Transplant Patients

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Introduction: Single-gene pharmacogenetic (PGx) tests have been implemented to guide antiplatelet therapy selection (*CYP2C19*) after percutaneous coronary intervention (PCI) and tacrolimus dosing (*CYP3A5*) after transplant. However, it remains unclear whether preemptive multigene testing could further optimize medication prescribing in these specialized clinical settings.

Research Question or Hypothesis: What is the projected impact of preemptive multigene PGx testing on medication prescribing in distinct clinical settings that are currently utilizing single-gene reactive PGx testing?

Study Design: Single-center retrospective cohort study.

Methods: Prescription frequencies for 66 medications with PGx actionable evidence (CPIC Level A-B) were collected over three encounters in 215 PCI and 131 allogeneic hematopoietic cell transplant (allo-HCT) patients that underwent *CYP2C19* and *CYP3A5* testing, respectively. Frequencies were compared across populations by chi-square test. A simulation analysis projected the number of medication interventions, beyond clopidogrel and tacrolimus, which could have been made if preemptive testing for *CYP2C19*, *CYP3A5*, *CYP2D6* and 5 additional pharmacogenes was used.

Results: In the PCI and allo-HCT cohorts, respectively, 66.5% and 90.1% of patients were prescribed at least one PGx actionable medication ($p<0.001$); 35.6% and 74.1% were prescribed two or more medications ($p<0.001$). Medications impacted by *CYP2C19* and *CYP2D6*, specifically proton pump inhibitors (40.5% vs. 74.8%, $p<0.001$), antidepressants (14.9% vs. 13.7%, $p=0.77$), and opioids (17.2% vs. 17.5%, $p=0.92$) were commonly prescribed. Simulated preemptive multigene PGx testing projected a total of 26.0 and 41.7 actionable interventions per 100 PCI and allo-HCT patients, respectively, which were informed by *CYP2C19* (18.1 vs. 35.9 per 100 patients), *CYP2D6* (5.1 vs. 5.0), and other (2.8 vs. 0.8) genotypes.

Conclusion: Multiple medications with actionable PGx recommendations, beyond clopidogrel and tacrolimus, are commonly prescribed in PCI and allo-HCT patients. A preemptive multigene PGx testing strategy could benefit both populations, and may have a higher impact on medication prescribing following allo-HCT. Prospective studies evaluating the clinical utility of preemptive multigene testing in these settings are warranted.

186 | Multi-site evaluation of institutional processes and implementation determinants for pharmacogenetics testing to guide antidepressant therapy

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Introduction: There is growing interest in utilizing pharmacogenetics (PGx) testing to guide antidepressant therapy, but there is a lack of clarity on how to implement testing into clinical practice.

Research Question or Hypothesis: What approaches have early adopters of clinical PGx testing taken to operationalize PGx testing within their institutions and what factors were perceived to be important to implementation.

Study Design: Two electronic surveys administered to 17 affiliate sites within the Implementing Genomics in Practice (IGNITE) network.

Methods: Surveys were administered to sites that had implemented or were in the process of implementing PGx testing to guide antidepressant prescribing. Survey 1 collected data on testing process and logistics. Survey 2 asked sites to rank the importance of Consolidated Framework for Implementation Research (CFIR) constructs using best-worst scaling choice experiments and collected data regarding implementation strategies and outcomes.

Results: 13 of 17 sites had implemented testing and 4 were in the planning stage. 13 offered testing in the outpatient setting, and 9 in both outpatient/inpatient settings. PGx tests were mainly ordered by psychiatry (92%) and primary care (69%) settings. *CYP2C19* and *CYP2D6* genotypes were the most common genes tested. Institutions provided recommendations according to Clinical Pharmacogenetics Implementation Consortium (CPIC) guidelines (94%) and FDA guidance (76%). Both institutional (53%) and commercial labs (53%) were used for testing. Sites varied on the methods for returning results to providers and patients. Sites were consistent in ranking CFIR constructs and identified *patient needs/resources*, *leadership engagement*, *intervention knowledge/beliefs*, *evidence strength and quality*, and the *identification of champions* as most important for implementation. Sites deployed similar implementation strategies and measured similar outcomes.

Conclusion: The process of implementing PGx testing to guide antidepressant therapy varied across sites, but the key drivers for successful implementation were similar and may help guide other institutions interested in providing PGx-guided pharmacotherapy for antidepressant therapy.

187 | Evaluation of a Primary Care Based Pharmacogenomic Pilot Program

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Introduction: ARUP Laboratories has an onsite primary care clinic for employees and dependents. Pharmacogenomic testing (PGX) was implemented and evaluated by clinical pharmacists at ARUP Laboratories to better understand how PGX can improve medication use and minimize potential drug therapy problems within an employer-based primary care setting.

Research Question or Hypothesis: 1) Provide characterization of ARUP Laboratories pharmacist-led PGX program. 2) Assess the clinical utility of a PGX program in an employer-based primary care population.

Study Design: Single site, retrospective pre-post, observational, cohort study.

Methods: Selection for inclusion in the PGX program was based on claims data and provider referral. Patient enrollment and medication reconciliation was completed during an initial appointment with the clinical pharmacist and a venous blood sample was collected (CYP panel including genotype for 2C19, 2C8, 2C9, 2D6, 3A4, and 3A5). At the second appointment, pharmacists discussed results and medication recommendations, both PGX and non-PGX related, with patients. Genetic results, drug-gene interactions (DGI), and medication recommendations and adjustments were recorded in the electronic medical record. Descriptive statistics were used to report the mean number of DGI, medications pre and post PGX, and medication recommendations made per patient. Statistical significance of changes in medication use, pre- versus post-PGX, was determined through a two-tailed paired student T-test with an alpha of 0.05.

Results: One DGI on average was identified per participant. A statistically significant reduction in the mean number of medications used pre- vs. post-PGX was noted (11.5 to 11.3, $p = 0.02$). On average, 5.1 medication recommendations were made per patient (3.8 PGX related vs. 1.2 non-PGX related). A majority (52.6%) were related to future vs. current or past medications. Most recommendations were related to mental health (39.7%) or chronic pain (32.4%).

Conclusion: PGX is a useful clinical tool within primary care and pharmacists can effectively implement PGX programs.

188 | Perceptions regarding pharmacogenomics and return of results for antidepressant medications in Minnesota Hmong

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Introduction: Genomic-guided treatment for depression may improve remission rates versus usual-care. We previously reported pharmacogenomic (PGx) knowledge could yield clinically meaningful recommendations in 11/16 antidepressants reported for a Hmong

cohort. This suggests value in understanding the perceptions and acceptance of return of PGx reports in underrepresented populations.

Research Question or Hypothesis: The Hmong community (A) perceives value in receiving PGx reports and (B) prefer a community-derived over a commercial report format.

Study Design: Qualitative study

Methods: Two focus groups were attempted to evaluate two mental health PGx reports using recorded HIPAA compliant Zoom sessions. Semi-structured questions explored attitudes towards receiving PGx reports and preferences regarding format and content between a Community-Based Participatory Research (CBPR)-derived report focused on pharmacokinetic genes and a commercial report (OneOme) integrating pharmacokinetic and pharmacodynamic genes. Participants contacted from two previous cohorts received either a personal (Nelson et al.) or a mock (Wen et al., Holzer et al.) PGx report. Two investigators utilized thematic analysis to identify common themes.

Results: Focus groups were converted into semi-structured group interviews of two participants each (2 males, 2 females) between 20 and 40 years old. Themes of utility, empowerment, communication, and trust were identified. Participants endorsed the utility of PGx reports to the Hmong community which could provide a sense of empowerment in their own health. Participants perceived PGx reports could aide in communicating treatment decisions and could mitigate the older generations' distrust of western medication regarding non-physical conditions, such as depression. When comparing the two reports, participants generally preferred the simpler CBPR report but concluded a combinatorial approach would be best for the community, as the commercial report included more detailed results.

Conclusion: Our findings support the value of PGx results in the Hmong community and identify preferences for the simplicity of the CBPR-derived report and for the detailed results from the commercial report.

189 | 30-day and 90-day readmissions between genotype-optimal and genotype-suboptimal antiplatelet therapy following percutaneous coronary intervention

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Introduction: Practice guidelines recommend dual antiplatelet therapy (APT) with a $P2Y_{12}$ inhibitor and aspirin following percutaneous coronary intervention (PCI). Pharmacogenetic guidelines are also available to inform *CYP2C19* genotype (PGx)-guided $P2Y_{12}$ inhibitor selection. Despite increased accessibility to alternative $P2Y_{12}$ inhibitors, clopidogrel remains most commonly prescribed; however, *CYP2C19* polymorphisms may reduce clopidogrel efficacy and increase the risk of poor outcomes such as hospital readmissions.

Research Question or Hypothesis: To compare 30-day and 90-day readmissions of patients prescribed PGx-optimal APT versus PGx-suboptimal APT.

Study Design: Retrospective cohort observational study

Methods: Adults 18 years and older undergoing PCI, *CYP2C19* genotyping, and prescribed a $P2Y_{12}$ inhibitor as part of dual APT between January 2017 and January 2021 were included. Data were abstracted from electronic health records. Primary outcomes included 30-day and 90-day readmissions following index PCI. Secondary outcomes included readmission type and duration, and $P2Y_{12}$ inhibitor conversion during readmission. Data were analyzed using Kruskal-Wallis and Chi-Square tests.

Results: A total of 589 patients were included (464 prescribed PGx-optimal APT; 125 prescribed PGx-suboptimal APT). The population was 65% male, averaged 64 years of age, and 78% were of non-European ancestry. 50% (PGx-optimal) and 39% (PGx-suboptimal) underwent PCI for acute coronary syndromes while 45% (PGx-optimal) and 61% (PGx-suboptimal) underwent PCI for stable coronary artery disease. Clopidogrel was the most prescribed $P2Y_{12}$ inhibitor (72% PGx-optimal, 96% PGx-suboptimal). Comparable 30-day and 90-day readmission rates were observed between the PGx-optimal and PGx-suboptimal arms (30-day: 12% vs. 10%, $p=0.481$; 90-day: 24% vs. 28%, $p=0.323$). Approximately 63% (PGx-optimal) and 57% (PGx-suboptimal) of readmissions were cardiac-related, with no difference between groups ($p=0.129$). Median readmission duration was not significantly different. $P2Y_{12}$ inhibitor therapy was switched more often during a readmission in PGx-suboptimal patients (48% vs. 18%, $p<0.001$).

Conclusion: Optimally-selected $P2Y_{12}$ inhibitor by PGx did not appear to impact subsequent rehospitalizations or readmission type. Further study is needed due to a limited sample size.

190 | Clinical Impact of Precision Medicine in a Precision Genomics Oncology Clinic Population

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Introduction: The high prevalence of polypharmacy in patients with advanced cancer suggests that they would likely benefit from precision prescribing of drug therapies.

Research Question or Hypothesis: Our objective was to assess the potential impact of pharmacogenomics (PGx) and management of

drug-drug interactions (DDIs) within a cohort of adults with advanced cancer.

Study Design: This study was a retrospective review of genetic and demographic data for patients seen at our institution's solid molecular tumor board and enrolled in the associated research study.

Methods: Demographic, cancer diagnosis, and inpatient and outpatient medication data were collected from the electronic health records of subjects from the Indiana University Precision Genomics Oncology Clinic. All subjects were genotyped for actionable alleles in *CYP2B6*, *CYP2C19*, *CYP2C9*, *CYP2D6*, *CYP3A4*, *CYP3A5*, *CYP4F2*, *DPYD*, *G6PD*, *IFNL3*, *SLCO1B1*, *TPMT*, and *VKORC1*. DDIs were defined as concomitant prescription of strong inhibitors or inducers with sensitive substrates of the same drug-metabolizing enzyme. Data were analyzed starting from each subject's date of first cancer diagnosis.

Results: We coded 269,255 unique medication orders for our cohort of 481 subjects. 31% of genotypes were actionable for at least one drug based on clinical guidelines, and all but 2 subjects had an actionable genotype for at least one potential drug. 13% of subjects had an actionable genotype and were prescribed a corresponding actionable drug. The rates of DDIs involving drugs affecting CYP2B6, CYP2C8, CYP2C9, CYP2C19, CYP2D6, and CYP3A were 0%, 0%, 15%, 31%, 45%, and 36%, respectively. When incorporating strong inhibitors with genotypes, the rates of actionable phenoconverted genotypes for CYP2B6, CYP2C9, CYP2C19, CYP2D6, and CYP3A4 were 50%, 57%, 75%, 78%, and 40%, respectively.

Conclusion: Our results indicate that the majority of advanced cancer patients have genetic or drug-induced alterations in biological systems that affect drug action and may therefore benefit from PGx and management of DDIs.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

191 | Effects of diabetes and obesity on in vitro human carboxylesterase-1 activity

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Introduction: Clopidogrel is an antiplatelet agent used to reduce the risk of cardiovascular events in patients with acute coronary syndrome and those undergoing coronary artery stent placement. The clopidogrel parent drug is inactive and the majority (85-90%) is hydrolyzed by hepatic carboxylesterase-1 (CES1) to form an inactive metabolite. In a competing metabolic pathway, the remaining drug undergoes a two-step metabolic process catalyzed by hepatic CYP450 enzymes to form the active metabolite that inhibits platelet aggregation. Clopidogrel active metabolite plasma concentrations and antiplatelet activity are markedly reduced in patients with diabetes or obesity but the mechanism(s) remain unclear.

Research Question or Hypothesis: This project seeks to determine the effects of diabetes and obesity (BMI) on CES1-mediated clopidogrel and oseltamivir (>90% hydrolyzed by CES1) in vitro metabolism.

Study Design: In vitro metabolic studies were conducted in human liver microsomes (HLMs) from diabetic and non-diabetic donors using clopidogrel and the antiviral agent oseltamivir as CES1 activity probes.

Methods: Michaelis-Menten enzyme kinetics (V_{max}, K_m, and CL_{int} intrinsic clearance) were determined for CES1 hydrolysis of clopidogrel and oseltamivir in HLMs. Drug and metabolite concentrations were determined by LC-MS/MS.

Results: There were no differences in the CL_{int} (mean $\pm$ SD) for CES1 hydrolysis of either clopidogrel (415 $\pm$ 212 vs 484 $\pm$ 228 $\mu L \cdot min^{-1} \cdot mg^{-1}$ protein) or oseltamivir (19.6 $\pm$ 11.9 vs 23.2 $\pm$ 4.9 $\mu L \cdot min^{-1} \cdot mg^{-1}$ protein) in HLMs from diabetic versus non-diabetic samples, respectively. Both clopidogrel (653 $\pm$ 253 vs 400 $\pm$ 182 $\mu L \cdot min^{-1} \cdot mg^{-1}$ protein) and oseltamivir (31 $\pm$ 6 vs 19 $\pm$ 8 $\mu L \cdot min^{-1} \cdot mg^{-1}$ protein) CL_{int} were significantly ($p<0.05$) lower in samples from obese compared to normal weight subjects.

Conclusion: Obesity, but not diabetes, is associated with reduced CES1 in vitro activity. Thus, obesity may be an important factor affecting variability in the disposition and response to the growing number of CES1 substrate drugs.

192 | Pharmacokinetics, safety, and tolerability of intravenous spesolimab, an anti-interleukin 36 receptor (IL-36R) monoclonal antibody in healthy male subjects

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Introduction: Spesolimab (BI 655130) is a humanized, monoclonal antibody that targets IL-36R. Dysregulation of the IL-36 signaling pathway is associated with the pathogenesis of inflammatory diseases such as generalized pustular psoriasis, which has an unmet clinical need.

Research Question or Hypothesis: Evaluate the pharmacokinetics, safety, and tolerability of single- and multiple-rising doses of spesolimab in healthy male subjects.

Study Design: Two Phase 1, placebo-controlled, dose-escalation studies with spesolimab (single or multiple dose) were conducted in healthy male volunteers. Study 1, a partially randomized, single-blind study, assessed single-rising intravenous doses of spesolimab 0.001, 0.003, 0.01, 0.03, 0.1, 0.3, 1.0, 3.0, 6.0, and 10 mg/kg. Study 2 was conducted in two parts; part 1 (randomized 3:1, double-blind) assessed multiple-rising intravenous doses of spesolimab 3, 6, 10, and

20 mg/kg once a week over 4 weeks and part 2 (partially randomized, single-blind) assessed a single intravenous dose of 20 mg/kg.

Methods: Spesolimab plasma concentrations were determined by a validated enzyme-linked immunosorbent assay (Study 1) or Gyros affinity flow-through immunoassay (Study 2). Safety and tolerability were evaluated using standard safety assessments.

Results: Spesolimab exhibited target-mediated drug disposition (TMDD) after single-dose administration. A more than dose-proportional increase in the area under the curve was noted at lower doses but increased linearly with 0.3 to 20 mg/kg doses. In the linear range, terminal half-life was 20.4–35.2 days and systemic clearance was 0.147–0.193 L/day. Pharmacokinetic data were linear after multiple-dose administration. All adverse events were of mild or moderate intensity. The overall incidence of subjects with adverse events was comparable between spesolimab and placebo groups.

Conclusion: Spesolimab exhibited TMDD and demonstrated linear pharmacokinetics from 0.3 to 20 mg/kg. Single- and multiple-dose spesolimab up to 20 mg/kg were well-tolerated in healthy male subjects.

193 | Comparison of Bayesian and First-order Kinetics for Calculation of Vancomycin Area Under the Curve

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Introduction: Consensus guidelines recommend monitoring vancomycin AUC_{24} to improve therapeutic success and reduce nephrotoxicity. Although guidelines specify that either Bayesian software or first-order equations may be used to estimate AUC_{24}, there are currently no large studies directly comparing these two methods.

Research Question or Hypothesis: To compare calculated AUC_{24} using first-order equations from two drug concentrations at steady state to Bayesian one and two-level estimations.

Study Design: Single center, retrospective study of 980 adult hospitalized patients receiving vancomycin from 2017-2019.

Methods: Patients were included if they received at least 72 hours of vancomycin and had two serum drug concentrations obtained within 96 hours of vancomycin initiation. Patients with acute kidney injury (AKI) prior to vancomycin were excluded. AUC_{24} was calculated using first-order analytic, Bayesian one-level, and Bayesian two-level methods for each patient. The InsightRx™ software platform was used to calculate Bayesian estimates.

Results: Strong correlation was observed between Bayesian two-level and linear methods (r=0.963) and between Bayesian two-level and one-level methods (r=0.931). The correlation between Bayesian one-level and linear equations was still strong (r=0.829), but less so than the prior correlations. In subgroup analysis, correlations between AUC methods did not vary according to critically ill status, however, correlations between Bayesian one-level and linear methods and Bayesian one-level and two-level approaches were noticeably reduced in obese compared to non-obese patients. In patients who developed AKI during therapy, there was no difference in InsightRx™ recommended and pharmacist-recommended median total daily doses of vancomycin at 2500 mg (1500-3500) and 2500 mg (2000-3000), respectively.

Conclusion: Bayesian two-level AUC_{24} methods demonstrated high correlation with linear AUC_{24} and with Bayesian one-level AUC_{24} methods. Correlations between these approaches may be impacted by obesity, as suggested in our subgroup analysis. Initial total daily doses of vancomycin were similar between our pharmacist-driven protocol and InsightRx™ in patients who developed AKI.

194 | Defining the importance of age-related changes in drug clearance to optimizing aminoglycoside dosing regimens for adult patients with Cystic Fibrosis

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Introduction: Systemic aminoglycosides are commonly administered for CF (Cystic Fibrosis) pulmonary exacerbations (PEX). As CF patients continue to age, the cumulative risk of aminoglycoside toxicity increases. We sought to define optimized dosing regimens for various age groups of adult CF patients to reduce toxicity risk while maintaining efficacy.

Research Question or Hypothesis: Lower empirical doses of aminoglycosides in older CF patients will minimize toxicity risk while maintaining efficacy

Study Design: Population pharmacokinetic modeling and simulations

Methods: Hospitalized adult CF patients admitted for PEX who received at least 72-hr of systemic gentamicin, tobramycin, or amikacin, having measured plasma aminoglycoside concentrations were included. Covariates [e.g., age, weight, creatinine clearance (CRCL)] were screened as modifiers of population typical values. Population PK modeling was completed using Monolix and simulations were conducted in R. Holding weight constant at 60 kg and using the 20 year old as a referent category, we compared once-daily fixed (10mg/kg) and exposure-matched dosing (i.e., 15, 10, 7.5, 6mg/kg for ages 20, 30, 40, and 50 years) strategies. Over the first 24 hours of therapy, the Probability of Target Attainment (PTA) (Cmax/MIC or

AUC/MIC) and Probability of Toxic Exposure (PTE) (Cmin>2mg/L) were calculated for each dose

Results: 48 adult patients (55% female) were included. A one-compartment PK model best fit the data. Estimates for volume of distribution (V) and clearance (CL) were 22L and 5.57 L/hr, respectively. Weight was the modifier for both CL and V but Age was a significant covariate for CL. PTA was maintained over 90% at MICs ≤ 1 mg/L for both fixed-doses of 10mg/kg and for exposure-matched doses. However, Exposure-matched dosing reduced PTE roughly 50% in patients aged 40 and 50 years as opposed to fixed-dosing.

Conclusion: Exposure-matching maintained PTA at MICs ≤ 1 mg/L while reducing toxicity risk in older patients compared to fixed-dosing. Confirmatory studies are needed.

Psychiatry

195 | Identifying Patients' Attitudes Toward Major Depressive Disorder Treatment Modalities

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Introduction: Major Depressive Disorder (MDD) has a high disability burden and suicide rate in the United States despite numerous treatment modalities available for patients. Understanding patient perspectives of MDD treatment is critical to addressing disease burden and access-to-care barriers.

Research Question or Hypothesis: How have MDD patients' experiences influenced their perspectives toward different treatment modalities provided to them?

Study Design: We conducted qualitative patient interviews, a scoping review to refine patient value elements and a thematic analysis on the transcribed data.

Methods: We interviewed with twenty English-speaking adults who have been diagnosed with MDD. Of the 20 patient interviews, 15 were transcribable to understand treatment importance. The interviews included two major sections; qualitative open-ended questions regarding ones' journey through depression followed by guided activities regarding treatment importance and multiple-choice demographic questions.

Results: Thematic analysis of the 15 transcriptions identified six main themes. We extracted verbatim quotes that represent each theme in the voice of the patients. The number of quotes per theme were as follows: 28 emotional status (25.7%), 20 treatment availability and reimbursed care (18%), 19 provider relationship and trust (17%), 18 ability to work (16%), 17 side effects (15%) and 7 relationships with family and friends (6%). Participants who selected emotional status valued treatments that reduced their daily mood swings and episode nature of symptoms. Although it was not the most prevalent theme identified, every participant selected provider relationship and trust, reflecting on how important a good relationship with their primary care provider was in receiving appropriate treatment.

Conclusion: Emotional status, availability and reimbursement of care were the most frequently mentioned themes. All participants appreciated the importance of provider relationships and trust as a major factor in the quality of care. This work demonstrates the value of identifying patients' needs and concerns with accessing high-quality care.

196 | Survey of CNS-related (Psychiatry/Neurology/Substance Use) elective courses offered at US schools of pharmacy

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Introduction: There have been several publications regarding CNS-related (central nervous system) elective courses offered at pharmacy schools all with varying pedagogy and evaluations. Given wide variability among these few courses, there likely exists even more variety among all US pharmacy schools.

Research Question or Hypothesis: To systematically evaluate CNS-related elective courses offered at US pharmacy schools.

Study Design: Voluntary, anonymous, cross-sectional survey

Methods: A 25-question anonymous survey assessing CNS-related elective courses was developed by the research team and sent via Qualtrics to 133 identified content experts at pharmacy schools in the US. Survey questions primarily assessed timing and frequency of elective course offering, number of students enrolled, credits earned, topics covered, course format, didactic materials, course activities, evaluations, and interprofessional work. Outcomes were reported with descriptive statistics.

Results: Thirty-eight respondents indicated their school offered a CNS-related elective and information was provided for 46 unique elective courses. The primary focus for most electives was psychiatry (43.5%) followed by substance use disorders (30.4%). No courses reported wellness as the primary focus, but 5 courses included mindfulness/meditation, 9 included stress management, and 8 included coping strategies/resilience. Movies/media were incorporated into

54.3% of courses and 32.6% included autobiography/biography reading assignments. Thirty-six courses (78.3%) incorporated guest speakers and the most common projects/activities were reflection(s) (63%) and group presentation(s) (58.7%). Nine courses included interprofessional education with students in medicine, nursing, social work, public health, and law enforcement.

Conclusion: CNS-related elective courses afford the opportunity for additional learning and expanded, creative pedagogical methods for teaching about this vital part of healthcare. The most common areas of focus were psychiatry and substance use disorders. The lack of reported wellness-focused electives was surprising; however, this could change based on the cultural and mental health landscapes over the last year and a half.

197 | Evaluation of cardiovascular risk in adult psychiatry outpatients in Qatar using two different risk assessment tools.

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Introduction: Individuals with serious mental illness (SMI) experience premature death, likely as a result of increase rates of obesity and cardiovascular disease (CVD).

Research Question or Hypothesis: The study aimed at estimating the CVD risk in a cohort of people with SMI attending outpatient psychiatric services in Qatar and to assess their contributory CVD risk factor profiles.

Study Design: This is a retrospective review of the electronic medical records of a cohort of outpatients with SMI attending a mental health clinic in Doha, Qatar.

Methods: CVD risk was estimated using two risk prediction tools: the American Heart Association and the American College of Cardiology (AHA/ACC) calculator and the World Health Organization/International Society of Hypertension (WHO/ISH) CVD risk charts for the Eastern Mediterranean region. Descriptive and inferential statistics were used to analyze the demographic and clinical data. Data analysis was carried out using SPSS® software.

Results: Of 346 SMI eligible patients, 28% (n=97) had obtainable data to estimate their CVD risk using both, the AHA/ACC calculator and the WHO/ISH CVD risk tables. About one-third of the cohort (33%) were classified as high risk using AHA/ACC, and 13.3% were classified as intermediate to high risk using the WHO/ISH CVD risk tables. Based on the AHA/ACC risk scores, amongst those at high CVD risk, almost two-thirds had CVD modifiable risk factors (smoking, diabetes, dyslipidemia, and hypertension). There was no statistically significant difference in the CVD risk estimates among individuals with a body mass index higher or lower than 30 (p=0.815).

Conclusion: Based on the AHA/ACC risk calculator, about one-third of this sample of people with SMI in Qatar had high CVD risk estimates. WHO/ISH CVD risk tables performed worse in identifying high risk patients. A closer alliance between psychiatrists and primary healthcare professionals to control modifiable cardiovascular risk factors among patients with SMI is necessary.

Pulmonary

198 | Characteristics and Outcomes of Adult Asthmatic Patients Presenting with Coronavirus Disease 2019 (COVID-19) in Qatar

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Introduction: Around one in every five people in Qatar has bronchial asthma. Asthma may be associated with worse Coronavirus disease 2019 (COVID-19) outcomes.

Research Question or Hypothesis: What are the characteristics and outcomes of adult asthmatic patients presenting with COVID-19 and what factors, including asthma medications, are associated with worse disease outcomes?

Study Design: Retrospective observational cohort study

Methods: Adult patients with documented history of asthma and laboratory-confirmed diagnosis of COVID-19 were included. Relevant data was retrieved through electronic chart review. Descriptive statistics were used to summarize the characteristics and the outcomes of the study cohort. Factors independently associated with COVID-19 related hospitalization were determined by multivariable logistic regression models.

Results: Between March and August 2020, 616 patients met the inclusion criteria, of whom 52% were females. Median age was 44 years (interquartile range [IQR], 34-57 years). Forty-four percent of patients received inhaled corticosteroids (ICS) and 41.7% received long-acting beta agonists (LABA). Montelukast and tiotropium were used by 17.9% and 2.9% of patients, respectively. One patient was receiving long term oral corticosteroid and two patients were on biological agents. The most common comorbidities were hypertension (31%) and diabetes (27.1%). Two-hundred thirty-six patients (38.3%) required hospitalization for COVID-19, with a median hospital stay of 10 days (IQR, 5-15). Invasive mechanical ventilation was required in 26 patients (4.2%) and 16 patients (2.6%) died. The need for hospitalization was independently associated with older age (odds ratio [OR] for 10-years, 1.32; 95% confidence interval [CI], 1.13–1.54) and hypertension (OR, 2.4; 95% CI, 1.43–3.93) but not with the use of ICS, LABA, montelukast or tiotropium.

Conclusion: In Qatar, adult patients with asthma appear to be at higher risk of COVID-19 related hospitalization compared to the general adult COVID-19 infected population. Older age and hypertension were associated with worse outcomes while asthma medications were not.

Substance Abuse/Toxicology

199 | Stress and Substance Abuse Among College of Pharmacy andPharmaceutical Sciences (CPSS) Doctor of Pharmacy Students

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Introduction: College of Pharmacy and Pharmaceutical Sciences (CPPS) students report high rates of stress, anxiety, and poor quality of life. It is important to study the impact of stress on learners because it impacts their overall physical and mental health as well as their ability to achieve their academic goals.

Research Question or Hypothesis: The primary objective of this study was to identify and determine associations between perceived stress and lifestyle habits among Doctor of Pharmacy (Pharm.D.) students.

Study Design: Cross-sectional analysis

Methods: All students in the CPPS at The University of Toledo (UToledo) were invited to participate in this IRB-approved, anonymous, web-based survey. A subset, those students enrolled in the professional division (P1 – P3) of the Pharm.D. program, were used in this data analysis.

Results: The study response rate was 38%. According to preliminary results, the P2 students appear to be experiencing the most stress (~82% report very often felt stressed), get the least sleep (~26% get <5 hours per night), and drink the most alcohol (~66% report using alcohol at least once per week).

Conclusion: Our initial hypothesis was that students in the final year of didactic coursework (P3) would have the highest reported levels of stress, due to their upcoming clinical rotations and advanced course load. However, we found that the P2 (second year) students reported the highest level of stress, lowest levels of sleep and drink the most alcohol. This could be due to implementation of a new curriculum last year, which they were the first to experience.

200 | Do Buprenorphine Doses and Ratios Matter in Medication Assisted Treatment (MAT) Adherence and Retention?

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Introduction: Medication assisted treatment (MAT) utilizes medications such as buprenorphine/naloxone (BUP/NLX) in conjunction with behavioral therapies to treat opioid use disorder. Studies suggesting increased treatment adherence with higher doses of BUP/NLX. Routine urine drug screens (UDS) assist in monitoring MAT adherence via measurement of excreted BUP and its metabolite, norbuprenorphine (NBP). The clinical significance of BUP/NBP levels and ratios outside of assessing adherence and detecting urine adulteration is unknown. Furthermore, the impact of COVID-19 on the MAT population has yet to be fully explored.

Research Question or Hypothesis: (1) Does total daily BUP doses affect treatment adherence and substance use? (2) Is there a relationship between BUP/NBP levels/ratios and MAT adherence and substance use? (3) How has COVID-19 impacted MAT treatment population?

Study Design: Single-center, retrospective chart review.

Methods: Data was collected on 195 clients age ≥18-years enrolled in a local MAT program from August 1, 2017 to February 28, 2021. Demographic variables, BUP doses, prescription fill history, and UDS results were collected. Participants were divided into two groups based on MAT adherence (<80% vs ≥80%) in addition to pre- and post-COVID-19 cohorts.

Results: Median total daily dose of BUP ≥16mg (n=126) vs <16mg (n=68) was not correlated with MAT adherence (p=0.107) or incidence of illicit drug use (p=0.117). Median BUP and NBP urinary concentrations were significantly correlated with MAT adherence (p<0.0001) and reduced percentage of positive UDS for opioids (p=0.0004 and p<0.0001, respectively) but not their ratios. For clients enrolled both pre- and post-COVID, a significantly higher incidence of UDS positive for opiates (p=0.049) and alcohol (p=0.035) were observed post-COVID.

Conclusion: Higher concentrations of urinary BUP and NBP were correlated with increased MAT treatment adherence and reduced incidence of opioid-positive UDS independent of the dose of BUP prescribed. An increase in opioid- and alcohol-positive UDS were observed during the COVID-19 pandemic.

201 | Initiating Treatment for Opioid Use Disorder in the Acute Hospital Setting

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Introduction: There were nearly 500,000 opioid-related deaths between 1999-2019. Medications for opioid use disorder (MOUD) is safe, effective, and lifesaving, but remains underused. The scope of interventions for opioid use disorder (OUD) inpatient management at

University of Illinois Hospital & Health Sciences System (UI Health) is unknown.

Research Question or Hypothesis: OUD treatment is underutilized at UI Health

Study Design: Single-center, cross-sectional study

Methods: Patients with an OUD diagnosis admitted to the emergency department or hospital for any reason between 8/1/2019 and 7/31/2020 were eligible. The primary objective was the prevalence of patients with OUD who received an OUD intervention, defined as counseling, administering MOUD, and linkage to outpatient clinics. Secondary objectives include association between receiving an OUD intervention and patient specific factors, interprofessional collaboration, and time to readmission. Descriptive analysis was used for primary outcome, chi-square test for categorical variables and Wilcoxon Rank Sum for continuous variables. A multivariate cox proportional hazard test was used to analyze time to next hospital encounter.

Results: 585 unique patient encounters met the inclusion criteria. The mean age was 50.98 (SD ±13.29), 403 (68.9%) were male and 339 (58%) were African Americans. 356 (60.9%) met the primary outcome of receiving an OUD intervention. Being female (OR 1.65, 1.12-2.44; p=0.01) and longer length of hospital stay (OR 2.17, 1.57-3.16; p<0.001) were associated with receiving an OUD intervention. Patients who received an OUD intervention had less hospital encounters (HR 0.69; CI 0.49-0.97; p=0.03). Administering MOUD had the most significant impact (HR 0.58; CI 0.40-0.83; p=0.003).

Conclusion: Approximately half of patient encounters received an OUD intervention. Those who received an OUD intervention had less future hospital encounters. Of all interventions offered, administering MOUD had the most significant impact on reducing hospital re-admissions. OUD interventions should be offered to every patient with OUD while inpatient.

202 | E-Cigarette Dependence and Weight-Related Attitudes/Behaviors Associated with Eating Disorders in Adolescent Girls

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Introduction: Although numerous motivations for vaping have been identified in adolescents, no study to date examined a possible link between vaping and attitudes/behaviors that are associated with eating disorders in adolescent females. Examining this question in adolescent females is especially relevant given the higher prevalence of eating disorders in women. This research is designed to generate new knowledge in the field and aid the practice of clinical pharmacy related to Women's Health.

Research Question or Hypothesis: We hypothesized that electronic cigarette dependence would correlate with binge eating and weight preoccupation.

Study Design: Cross-sectional.

Methods: Study participants (299 girls between 13 to 17 years old) completed a REDCap survey which included the following outcomes: (1) Electronic Cigarette Dependence Index (ECDI), and (2) Minnesota Eating Behavior Survey (MEBS) subscales (weight preoccupation, binge eating, body dissatisfaction, and compensatory behavior). Data were analyzed using nonparametric Spearman rank correlation test in R. We considered a p value of 0.05 to be statistically significant.

Results: Electronic Cigarette Dependence Index (ECDI) scores were correlated with three out of four subscales of MEBS: weight preoccupation (WP), binge eating (BE) and compensatory behavior (CB), with the following results for Spearman correlation tests: (1) WP: rho =0.13, p=0.02, S = 3853727; (2) BD: rho=0.06, p=0.28, S = 4175196; (3) BE: rho=0.15, p=0.0095, S = 3787501; (4) CB: rho=0.021, p= 0.00027; S = 3523183.

Conclusion: The present study adds to the current literature examining motivations for e-cigarette use in adolescent girls. In line with our hypothesis, we showed a significant correlation between e-cigarette dependence, and binge eating and weight preoccupation. As eating disorders and e-cigarette dependence are significant public health concerns, our results highlight the need for intervention development.

203 | Availability of buprenorphine/naloxone films and naloxone nasal spray in community pharmacies in eleven U.S. states

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Introduction: Patients with opioid use disorder must be able to obtain prescribed buprenorphine/naloxone films (BUP/NX) and naloxone nasal spray (NNS) from a community pharmacy promptly to reduce risk for recurrence of use and subsequent morbidity and mortality.

Research Question or Hypothesis: This study assessed availability of generic BUP/NX and NNS among pharmacies in eleven U.S. states.

Study Design: A telephone audit of 5734 randomly selected community pharmacies in Arizona, California, Florida, Maine, Massachusetts, New Jersey, North Dakota, Ohio, Pennsylvania, South Dakota and Texas was conducted from May 2020 to May 2021.

Methods: Trained interviewers followed a script to inquire about availability of BUP/NX and NNS and recorded responses in a standardized data collection template. Primary outcomes included

availability of a one-week supply of BUP/NX and a single unit of NNS. Secondary outcomes were willingness to order BUP/NX and estimated timeframe to order if unavailable. Availability of BUP/NX was compared among states based on Medicaid expansion status and state drug overdose rates.

Results: Data from 4984 pharmacies (3402 chain, 1582 independent) were analyzed. Of these, 2054 (41.2%) were prepared to dispense both a one-week supply of generic BUP/NX and NNS, with availability ranging from 26.8% in South Dakota to 74.7% in Maine. Of the 2578 pharmacies with generic BUP/NX unavailable, 1650 (64.0%) indicated willingness to order. States that expanded Medicaid had significantly higher BUP/NX availability (53.0% vs 37.6%, p<0.001) and NNS availability (72.6% vs 62.7%, p<0.0001). Additionally, states with high drug overdose rates had significantly greater BUP/NX availability (54.1% vs 38.2%, p<0.0001) and NNS availability (75.3% vs 59.5%, p<0.0001).

Conclusion: Fewer than 50% of pharmacies audited were prepared to dispense BUP/NX and NNS, demonstrating a barrier to timely access of these vital medications.

204 | Efforts to Improve Medication Storage and Disposal Practices for Opioid Naïve Patients in Primary Care

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Introduction: Prescription opioids in the home can be misused and contribute to the opioid epidemic. Proper medication storage and disposal of unused opioids can help mitigate this risk. Patient education and a disposal tool for patients discharged from an emergency department or post-surgery increases proper medication disposal, but these interventions have not been investigated within primary care.

Research Question or Hypothesis: Do different combinations of interventions change medication disposal practices for an opioid naïve patient in primary care?

Study Design: We performed a stepped-wedge trial among primary care practices. Primary care clinics stepped into interventions including 1) a storage and disposal education best practice alert (BPA) delivered at the time of opioid prescribing plus education mailed to the patient followed by 2) BPA and mailed education plus mail-back medication bag. Patients were also randomized to a disposal reminder interactive voice response (IVR) delivered 7 days following their visit.

Methods: Our primary outcome was the proportion of patients who disposed of leftover opioids assessed via telephone survey between 30-45 days post-visit. Proper medication storage was also assessed. Outcomes were compared using logistic regression completed in R with p<0.05 considered statistically significant.

Results: A total of 683 patients were included (208 baseline, 484 intervention), with 379 patients eligible for medication disposal. Combined opioid disposal rate was 13%. Only patients receiving BPA, education, bag and IVR together had an increased odds of disposing of medications properly (4% vs. 11%, OR 3.45, CI 1.02, 11.70). Only 15% of patients properly stored their opioids, which was similar between groups.

Conclusion: Low disposal rates following a new opioid prescription in primary care were slightly improved with a combination of BPA, IVR and disposal bags. This marginal gain should be weighed against the cost of maintaining a program. Since most patients improperly store opioids, proper medication storage should be a key future focus to reduce opioid misuse.

Transplant/Immunology

205 | A Randomized Phase 3 Open-Label Study of Maribavir Versus Investigator-Assigned Therapy (IAT) for the Treatment of Transplant Recipients With Refractory/Resistant (R/R) Cytomegalovirus (CMV) Infection: Subgroup Analyses of Efficacy Data

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Introduction: Development of resistance and toxicities limit the efficacy and safety of current therapies for CMV in transplant recipients.

Research Question or Hypothesis: Efficacy across subgroups and safety of maribavir versus IAT in patients with R/R CMV.

Study Design: Phase 3 study (NCT02931539) of hematopoietic cell/solid organ transplant (HCT/SOT) recipients with R/R CMV infection. Patients received maribavir 400mg BID or IAT (val/ganciclovir, foscarnet, cidofovir) for 8 weeks.

Methods: HCT/SOT recipients with CMV (screening viral load [VL]≥910IU/mL CMV DNA[plasma]) R/R to previous treatment (failure to achieve >1 $\log_{10}$ decrease in CMV DNA after≥14days of anti-CMV therapy±genotyped resistance) were randomized (HCT/SOT +screening CMV VL stratification) 2:1 (maribavir:IAT). Primary endpoint: confirmed CMV clearance (central laboratory VL<137IU/mL, two consecutive tests≥5days apart) at Week8. Key secondary endpoint: CMV clearance and symptom control at Week8 maintained to Week16. Subgroup analyses were performed.

TABLE 1 Confirmed CMV Clearance at Week8 (Randomized Set)[a]

Responders, %[n/N]	Maribavir	IAT
Primary endpoint	55.7 [131/235]	23.9 [28/117]
Subgroup analyses		
Study drug[b]		
Ganciclovir/valganciclovir		26.8 [15/56]
Foscarnet		19.1 [9/47]
Transplant		
HCT	55.9 [52/93]	20.8 [10/48]
SOT[c]	55.6 [79/142]	26.1 [18/69]
Heart	42.9 [6/14]	11.1 [1/9]
Lung	47.5 [19/40]	13.6 [3/22]
Kidney	59.5 [44/74]	34.4 [11/32]

[a]One patient in each treatment group was not dosed.
[b]Cidofovir,n=6; combination therapy,n=7 (not shown).
[c]Organ types with sample size n>20 are presented. Organ refers to most recent organ transplanted.

Results: More patients treated with maribavir than IAT achieved the primary endpoint (p<0.001;**Table 1**); outcomes were consistent across subgroups. The key secondary endpoint was met (maribavir 18.7% versus IAT 10.3%,p=0.013). Treatment-emergent AEs (TEAEs,% patients): maribavir 97.4%, IAT 91.4%. Most frequent TEAEs (% patients) were dysgeusia for maribavir (37.2%, IAT 3.4%) and neutropenia for IAT (22.4%, maribavir 9.4%). TEAEs leading to treatment discontinuation (%patients): maribavir 13.2% (dysgeusia, 0.9%), IAT 31.9%.

Conclusion: Maribavir was superior to IAT in achieving R/R CMV clearance, with consistent efficacy across subgroups. TEAEs leading to treatment discontinuation were lower with maribavir than IAT.

206 | Time in Therapeutic Range with Once-Daily, Extended-Release Versus Immediate-Release Tacrolimus and Impact on Donor-Specific Antibodies in *De Novo* Kidney Transplant Recipients

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Introduction: Time in therapeutic range (TTR) is a measurement of tacrolimus (TAC) exposure and a known predictor of *de novo* donor-specific antibodies (dnDSA). Once-daily, extended-release TAC (LCPT) has improved bioavailability and less pharmacokinetic fluctuation compared to immediate-release TAC (IR-TAC), but data are lacking on the impact of LCPT and the development of dnDSA.

Research Question or Hypothesis: How does de novo use of LCPT compare to IR-TAC for suboptimal TTR (<60%) and how does this impact DSA development?

Study Design: Single-center, retrospective

Methods: Adult KTRs between October 2019-2020 initiated on IR-TAC or converted to LCPT within 30 days of transplant as part of triple immunosuppression and maintained on cohort formulation for 6 months were included. Patients with multi-organ transplant, belatacept use, or <5 TAC trough concentrations (C_0) were excluded. TAC concentrations <2 or >15 ng/mL were validated to ensure true trough. TAC TTR was calculated using the Rosendaal method and TAC C_0 5-12 ng/mL. The primary outcome was TAC TTR <60% within 6 months.

Results: This analysis included 195 KTRs with over 4,500 TAC C_0. Overall immunologic risk factors included pre-transplant DSA (n=45), 4-6 HLA mismatches (n=128), and high risk eplet mismatch (n=69). TAC TTR <60% was not significantly different between the IR-TAC and LCPT cohorts (10.9% vs 8.5%, p=0.58). In the LCPT group, there was significantly higher mean TAC C_0 (9.5 vs 9.9, p=0.02). *De novo* DSA occurred in 10.9% of the IR-TAC cohort compared to 5.3% in LCPT at 6 months, although this was not statistically significant (p=0.16).

Conclusion: Overall, LCPT was associated with similar achievement of TAC TTR and higher TAC C_0 compared to IR-TAC. Interestingly, the LCPT cohort experienced half as much dnDSA in this high-risk cohort, although longer term follow-up is warranted to confirm these results.

207 | Incidence and Risk Factors for Acute Cellular Rejection in a Steroid Sparing Liver Transplant Center

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Introduction: With the use of modern immunosuppressants (IMS), a steroid sparing approach may be beneficial given the adverse events with long term steroid use. Despite evidence for this, less than 20% liver transplant (LT) centers utilize a steroid-sparing IMS strategy. This study aims to provide evidence to the effectiveness of using steroid-sparing regimens and to identify risk factors for acute cellular rejection (ACR) at a steroid-sparing transplant center.

Research Question or Hypothesis: Steroid sparing IMS regimen does not increase ACR rate.

Study Design: This is a single-center retrospective cohort study of LT patients at transplant center between 01/01/2008 and 6/30/2019. Primary outcome was the incidence of biopsy-confirmed ACR episode.

Methods: Patient risk factors for ACR were identified by comparing between patients who had at least 1 episode of ACR and patients without ACR. Data was analyzed and characterized using descriptive, comparative, and regression analyses. Univariate and multivariate logistic regression model was used to identify risk factors for ACR.

Results: 266 patients were enrolled in our study. ACR rate was 18.4% with a median time to first rejection of 134 days. Being Black, on prednisone on post-operative day 90 and CMV viremia post transplantation remained to be significant risk factors for ACR with odds ratios of 4.39 (95% CI: 2.04 to 9.47), 2.8 (95% CI: 1.20 to 5.59) and 6.27 (95% CI: 2.23 to 17.57). Being on tacrolimus was protective with an odds ratio of 0.33 (95% CI: 0.13 to 0.79).

Conclusion: Biopsy-proven ACR at our transplant center following steroid-sparing protocol was comparable to other published studies. Potential risk factors for ACR include being Black the use of prednisone and CMV viremia post transplantation. Using tacrolimus is potentially a protective factor for ACR.

208 | Incidence and risk factors for the development of cytomegalovirus viremia in a steroid sparing liver transplant center

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Introduction: Cytomegalovirus (CMV) is a common opportunistic infection in patients after liver transplant (LT). Guidelines recommend prophylaxis for CMV for LT recipients, suggesting 900mg daily of valganciclovir with different durations of therapy depending on risk stratification. However, valganciclovir commonly causes dose-dependent hematologic toxicities including leukopenia, anemia, and thrombocytopenia. Low-dose valganciclovir (450mg) has been used to prevent these adverse effects, but the data regarding this dosing strategy is lacking in LT recipients.

Research Question or Hypothesis: Low-dose valganciclovir is effective in the prevention of CMV viremia in LT recipients.

Study Design: Retrospective, single-center chart review study at UI Health.

Methods: LT recipients between 1/1/08-6/30/19 were reviewed. Primary outcome was the incidence of CMV viremia in LT recipients at 12 months post-LT. Secondary outcomes were time to CMV viremia, risk factors for the development of CMV viremia, incidence of breakthrough CMV viremia while on valganciclovir prophylaxis, incidence of CMV viremia after completion of 6 months of prophylaxis, description of the treatment of CMV viremia, incidence of valganciclovir-resistant CMV, and incidence of organ-specific CMV disease.

Results: 266 patients were included in this study. Overall, the majority were male (63.2%) and Caucasian (45.5%). The most common indication for transplant was decompensated cirrhosis (82%) and had an underlying liver disease etiology of alcohol-related liver disease (39.9%). The incidence of CMV at one year post-transplant was 7.9%. Most patients had either completed prophylaxis or prophylaxis was being held. The time to CMV viremia was 204 days and no valganciclovir resistance was seen. Independent risk factors included high risk status as well as an episode of rejection.

Conclusion: Low-dose valganciclovir is effective in the prevention of CMV viremia in LT patients and may be a beneficial strategy for CMV prophylaxis. Further studies may be needed to determine appropriate length of prophylaxis therapy for different risk groups.

209 | Impact of Early Corticosteroid Withdrawal on Simultaneous Pancreas-Kidney Transplant Outcomes: Single Center Experience and Comparison to the International Pancreas Transplant Registry

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Introduction: There is a paucity of long-term data comparing early corticosteroid withdrawal (ESW) versus chronic corticosteroid (CCS) immunosuppression (IMS) regimens in simultaneous pancreas-kidney (SPK) despite concerns over the impact of CCS on pancreas function over time. The purpose of this study is to compare the efficacy of ESW versus CCS in SPK recipients.

Research Question or Hypothesis: SPK patients receiving ESW will have similar allograft and patient survival as those on CCS.

Study Design: Retrospective single-center matched cohort study. Patients from University of Illinois Hospital represented the ESW group and were compared to matched CCS patients from the International Pancreas Transplant Registry (IPTR) based on key recipient, donor, and transplant characteristics.

Methods: Adult primary SPK recipients between 01/01/2003-12/31/2018 receiving rabbit anti-thymocyte globulin induction and tacrolimus/mycophenolate-based maintenance IMS were included. Those with technical failures, graft thrombosis, or positive crossmatch were excluded. Allograft and patient survival were compared. Immunologic graft survival was defined as failure due to rejection.

Results: A total of 156 patients were analyzed. Patients were predominantly Black (46.2%), male (64.1%), and 40.9 years old on average. Overall pancreas allograft survival (HR 0.889, 95%CI 0.34-2.30, p=0.81) and kidney allograft survival (HR 0.800, 95%CI 0.32-2.03, p=0.64) were similar. Immunologic pancreas allograft survival was statistically similar at 1-year (ESW 98.7% vs CCS 100%%, p=0.16), 5-year (ESW 98.7% vs CCS

92.3%, p=0.16), and 10-year (ESW 89.0% vs CCS 92.3%, p=0.99) post-SPK. Immunologic kidney allograft survival were also similar at the same time points (p>0.05 for all). There was no difference in 10-year patient survival (ESW 76.2% vs CCS 65.6%, p=0.45).

Conclusion: Recipients receiving ESW or CCS IMS regimens demonstrated similar allograft and patient survival out to 10 years post-SPK. Future assessment is needed to examine allograft function and metabolic outcome differences.

210 | Evaluation of Prior Authorization Burden in an Academic Urban Transplant Center

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Introduction: Prior authorizations (PAs) are a tool used to promote cost effectiveness but can be a burden on transplant recipients due to delays in preferred treatment and decreased adherence. It is currently unknown what the extent of burden PAs at a transplant institution.

Research Question or Hypothesis: What is the total number of prior authorizations and approval rate of PAs at an urban academic transplant center?

Study Design: Retrospective single center analysis from 11/1/2019-12/1/2020 of a centralized PA service.

Methods: Race, organ transplanted, insurance, inpatient vs. outpatient PA request, medication, days to determination of initial PA, first appeal, and second appeal were collected. Multivariate logistic regression was analyzed to identify independent factors associated with approval rates. All analyses were conducted using STATA v. 13.0.

Results: A total of 879 PAs were included in the study, with an 85% approval rate. The most common transplanted organ in the study was kidney (62%). Majority of PAs were in minority patients, with Black patients having the highest incidence (45%). Multivariate logistical regressions found that Black patients had a higher likelihood of approval, OR 1.8 (1.21-2.68), p=0.004. Medicaid and Medicare required the most PAs (81.7%). Patients with Medicaid were more likely to receive a denial, OR = 0.55 (0.37-0.81), p=0.002. Most requests were outpatient (73%) and had a higher approval rate. Of all the medications requiring PAs, immunosuppressants were the most common (63%). Envarsus was the most common medication that required a PA (35%).

Conclusion: The results of this study showed that the majority of PAs were approved, thus causing an unnecessary burden on an already medically underserved population. Medicaid was more likely to deny PAs, and PAs disproportionately affected minority patients, especially Black patients. These denials can lead to delays in appropriate care which place transplant patients at risk for complications.

211 | Methenamine for recurrent urinary tract infections in solid organ transplant

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Introduction: Recurrent urinary tract infection remain a challenge in solid organ transplant and have a negative impact on morbidity/mortality.

Research Question or Hypothesis: What is the impact of methenamine on recurrent urinary tract infection in kidney and liver-kidney transplant?

Study Design: This is a retrospective chart review.

Methods: This retrospective review included patients > 18 years of age who received a kidney or liver-kidney transplant. Patients were divided into the following groups: (1) Methenamine therapy initiation received methenamine for ≥ 180 days or (2) Non-methenamine therapy: did not receive recurrent urinary tract infection prophylaxis. A total of 60 patients were included.

Results: When comparing outcomes between methenamine therapy initiation and non-methenamine therapy group, a significant reduction in the rate of recurrent urinary tract infection was reported in the methenamine therapy initiation group (0.6 vs. 1.3 per 180 patient days follow-up, P=0.0005). A significant reduction was also noted with rate of asymptomatic bacteriuria, treatment failures, bacteremia, hospitalizations due to recurrent urinary tract infection, multi-drug resistant organism isolated, and the average duration of antibiotic use. A significant difference in the time to failure of methenamine therapy initiation vs. non-methenamine therapy is noted up to 180 patient-days follow-up (RR 1.56, P=0.0019).

Conclusion: This is the first study to date supporting methenamine therapy for recurrent urinary tract infection compared to a control group in kidney and liver-kidney transplant. The most significant impact of methenamine recurrent urinary tract infection was seen in the first 30 days after initiation of methenamine.

Women's Health

212 | American College of Clinical Pharmacy Women's Health Practice and Research Network Survey of Colleges/Schools of Pharmacy to Determine Limitations for Teaching, Research, and Advocacy Related to Contraception

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Introduction: Pharmacists often prescribe, dispense, and counsel on contraception. Institution restrictions on contraception teaching, advocacy, and research may impact learning.

Research Question or Hypothesis: Do schools/colleges of pharmacy restrict teaching, research, or advocacy related to contraception? Have students, faculty, or pharmacists expressed ethical questions/concerns with contraception or miscarriage management/abortifacients?

Study Design: Electronic survey via REDCap.

Methods: A survey was developed and sent to all schools of pharmacy on the American Association of Colleges of Pharmacy Institutional Membership list. An informational email was sent to each school's dean, requesting the survey link be shared with faculty who teach women's health content within the curriculum. The survey collected information about contraception teaching, research, and advocacy to answer the research questions. This project was approved by the Concordia University Institutional Review Board.

Results: Of 145 schools contacted, complete responses were received from 39 institutions (27%): 22 (56%) public, not religiously-affiliated, 7 (18%) private, not religiously-affiliated, 6 (15%) private, currently religiously-affiliated, and 4 (10%) private, historically religiously-affiliated. All teach hormonal contraception in the required curriculum and 15 (39%) teach miscarriage management/abortifacients. No schools reported a restriction on contraception teaching or research. One respondent cited a restriction on advocacy for miscarriage management/abortifacients and another cited a restriction on advocacy for contraception methods that violate the school's religious beliefs. Respondents noted that students expressed ethical questions/concerns about refusing to dispense contraception (59%), dispensing certain contraceptives (54%), dispensing to minors (46%), and dispensing all contraceptives (21%). Additionally, respondents reported that pharmacists or faculty expressed ethical questions/concerns about refusing to dispense contraception (31%), dispensing to minors (21%), dispensing certain contraceptives (15%) and all contraceptives (13%).

Conclusion: Overall, no restrictions in teaching and scholarship of contraception, and minimal restrictions for advocacy were reported. Ethical questions/concerns from students, faculty, and pharmacists should be considered by faculty teaching this material.

213 | ACCP Women's Health PRN Contraception in Transgender and Gender-Nonconforming Individuals Teaching Survey

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Introduction: Pharmacists are increasingly becoming part of interdisciplinary teams providing health care to members of the transgender community. However, many curriculums in pharmacy education are lacking or limited in topics specific to this population, including contraceptive care. As health care members in multiple practice environments, it is essential for pharmacists to be aware of transgender care and to be knowledgeable and sensitive to the specific healthcare needs.

Research Question or Hypothesis: How are colleges and schools of pharmacy addressing contraception care for transgender and gender non-conforming individuals in their curricula?

Study Design: Cross-sectional survey administered via Qualtrics

Methods: An informational email, which included a link to an 18-question anonymous survey, was developed and sent to contacts at schools of pharmacy on the American Association of Colleges of Pharmacy Pharmacy Practice list. The email requested the survey link be shared with faculty teaching women's health content within the curriculum. The survey collected information about demographics and contraception teaching in transgender and gender-non conforming individuals. This project was approved by Butler University's Institutional Review Board.

Results: Of 145 institutions contacted, 140 respondents were collected representing 99 institutions (68% school response rate). 118 respondents identified as female (84%). Only 7 (5%) respondents reported having additional training specific to transgender [health] care. 42/99 Institutions (42%) reported that contraception in transgender and gender-nonconforming individuals is taught at their institution, and most often part of the required curriculum through a variety of modalities (didactic, case-based, team-based learning). Majority of institutions would desire an average of 4.4 hours to teach this topic.

Conclusion: Less than half of responding institutions are teaching about contraception care for transgender and gender non-conforming individuals in their curricula. In order to create an inclusive teaching space, we recommend the addition of this topic to pharmacy school curricula and faculty development to best prepare student pharmacists for practice.

214 | Geographic Accessibility of Contraceptive Prescribers in Georgia

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Introduction: Unintended pregnancy is increasingly concentrated in low-income women, and occurs in 45% and 60% of pregnancies in the United States and Georgia, respectively. Commonly cited barriers to contraceptive access include difficulty obtaining, traveling to, or attending a traditional clinic appointment. Novel strategies are needed to improve contraceptive access, especially for low-income and rural women.
Research Question or Hypothesis: Examine access to traditional contraceptive services and community pharmacies across metropolitan and non-metropolitan counties in Georgia.
Study Design: This is a retrospective, cross-sectional study.
Methods: A list of 2021 licensed community pharmacies was obtained from the Georgia Board of Pharmacy. Georgia Department of Public Health, Planned Parenthood, and Federally Qualified Health Centers websites were used to identify safety net clinics providing free or low-cost contraceptive services. Counties were stratified as metropolitan or non-metropolitan per 2013 National Center for Health Statistics Code. Descriptive statistics and student's t-test were conducted using SPSS Version 27.
Results: Georgia community pharmacies outnumber safety net clinics per county (6.2 ± 0.7 pharmacies vs. 3.9 ± 0.2 clinics, $p < 0.01$). Regardless of region, there are more pharmacies than safety net clinics per 100 square miles [Nonmetropolitan: 1.6 ± 1.7 pharmacies vs. 0.9 ± 0.5 clinics, ($p < 0.01$); Metropolitan: 6.7 ± 9.8 pharmacies vs. 1.1 ± 1.1 clinics ($p<0.01$)].
Conclusion: Several states already permit pharmacists to prescribe contraceptives, however Georgia does not. Expanding pharmacists' scope of practice in Georgia could significantly increase women's access to contraception, including an over 2.5 fold increase in non-metropolitan counties where improved access may be of most benefit.

215 | Spexin as a novel marker in obesity among Egyptian women and its possible relationship with some metabolic parameters

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Introduction: Spexin,also known as Neuropeptide Q, is a novel human peptide. It is one of the novel markers that is still under investigation to uncover its role in obesity and metabolism regulation with the potential to develop targeted obesity therapy. There are conflicting data about spexin's relation to obesity and different obesity related metabolic parameters. Little is known about spexin in Egypt so we conducted this study to explore its levels in obese women.
Research Question or Hypothesis: What's the relationship between circulating spexin levels and anthropometric and metabolic parameters in obese Egyptian women?
Study Design: Case-control study included total of 86 women. Women who are pregnant ,lactating, at menopause ,with hypertension ,diabetes or thyroid diseases were excluded. Control group included 35 women of BMI 18-25 kg/m^2.Cases group included 51 women of BMI > 25 kg/m^2;16 had BMI 25-30 and 35 had BMI >30.Both groups were matched with regards to demographic data .The study compared the groups in terms of serum spexin levels ,anthropometric & some metabolic parameters.
Methods: We measured spexin levels using commercially available assays. Anthropometrics were measured. Metabolic parameters (Fasting, postprandial serum glucose levels and lipid profile) were quantified. Descriptive and Correlation analysis were performed using SPSS version 20.Signifcance was defined as p-value of < 0.05.
Results: Spexin levels correlated positively and significantly with BMI , waist circumference, hip Circumference and % body fat mass ($r =0.34, 0.31, 0.29, 0.27$ respectively) . With regard to glucose level& lipid profile spexin correlated positively and significantly with postprandial serum glucose, LDL (mg/dl) and triglycerides (mg/dl) ($r=0.22, 0.28, 0.3$, respectively)
Conclusion: This study shows positive association of spexin to BMI suggesting promising implications of spexin in obesity and obesity targeted treatment in women. Findings illustrate a potential role of this novel peptide in regulation of metabolism. Further studies are needed to confirm present findings.

216 | Renal Function Estimating Equations Performance During Pregnancy and Postpartum

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Introduction: Dosing of renally eliminated medications during pregnancy can be challenging due to marked changes in renal function.
Research Question or Hypothesis: Not all renal function estimating equations perform equally well during pregnancy and postpartum.
Study Design: Retrospective.
Methods: Equations [Cockcroft-Gault (CG), Modification of Diet in Renal Disease (MDRD2), Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI), Preeclampsia Glomerular Filtration Rate (PGFR), 100/SCr, and Diabetes and Complications Control Trial (DCCT)] were assessed for mean difference, correlation (r), slope, y-intercept and relative accuracy within 10 and 25% of measured CrCl in 173 women

during early-, mid- and late-pregnancy as well as ≥ 3 months postpartum compared to measured CrCl. CG was calculated using pre-pregnancy weight (PPW), actual weight (ABW), and ideal weight (IBW). MDRD2, CKD-EPI, and DCCT non-adjusted and adjusted by BSA were calculated using PPW and ABW.

Results: During pregnancy, the best performances for correlation, slope and y-intercept were CG (PPW) (r=0.7, p<0.05; slope 0.9; y-intercept=24.4 ml/min) and CG (ABW) (r=0.7, p<0.05; slope 0.9; y-intercept=41.5 ml/min). The lowest mean difference was seen with DCCT adjusted by BSA (ABW), followed by DCCT adjusted by BSA (PPW). DCCT adjusted by BSA (ABW) was significantly lower in mean difference (2.7) than DCCT adjusted by BSA (PPW) (-6.3) (p<0.05). Best accuracy within 10% and 25% was CG (PPW) (32.9 and 71.5%).

Postpartum, the best performances for correlation, slope and y-intercept were MDRD2 adjusted by BSA (ABW) (r=0.9, p<0.05; slope=0.9; y-intercept=1.8 ml/min) and MDRD2 adjusted by BSA (PPW) (r=0.9, p<0.05; slope=0.9; y-intercept=-4.3 ml/min). Mean difference was lowest with 100/SCr and PGFR. 100/SCr was significantly lower in mean difference (2.1) than PGFR (-9.2) (p<0.05). Accuracy within 10% and 25% was greatest with PGFR (47.9 and 93.8%).

Conclusion: Based on overall accuracy, bias, correlation, slope and y-intercept, the performance of CG (PPW) was best during pregnancy and PGFR was best postpartum.

217 | Temporal Access to Contraceptive Prescribers in Georgia

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Introduction: Delaying contraceptive access may contribute to unintended pregnancies, and during the covid-19 pandemic the appointment wait time for contraceptive care in free or low cost clinics in Georgia is unknown. Pharmacist prescribed contraception does not require an appointment and is used to improve access in other states.

Research Question or Hypothesis: What is the appointment wait time in federally-funded family planning clinics, and are there differences between metropolitan (M) and non-metropolitan (NM) counties in Georgia?

Study Design: Prospective, cross sectional, telephone-based survey.

Methods: The Office of Population Affairs provided a list of Georgia clinics receiving Title X federal funding to provide free or low cost family planning services. Clinic location was defined as M or NM per 2013 National Center for Health Statistics Code. Using a prewritten script, researchers called clinics between Jan-May 2021 to inquire about the earliest available contraceptive appointment. Descriptive statistics, t-test, and chi square tests were completed using SPSS.

Results: Of the 180 clinics called, 163 (90.6%) answered (89.6% M vs. 91.7% NM, p=0.63). Metropolitan clinics had longer average wait times to first available appointment (M 14.3 +/- 16.1 vs. NM 6.0 +/- 9.5 days, p<0.01), but no difference in availability of same day (50.8% M vs. 69.8% NM, p=0.07), walk-in (52.3% M vs. 68.3% NM, p=0.13), or telehealth appointments (43.1% M vs. 36.5% NM, p=0.47).

Conclusion: During covid-19, average contraceptive appointment wait time in Georgia Title X federally-funded family planning clinics was 1 to 2 weeks. This is longer than the "walk-in" model that would likely be used if pharmacist prescribed contraception was permitted in Georgia. Patients seeking to minimize contraceptive appointment wait times, particularly in metropolitan areas, could potentially benefit if pharmacist prescribed contraception were permitted.

ADVANCES IN INTERNATIONAL CLINICAL PHARMACY PRACTICE, EDUCATION, OR TRAINING

Critical Care

218 | Drug-related problems in a medicinal intensive care unit detected by clinical pharmacists on bedside rounding teams

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Service or Program: Participation of pharmacists on bedside rounding team in Intensive care unit (ICU)

Justification/Documentation: ICU patients often require complex drug regimens, which may increase the risk of drug-related problems (DRPs). Based on studies carried out worldwide, implementing clinical pharmacy services in critical care teams can reduce DRPs and improve healthcare quality. However, in Vietnam, the team-based care model in ICU with clinical pharmacists' participation has not yet been well-established. Additionally, there is no published interventional study on DRPs in Vietnam. Thus, the aims of this study were to identify DRPs in ICU patients and the clinical impact of interventions made by pharmacists during patient rounds.

Adaptability: A descriptive study from May 2018 to July 2020 was performed in a medical ICU in HoChiMinh City. Since January 2019, a clinical pharmacist was integrated in the inter-professional daily rounding team to detect and prevent DRPs. Detected DRPs during the study time were categorised by a modified PCNE classification system. A comparison of DRPs before and after clinical pharmacy inclusion in ICU rounds was done.

Significance: 56 and 152 patients were included before and after pharmacist's participation, respectively. 36% (20/56) and 86% (131/152) of them experienced 43 and 523 DRPs, respectively. The rate of detected problems per patient increased from 0.8 to 2.9 then to 4.7 in 3 consecutive years. Identified DRPs are often associated with anti-infective use but its proportion dwindled over time (from 65% in 2018 to 34% in 2020). Furthermore, the intervention rate

before drug administration was around 64-72%. Among interventions after drug administration, optimising anti-infective dosage accounted for the highest percentage (29%). The most frequent interventions were dosage adjustment (28%) and instituting a new drug (25%). Over 96% of the detected problems were resolved. Finally, the healthcare team also detected or prevented 136 adverse drug reactions and 19 drug interactions via active surveillance.

Emergency Medicine

219 | Implementation of On-Call Clinical Pharmacy Service in Emergency Department During COVID 19: New Initiative in Hamad General Hospital, Qatar

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Service or Program: Throughout COVID-19, complex therapeutics and medication protocols left clinicians overwhelmed by contradicting information leading to drug-related problems (DRPs) potentially leading to ineffective pharmacotherapy and drug-related morbidity and mortality. DRPs queries are time consuming, utilize different resources, and require skills and experience to provide accurate answers[3]. Quick answers are paramount in the Emergency Department (ED) especially during pandemic period. Clinical pharmacists (CP) can identify and resolve DRPs but are only available from 7AM-3PM in ED. We set up on-call CP service for ED DRPs calls during out-of-office hours.This study aimed to assess the capacity of the service to capture 100% of calls received and to measure the time taken to resolve DRP queries compared to international standard.

Justification/Documentation: A dedicated ED CP on-call phone line until 10pm daily was arranged by Hamad General Hospital Pharmacy (Qatar).Data was documented on a logbook/Electronic Medical Records (EMR) and analysed using predefined parameters.

Adaptability: Between March-September 2020, 133 DRPs calls were received and resolved by CP. 38% of these were related to drug interaction/safety, adverse drug reactions, dose-adjustments, drug-allergies, and drug in pregnancy.30% were related to medication administration, such as infusion rates, titration, and IV compatibility. Those questions were mostly received from nurses(Figure 1).Appropriate dose selection and appropriate indication represented 21% and 11% respectively (Figure 2). Caller's acceptance rate to responses provided by CP were 100%. Responses were documented in patients' EMR. The call duration extracted from phone-log showed an average time of 4.66 minutes/call which is below average standard of 15-30 minutes.

Significance: Availability of clinical pharmacists to provide quick, acceptable responses to DRPs queries, is crucial given the complexity and diversity of ED patients. During COVID-19, on-call clinical pharmacy service has proven its capability to resolve DRPs and support clinical decision-making process in a relatively shorter time.

220 | Impact of expanding clinical pharmacy service in Emergency Department at Hamad General Hospital; A tertiary Hospital in Qatar: A cross Sectional Study

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Service or Program: The Emergency department (ED) is a complex environment presenting unique challenges for high-risk populations such as the critically ill patients who often require the use of high-risk medications (1). One study suggests that clinical pharmacists (CPs) may improve the fulfillment of safety goals for the ED patient as per the Joint International Commission (2). Some published reports have asserted that ED-based CPs would have the potential to increase patient safety (3). In our hospital, the number of CPs covering the ED increased from 2 to 9 starting from November 2019.

Justification/Documentation: This is a retrospective audit covering the period from January 1st 2019 till October 25th 2020 at Hamad General Hospital (HGH) in Doha, Qatar, to determine the impact of increasing the number of CPs covering the ED on the number of identified, solved, and documented drug related problems (DRPs) on the electronic medical records of ED patients. The interventions retrieved from pharmacy reports were analyzed and evaluated in terms of numbers by classification and percentages by the investigators.

Adaptability: A total number of 8,946 interventions covering 6,284 patients were carried so far in 2020 compared with 1,515 interventions covering 1,001 patients in 2019 (Figure 1) which represents a 6-fold increment by increasing the CPs from 2 to 9. Even the detection of Adverse Drug Reactions increased by 1.5 times with only 38 documented in 2019 compared to 64 in 2020. Classifications and quantities of interventions were also analyzed in detail

Significance: This audit demonstrates that a pharmaceutical intervention can positively contribute to the identification and resolution of DRPs. The benefit of CP involvement in patient care was observed based on the number of interventions that occurred. Studies are needed to assess the impact of those interventions on patients' outcomes or cost effectiveness.

Other

221 | Implementation of a Type 1 Diabetes Mellitus Template Utilizing Electronic Tablets

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Service or Program: A pilot program was developed to implement a tablet-based system for digitalization of medical records and assess documentation of patients with Type 1 Diabetes Mellitus (T1DM) in Jamaica. A secured, electronic T1DM template was developed for a public hospital endocrinology clinic. Patient medical records (n=25) were entered into the tablets to determine accuracy of documentation in the current medical record.

Justification/Documentation: Diabetes is the second leading cause of death from non-communicable diseases (NCDs) in Jamaica. A United Nations Sustainable Development Goal is to decrease premature mortality from NCDs by 1/3. Appropriate tracking of T1DM patients in Jamaica is difficult due to limited endocrinology offices, large rural areas, and lack of electronic medical records. A tablet-based registry/template for identifying patients and treatments may assist in improving these areas.

Pilot data was collected over a maximum of seven office visits (mean=5). Mean blood glucose and A1c values were 226 mg/dL and 11.5% (range=6.5-19.4%). Most patients were on basal-bolus insulin regimen with one dosing regimen documented throughout this period. All dates of initial diagnosis were documented. Eligible patients had the following screenings documented: blood pressure (96%), lipid panel (61%), renal function (40%), foot inspection (36%), dietary recommendation (32%), eye exam (17%), microalbuminuria (0%).

The T1DM care may be appropriate but not well documented. A T1DM template may provide a systematic process for documenting adherence to guidelines.

Adaptability: Continuous patient data, from childhood to adulthood, and guideline-based treatments can be provided in a tablet-based template to promote improved documentation to endocrinologists and family physicians throughout Jamaica. In addition, other NCDs, medical missions, or those in the rural areas can follow a similar model to improve care.

Significance: Implementation of tablet-based technology in Jamaica could increase documentation and compliance with guidelines. This could increase availability of epidemiologic information in the urban and rural areas and improve patient outcomes.

CLINICAL PHARMACY FORUM

Ambulatory Care

222 | Collaboration to Harmonize Antimicrobial Registry Measures (CHARM) Dashboard: A standardized tool for multi-region benchmarking of outpatient antibiotic use

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Service or Program: The CHARM dashboard is a tool created from electronic health records (EHR) to display antibiotic use parameters using Microsoft Power BI. It allows for new data collected from participating health systems to be entered and is updated quarterly to provide a current analysis. The dashboard divides the state of Michigan into geographic regions to display trends and allow comparisons across regions. The dashboard reports several parameters: (1) rate of antibiotic use per 1000 outpatient visits, (2) patient demographics, (3) indication and antibiotic agent, (4) appropriateness of prescriptions. The dashboard is intended for use by healthcare professionals and public health officials addressing antimicrobial stewardship. EHR data are provided by health systems to Ferris State University through partnership for the purpose of creating dashboard. While additional partnerships are being established, the current version of the dashboard reflects data from three health systems and 70 clinics. Between July 2019 to December 2020, a total of 1.1 million outpatient visits made by approximately 279,000 patients are included in the dashboard.

Justification/Documentation: As of January 2020, the Joint Commission requires ambulatory health care organizations to collect, analyze, and report data relating to antimicrobial stewardship performance measures. Currently, there is no standardized method for comparing antibiotic use among clinics to best create performance measures.

Adaptability: The dashboard uses de-identified EHR data extracted into comma-separated value format. This allows health systems with different EHR software to implement the dashboard program without software-specific adjustments. The dashboard is easily shared with stakeholders using a hyperlink, without having to install a software/application.

Significance: The CHARM dashboard is a dynamic benchmarking tool that allows the comparison of outpatient antibiotic usage in a timely and granular manner. Using the dashboard, clinical pharmacists can identify opportunities for antimicrobial stewardship initiatives for specific indications or patient populations and assess the impact of those initiatives.

223 | Methods to develop an ambulatory care scorecard to quantitatively measure the clinical outcomes of clinical faculty pharmacists at a health learning system

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Service or Program: The UF COP developed a scorecard to quantitatively identify and evaluate outpatient faculty pharmacists' clinical

outcomes at UF Health. The method was developed utilizing data available within the electronic health record which varied based on how pharmacists were designated as providers for patient encounters. The scorecard was developed through three phases: (1) cohort identification: developed a novel process to identify encounters tracking progress notes written by pharmacists; (2) outcomes collection: assessed relevant outcomes based on the availability of data and their potential impacts; and (3) benchmark comparison: utilized benchmarks adopted nationally to formulate outcomes comparision and interpretation

Justification/Documentation: There is a lack of quantitative data to show the impact of ambulatory faculty pharmacists on the UF Health system. The scorecard developed provides quantitative data for five outcomes (A1C, INR, BP, number of visits, and access to care) using different standards and benchmarks (eg,Medicare Merit-Based Incentive Payment System, Faculty Practice Solutions Center, and Healthy People 2030) that can be used for comparisons.

Adaptability: The UF COP is planning to review the scorecard data twice a year to track faculty pharmacists' impact and evaluate the process. The method used can be replicated at other institutions to help evaluate outpatient pharmacists' impact.

Significance: The scorecard can be used routinely to track the impact of pharmacy faculty in ambulatory care settings. Data can be used to show the impact of pharmacy faculty to provide justification to expand the inclusion of pharmacists on the care team.

224 | A public health pharmacy team provides vital support to a medically underserved community

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Service or Program: A novel public health pharmacy team (PHPT) provides comprehensive medication management services in medically underserved neighborhoods in NY's Capital District. The PHPT collaborates with community health workers to address not only medication needs, but social needs. Services include medication reviews, home visits, group education, device training, vaccine clinics, medication adherence support, and referral for social determinants of health needs (e.g., food or housing insecurity, lack of health insurance or primary care provider). The PHPT addresses population health through campaigns developed with interdisciplinary faculty and students, through contracts with the NYS Department of Health, and via partnerships with medical providers and federally qualified health centers.

Justification/Documentation: The Albany College of Pharmacy and Health Sciences opened a public health space, The Collaboratory, in a medically underserved area wrought with health disparities. The Collaboratory's neighborhood includes 1 medical provider, no pharmacies, and lacks a grocery store and other health resources. A needs assessment identified community concerns about lack of access to medical providers, prescription costs, plan navigation, questions about medications, and patient-provider communication. The PHPT's services enable patients to better manage chronic diseases, navigate health settings and insurance plans, and manage care transitions.

Adaptability: The PHPT includes pharmacists, PGY2 ambulatory care residents, certified pharmacy technicians, who reside in the neighborhood, and interns. It operates under the supervision of Pharmacy Practice and Population Health Sciences faculty. Services address individual-, community-, and system-level improvements in medically underserved areas. Replicability and sustainability require stakeholder engagement and support, including from community members, health providers, and payers.

Significance: Establishing the PHPT addressed a care gap in our community and fostered a direct partnership between public health and pharmacy. Development and implementation of pharmacy services that meet the unique needs of its patrons and that work with other community-based organizations and providers are expected to bring the most benefits to our patients.

225 | A model for providing comprehensive medication management through interdisciplinary co-visits within a large, multisite, primary care network

Samantha Leistman, Pharm.D., Lillian Brennan, Pharm.D. and Sarah Amering, Pharm.D.; Department of Pharmacy, UR Medicine, Rochester, NY

Service or Program: With the shortage of primary care physicians and the shift toward advanced practice providers (APPs) bridging this gap, it is important to consider opportunities for collaboration between pharmacists and APPs. Within our health-system's primary care network, three clinical pharmacists have partnered with APPs to conduct co-visits for patients with opportunities for improvement in chronic health conditions. Co-visits begin with the pharmacist conducting a comprehensive medication assessment and identifying opportunities for medication optimization or simplification. Next, the pharmacist and APP review recommendations together, and the APP finishes with a physical assessment and finalized care plan. Follow-up co-visits are scheduled as-needed.

Justification/Documentation: Pharmacists and APPs at each clinic worked collaboratively to identify patients and develop an efficient workflow. This interdisciplinary co-visit model aimed to re-engage patients who had extended periods without in-person care during the pandemic, increase primary care provider access, improve patients' overall health outcomes, and provide framework for value-based reimbursement in primary care. The pharmacist and APP each document interventions within the electronic medical record.

Adaptability: Pharmacists performing this service have similar training, credentials, and job responsibilities. The general co-visit workflow has been adapted to suit specific needs of each practice, but the

pharmacists ensure consistency of their services by following the comprehensive medication management model. Pharmacists regularly discuss barriers to service implementation and work together to develop solutions to overcome challenges.

Significance: Through this co-visit model, the pharmacists and APPs have provided care to 110 patients over four months; resulting in identification and resolution of numerous medication therapy problems and an increased percentage of patients meeting disease-specific metrics. This initiative built upon existing co-visit models and highlights the importance of clinical pharmacists providing direct patient care as part of an interdisciplinary team. Pharmacists have consistently received positive feedback from both patients and providers about this service.

226 | 2021 Update on the accomplishments and initiatives of the ACCP Ambulatory Care Practice and Research Network

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Service or Program: The Ambulatory Care Practice and Research Network (PRN) is comprised of approximately 2000 clinical pharmacists and trainees from a diverse range of outpatient settings, who actively contribute to the profession of pharmacy through leadership, education, research, and service. Members are surveyed biannually to evaluate accomplishments including promotions, practice advancement, awards, and scholarly activities.

Justification/Documentation: An electronic survey was developed through collaboration with the membership and communications committees to characterize the accomplishments and membership makeup of the Ambulatory Care PRN.

Adaptability: Data obtained from this survey is summarized and reported at the annual meeting and in the ACCP PRN Report. A biannual evaluation allows for comparison with previous years' data and adaptation to initiatives and advocacy within the Ambulatory Care PRN.

Significance: The Ambulatory Care PRN continues to contribute to ACCP as one of the largest and most diverse memberships. Voluntary responses were obtained from 261 members with a wide range of experience, varied levels of training, and a diverse array of practice settings. The Ambulatory Care PRN members continue to grow professionally through practice advancement, professional presentations, research publications, and funding. In 2020, thirty-eight percent of the elected ACCP Fellows (8 out of 21) were dynamic members within the Ambulatory Care PRN, further denoting the contributions of this vital group within the College. Through webinars, annual educational programming, listserv activities, networking events, and research efforts, the Ambulatory Care PRN members continue to advance pharmacy and collaboration within ACCP.

Clinical Administration

227 | Defining a Care Process, Documenting Activities, and Reporting Outcomes of a Medication History Program

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Service or Program: A pharmacy practice model (PPM) to provide comprehensive medication management for inpatients on select Hospital Medicine units was implemented in an Academic Medical Center. Clinical Pharmacists supervised Medication History Technicians (MHT) that collected the best possible medication list. A standard operating procedure (SOP) was developed and a flowsheet was embedded in the electronic medical record (EMR) to capture medication history activities and interventions. The flowsheet also served as a template for pharmacists to generate notes for the interdisciplinary team.

Justification/Documentation: Innovating new programs to provide quality care is a priority at the institution. The PPM aimed to standardize a process for efficiently improving care transitions, serve as a model for creating process and outcome metric dashboards, and documenting medication history misadventures in a novel way. Between June 1, 2020 and March 31, 2021, 4,132 medication histories were collected with 91.6% requiring an intervention by the MHT. An average of 4.9 interventions were documented per encounter with an average of 1.2 medications added and 1.4 removed per patient.

Adaptability: The program and associated workflows are designed to capture patient admissions without regard to payor, diagnosis, or other risk-factor. Flowsheets in the EMR generate discrete data points that drive an actionable dashboard of process and outcome measures. While the service was implemented on Hospital Medicine due to institutional priorities, the structure, SOP, EMR build, and data structures may be applied to any inpatient setting in the health-system.

Significance: This PPM facilitates pharmacist and MHT activities to align with interdisciplinary care teams and enhance patient-centered care. Obtaining the best possible medication list informs the care team of admission medications to improve safety and optimize pharmacotherapy. The list drives inpatient and discharge ordering practices and documents gaps in current medication reconciliation processes at our hospital.

Community Pharmacy Practice

228 | Community Pharmacist and Family Medicine Physician Pre-Visit Collaboration for Patients Receiving Chronic Care Management Services

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Service or Program: Pre-visit planning includes anticipating tasks (e.g. medication review) necessary for a patient's clinic visit and completing them in advance. This 8 month project had community pharmacists (CPs) at Greenwood Pharmacy (GwPh) perform pre-visit medication reviews for a group of Medicare patients at Northeast Iowa Family Practice Center (NEIFPC). Eligible patients were enrolled in the clinic CCM program and received their medications at GwPh. NEIFPC created a business agreement with GwPh and provided them access to the clinic EHR. NEIFPC submitted CCM claims to insurers for reimbursement. CCM payments were prorated and distributed each month according to billable minutes each entity provided. NEIFPC provided GwPh a weekly list of enrolled subjects who had a physician visit at NEIFPC the following week. CPs at GwPh would review pharmacy records, the clinic EHR and document drug therapy recommendations (DTRs) in the EHR "Prep Note" section for the scheduled patient encounter. NEIFPC physicians would review DTRs at the beginning of each patient encounter. Time tracking software in the EHR captured GwPh and NEIFPC time performing CCM services.
Justification/Documentation: There were 145 eligible subjects. CPs performed at least one pre-visit medication review for 95 patients. Overall there were 129 CP reviews performed for the 95 patients. These reviews resulted in 169 DTRs and 76% were accepted by the physician. There were 71 CCM claims billed and total net CCM revenue was $3,596 (NEIFPC $1796: GwPh $1800).
Adaptability: Approximately 15.4 million Medicare patients are eligible for CCM services. Allowing CPs access to the clinic EHR was instrumental for this project. CPs with other staffing models or less experience providing clinical services may have different experiences.
Significance: This project was successful in leveraging CPs to make drug-therapy recommendations before the physician-patient encounter and provided a mechanism for them to receive revenue for their services.

Drug Information

229 | Rapidly and easily providing medical information - when and where it is needed.

Evelyn Hermes-DeSantis, Pharm.D.; phactMI, Queen Creek, AZ

Service or Program: A non-profit collaboration of medical information leaders from 30+ pharmaceutical companies developed an Application Programming Interface (API). Currently sitting on the organization's website, it provides access to a navigable product labeling for all US approved products and scientific response documents (SRDs) from participating companies to healthcare professionals (HCPs) for free.
Justification/Documentation: In ACCP Standards for Clinical Pharmacy, virtually every step in the process of care requires knowledge about medications that clinical pharmacists need to research. While some information may be easily retrievable, some may take longer to find. Pharmaceutical companies' medical information departments have some of this data readily available for HCPs in the form of SRDs. These documents are evidence-based, scientifically accurate, and non-promotional; and may speak to off-label information relative to the question asked. However, accessing these resources may be time consuming. The current API is available 24/7.
Since January, with seven companies live, 1497 HCPs, 559 (39%) pharmacists, accessed the website for medical information. A total of 543 (45%) accessed SRDs from three pharmaceutical companies. The requests resulted in 191 unique documents. Most documents (160) were accessed between 1 and 3 times, and one document was accessed 62 times. The most common topics were therapeutic use (142), COVID19 vaccine storage or dosing (112), safety (106), and dosing/administration (101).
Adaptability: Although the API currently sits on the organization's website, it has been developed to be placed on multiple sites, such as within an electronic health record, or other sites that clinical pharmacists would search and utilize.
Significance: The ability to access medical information from the pharmaceutical industry with just a few clicks or keystrokes is valuable to the busy clinical pharmacist to optimize patient care. This API allows rapid and easy access to all approved product labels as well as SRDs from an expanding number of member companies.

Education/Training

230 | Student-coordinated clinical research design elective course in a Pharm.D. curriculum: the student coordinator perspective

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Service or Program: A clinical research design elective, co-coordinated by students and faculty and modeled after ACCP's Clinical Research

Challenge (CRC), was developed as a co-curricular elective in the Pharm.D. program. A novelty of the course was the inclusion of student co-coordinators (SCCs)—students who previously completed the course and competed in ACCP's CRC. SCCs assisted with all aspects of course governance including development of the syllabus, scheduling of online assignments, communication with enrolled students, assessment of performance, and assignment of grades. Additionally, SCCs assisted with recruitment efforts and served as liaisons between faculty and enrolled students.

Justification/Documentation: The quality and extent of research training experiences varies among pharmacy trainees. Our course exposes students to research, allowing them to develop their research, time management, and critical thinking skills while collaborating with others. Importantly, SCCs serve as a "near-peer" resource for enrolled students who may be reluctant to seek help from faculty. By sharing course governance responsibilities, SCCs are an asset to faculty coordinators. Recruitment efforts from SCCs and feedback from students who completed the course have contributed to course growth; enrollment increased from 12 to 21 students between years 1 and 2. Additionally, SCCs gain valuable experience as educators, equipping them with skills required of pharmacy faculty.

Adaptability: The success and growth of the course demonstrates the value of this novel teaching collaboration between students and faculty. While the content of our course focused on research skill development, inclusion of SCCs is easily adaptable to other content areas. SCCs can relieve some of the burden of course governance from faculty coordinators while serving as effective liaisons between faculty and enrolled students.

Significance: The clinical research design elective course provides enrolled students with practical research experience and SCCs with valuable experience as educators, helping to prepare both for future research and teaching opportunities.

231 | Perceptions of student-pharmacist led COVID point-of-care-testing

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Service or Program: Pharmacy, nursing, and other non-medical students at Binghamton University assisted in the administration of weekly point-of-care (POC) COVID-19 surveillance testing to the student, faculty, and staff population. The program was developed by Binghamton University and the tests were administered at Binghamton's on-campus surveillance testing center.

Justification/Documentation: Ensuring students can remain on campus and get a quality in-person education is integral to meeting Binghamton's educational standards. Students were tested frequently so proper mitigation measures could be enacted quickly. Testing participants were given a nasal swab at the Surveillance Testing Center and instructed on its use by an administrator. In a survey conducted by our research team, 91.9% (203/221) of respondents stated they were either "very comfortable" or "somewhat comfortable" receiving COVID-19 testing from pharmacist students, as compared with 93.7% (208/222) who were comfortable with nursing students. Additionally, only 6 participants (2.7%) said they believe pharmacists should be less involved in POC testing going forward, as compared to 139 (62.3%) who stated they want more involvement. Both of these measures point towards a public perception that the field of pharmacy should have greater involvement in POC testing.

Adaptability: Pharmacist-led POC testing programs, if authorized through legislation, would be best implemented at retail pharmacies due to their accessibility. Although the results of our survey skewed young and female, results did not vary significantly between the age groups or sexes and should be broadly generalizable to the public.

Significance: Greater involvement for pharmacists in POC testing can be implemented in retail pharmacies in New York state following a change in legislation and by granting pharmacists provider status nationwide. Pharmacies are more accessible than doctor's offices, especially for underserved rural and minority populations; allowing pharmacists more authority to administer testing could help improve healthcare access and health outcomes.

Endocrinology

232 | ACCP Endocrine and Metabolism Practice and Research Network: 2021 Update

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Service or Program: The Endocrine and Metabolism Practice and Research Network (PRN) is a relatively small group of approximately 290 pharmacists and trainees. A survey is conducted each year to determine the makeup of the PRN membership and what members value most about the PRN.

Justification/Documentation: An electronic survey was developed by the Endocrine and Metabolism PRN membership committee for annual distribution to the PRN membership.

Adaptability: Data obtained from the annual surveys are compared to data from previous years. They are also included in the ACCP PRN

Annual Report and used as a guide for engaging members and meeting their needs in new ways.

Significance: Forty-seven members completed the 2021 survey; forty-six full, associate, or affiliate members and one pharmacy resident. The results show that Endocrine and Metabolism PRN members are highly specialized clinical pharmacists practicing in a variety of settings with several members advancing pharmacy practice through collaborative practice agreements, prescribing privileges, and billing for pharmacist provided services. Aside from the focus on endocrine and metabolism, the small size and networking opportunities attracted the majority of respondents to the PRN and they find most value from the PRN educational offerings and leadership opportunities. The Endocrine and Metabolism PRN continues to contribute to the success of ACCP through provision of valuable practice, research, and networking opportunities for a small, strong group of pharmacists and trainees who are actively advancing the practice of pharmacy.

Family Medicine

233 | Pharmacist-driven communication process for inpatient to outpatient transitions-of-care within a Family Medicine residency program

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Service or Program: A pharmacy-driven transitions-of-care (TOC) documentation process within a Family Medicine residency was implemented as a means for communication between inpatient and outpatient interdisciplinary care teams within the same practice. A targeted TOC note in the clinic electronic health record (EHR) was initiated by the inpatient pharmacist (faculty, resident, student) in which medication specific documentation occurred. The note was an impetus for patient contact within 48 hours of hospital discharge by clinic staff. Documented information was available for the interdisciplinary care team conducting the hospital follow-up appointment, including nurses, physicians, and pharmacist.

Justification/Documentation: Pharmacist involvement in TOC has been documented to reduce medication errors. This unique process provides an avenue for pharmacist-driven communication focused on medications and provides nurses specific direction for medication-related questions during the phone follow-up conversation. In the two months after process implementation, more patients were contacted within 48 hours of discharge (75%, n=57) than the preceding two months (31%, n=22) ($p<0.05$) and more patients met criteria for Transitional Care Management billing after process implementation, 24% (n=17) vs 64% (n=48) ($p<0.05$).

Adaptability: While inpatient to outpatient pharmacist collaboration within the same physician group may be unique, the communication mechanism could be transferrable. Developing relationships with the pharmacy department at admitting institutions can help build a similar program to enable opportunities for improved patient care and avenues for increased revenue. With structured templates, education, and a clear process, clinical staff at many levels can become involved in the TOC process.

Significance: This process presents a unique opportunity for pharmacists in the TOC process and allows continuity from the inpatient to outpatient setting. Recommendations made in the TOC note provided focused guidance for the outpatient visit and aligned with preventative measures, optimizing care of chronic diseases, and preventing rehospitalization. Including learners in the process expanded opportunities for involvement in the patient care process.

Infectious Diseases

234 | COVID-19 Rapid Response Team: Pharmacy Practice, Public Health, and Interprofessional Education

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Service or Program: In partnership with the Chicago Department of Public Health, we developed a multidisciplinary COVID-19 Rapid Response Team (CRRT) to perform mobile educational outreach and vaccination in congregate settings in communities most impacted by COVID-19. An infectious diseases physician leads a team of pharmacists, nurses, and students from the colleges of pharmacy, medicine, nursing, and public health. On-site COVID-19 educational outreach and vaccination is provided. Pharmacist and nurse site coordinators oversee operations and are responsible for dose preparation. All CRRT members, including pharmacists and pharmacy students, alternate consenting of vaccine recipients, vaccine administration, monitoring, clinical documentation and patient education.

Justification/Documentation: COVID-19 vaccine hesitancy, infection rates and poor outcomes are disproportionately higher in certain communities where access to vaccines is often limited. Community-based, mobile COVID-19 outreach and vaccination performed by the CRRT is designed to address these barriers and provides interprofessional educational opportunities as providers and students from multiple disciplines work together, rotating through different roles. COVID-19 outreach has been performed at 32 sites and more than 2,100 vaccines have been administered during 87 separate mobile vaccination events between 2/5/21 – 6/11/21. These efforts have helped increase the percentage of fully vaccinated Chicago residents from 2.4% to 45.8% while decreasing rates of COVID-19 infection, hospitalizations, and death by 66-78%.

Adaptability: Although the CRRT effort was focused on COVID-19 vaccination, the community-based, mobile care model can easily be adapted to position pharmacists to provide education and treatment for other chronic conditions in underrepresented communities as part of a multidisciplinary team.

Significance: The CRRT is an innovative approach to respond to the COVID-19 pandemic that incorporates pharmacists into a multidisciplinary team to provide community-based education and vaccination. The CRRT has helped improve COVID-19 metrics in Chicago, is easily adaptable for the management of other chronic health conditions, and provides a rich interprofessional learning environment.

Medication Safety

235 | Using Inpatient Clinical Quality Metrics to Drive Inpatient Antimicrobial and Opioid Stewardship in an Integrated Health-System

Steven Johnson, Pharm.D.[1], Stephen Smith, MS, RPh, FASHP[2], John Brooks, MS, MD[3] and Tamitha Gipson-Goodnough, RN, BSN, JD, CPHRM, CPPS[4]

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Service or Program: Inpatient clinical pharmacy metrics were developed to measure quality, outcomes and medication safety adherence from various clinical pharmacy programs across an integrated health-system. Antimicrobial and opioid stewardship were two areas of targeted focus over a multi-year period.

Justification/Documentation: McLaren Health Care did not utilize consistent, systemized metrics for measuring quality outcomes from clinical pharmacy activities prior to 2018. In January 2018, a new system medication use evaluation program was established to measure quality and financial outcomes among 4 domains, which were established each year and had 1 or 2 metrics measured for 12 months each. We evaluated initial treatment of *Clostridium difficile* infections c/w 2018 IDSA guidelines, acute kidney injury from vancomycin monitored by pharmacists, opioid over-sedation requiring naloxone administration and fentanyl patch initial dosing appropriateness. All metrics performed at or above system goals and led to program improvements at individual sites.

Adaptability: The measurement of standardized inpatient clinical pharmacy metrics enabled comparison of performance across a diverse, integrated health system as well as various clinical pharmacy program quality improvement through cyclic performance improvement cycles at hospitals performing below the system targeted goal. Our health system is comprised of multiple community hospitals, a large oncology hospital, a long-term acute hospital and several small community hospitals. Given our success in a a diverse group of inpatient facilities, we believe our process is adaptable to any inpatient setting that provides inpatient clinical pharmacy services.

Significance: The creation of standardized and systemized quality metrics across an integrated health system enabled local subsidiaries to more effectively implement a new quality-based change in national guideline recommendations for the treatment of *Clostridium difficile*, improve local pharmacokinetic monitoring programs for vancomycin to reduce the rate of acute kidney injury, reduce the rate of preventable harm from opioid over-sedation requiring naloxone administration and ensure appropriateness of fentanyl patch initial dosing.

236 | Development of a Targeted Medication Safety Quarterly Action Agenda in an Integrated Health-System to Reduce the Rate of Preventable Harm from Medication Events

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Service or Program: A targeted quarterly action agenda was created to drive medication safety event prevention efforts using an integrated adverse drug event and medication variance database for 14 system subsidiaries. The intent of this action was to incorporate solutions and lessons learned from common, high-risk and priority focus areas identified from a new, system-wide event data set to reduce the rate of preventable harm.

Justification/Documentation: Raw medication event data was exported from RL7 to Microsoft Excel (Microsoft Corporation, Redmond WA) for each subsidiary and combined into a single data set representing the first systemized look at medication events across the enterprise. One author (STJ) manually reviewed each event narrative and manually populated/standardized the drug name using wholesaler description in a separate field, as medication name entry was not required/blank in the majority of events. One author (STS) manually reviewed each event and coded a pharmacy severity category in a separate field. An Excel VLOOKUP function was then used to populate American Hospital Formulary Service (AHFS) categories in a separate field to provide for further analytics.

The first quarterly action agenda (QAA) was designed to utilize Institute for Safe Medication Practices (ISMP) format but add additional

categorizations to allow system roll-up of the data and number of literature-based specific, actionable steps to improve systems and reduce the rate of preventable harm at each subsidiary in a dashboard-style fashion. Three event types were selected for action in our first QAA: U500 insulin safety, height/weight errors and look-alike, sound-alike drug pairs.

Adaptability: Our Excel-based analytic method is adaptable across a wide variety of institutions capturing electronic event data.

Significance: Our unique medication safety QAA based on actual events occurring within an integrated health-system targets high risk, problem-prone and preventable medication safety targets and will provide system-level dashboard metrics on local subsidiary adoption of recommended safety best-practices.

237 | Improving allergy electronic medical record documentation in the outpatient setting

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Service or Program: An evidence based, standardized medication allergy questionnaire and policy for medication allergy documentation was developed. A quality improvement (QI) team was formed to include physicians, nurses, pharmacists, and QI specialists. Education was delivered by the QI team to all nursing staff within a recognized Patient Centered Medical Home (PCMH) in an effort to improve completeness of medication allergy documentation. Plan, Do, Study, Act (PDSA) cycles were utilized throughout the project to refine interventions used. Interventions included nursing documentation reminder systems, patient education flyers, and improved questionnaire accessibility.

Justification/Documentation: Errors of omission or commission on the medication allergy list have potential for significant patient harm, accounting for approximately 12% of medical errors. Prior to this clinic QI initiative, medication allergies were assessed at 46% of patient visits and essential allergy details (onset date, severity, and reaction type) were not documented for approximately 90% of patient visits. Over a nine week period, three PDSA cycles were conducted resulting in medication allergies being assessed at 63% of patient visits and 25% of patient visits having complete medication allergy documentation that included allergy onset date, severity, and reaction type.

Adaptability: Comprehensive review and documentation of a patient's medication allergies is a necessary component of PCMH recognition. Medication allergy assessment and documentation may be completed by many members of the healthcare team, though most often performed by nursing staff. Utilization of an interdisciplinary QI team, development of standardized policies and processes, and targeted interventions improves medication allergy assessment and documentation.

Significance: Inaccurate documentation of medication allergies has the potential to significantly impact patient care. Use of clinical pharmacists on a QI team to educate and advance nursing practices has potential to prevent a large number of medication errors and adverse drug events, thus improving patient care.

Oncology

238 | Successful Adoption of Rituximab Biosimilars in an Integrated Health System

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Service or Program: Rituximab biosimilar conversion was performed with strong hematology provider support to integrate biosimilars across oncology, non-oncology and off-label uses (malignant and non-malignant) in an integrated health system with pharmacists driving system conversion across multiple electronic health records. Goal = 90% conversion in 3 months.

Justification/Documentation: Specific system implementation strategies were proactively developed to clinically address oncology, non-oncology and off-label uses. Biosimilar conversion was mandated for any inpatient rituximab use and strongly encouraged for patients not meeting pre-defined exclusion criteria in the outpatient setting. The subcutaneous innovator-extender product was excluded from biosimilar conversion and, while available on formulary, its usage discouraged except in specific clinical circumstances. A detailed cost-savings analysis was performed across all applicable purchase classes of trade and hospital types relevant to outpatient infusion reimbursement and a single preferred biosimilar chosen. Rapid adoption of our rituximab biosimilar was achieved, approaching our 90% conversion goal within 3 months, exceeding national conversion benchmarks by 4-fold, and on track to achieve savings/revenue enhancement of almost $4 million in 12 months. Clinical efficacy and safety of the biosimilar was observed through event reporting systems with similar adverse event rates noted between innovator and biosimilar.

Adaptability: Pharmacist-driven rituximab biosimilar conversion is achievable across an integrated health-system in a safe, efficacious, patient-centric manner with significant fiscal improvement potential. Our biosimilar conversion financial analysis and conversion model is adaptable to a wide variety of clinic, hospital, health-system and payor situations.

Significance: Pharmacist-driven rituximab biosimilar conversion was achievable across an integrated health-system in a safe, efficacious, patient-centric manner and on-track to produce nearly $4 million in cost savings/additional revenue in the 12 months post-conversion.

Other

239 | Development of a Population Health Pharmacy Team for Post Discharge Support of High Risk Medicare Patients

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Service or Program: Within a large multi-hospital healthcare system, a Population Health Pharmacy Team (PHPT) was developed to support High-Risk Medicare Patients (HRMPs) enrolled into the Center for Medicare & Medicaid Services Bundled Payments for Care Improvement Advanced initiative during a 90 day post-hospitalization period. PHPT pharmacists provided tele-outreaches from a tele-health pharmacy center to patients within 7 days of discharge and as needed. The PHPT performed comprehensive medication reviews, assessments and resolution of adherence barriers and health literacy, and identification and resolution of medication therapy problems (MTPs) focused on therapy indication, effectiveness, safety, and adherence.

Justification/Documentation: The systems' Population Health Program is a care management-led program tasked with improving clinical, humanistic, and economic patient outcomes. Historically, inpatient transitions of care pharmacists were incorporated to perform discharge medication reviews and discharge education; however, MTPs continued to arise post discharge necessitating a PHPT to provide longitudinal care. Over a 7 month period, the PHPT completed 801 tele-outreaches and identified 433 MTPs. One or more MTPs were identified in 35% of the tele-outreaches performed. The majority of MTPs identified, were related to adherence (48%). Other MTPs included: indication (21%), safety (20%), and effectiveness (11%). Ninety four percent (94%) of the MTPs identified by the PHPT were confirmed resolved or accepted by provider for reassessment.

Adaptability: The PHPT consists of pharmacists with training or experience in ambulatory medicine. One full time equivalency (FTE) was initially utilized to provide services Monday through Friday. To increase patient captures, staffing was expanded to 4 FTEs including a Clinical Pharmacy Manager to provide program direction and oversight. The PHPT employed a central staffing model to provide care to patients across the system.

Significance: Population health is an emerging opportunity for pharmacy practice. Pharmacists' expertise are optimal to reducing MTPs beyond the acute phase period and help support the longitudinal management of HRMPs.

240 | An Online International Pharmacy Network: Feasibility, Design, and Proof of Concept

Charles Foster, Pharm.D., BCPS, BCCCP; Independent Researcher, Denver, CO

Service or Program: An online network for clinical pharmacy professionals was launched in the fall of 2020 (globalPharm.D..com). By utilizing customizable open source software hosted on a virtual private server (VPS), pharmacy professionals are able to engage and collaborate through forums, groups, and an activity feed, while utilizing collaborative tools such as document libraries, direct messaging, event scheduling, and virtual meetings.

Justification/Documentation: Clinical pharmacists worldwide communicate and collaborate through the internet on a daily basis, but the channels through which this occurs have room for improvement. Methods such as email lists and basic forums have become technologically dated and are often siloed. Forming a professional pharmacy group within an existing social media platform may allow interactivity among colleagues, however one must first join the governing site, while entrusting all data to the servicing platform. Modern software and internet technology have provided the tools necessary for the development and successful launch of a private online network designed specifically for clinical pharmacy professionals.

Adaptability: The software used to develop this professional network helped facilitate a timely and relatively inexpensive launch, and using VPS hosting offers scalability, security, and privacy. In addition to multi-functional networking capabilities and mobile compatibility, functional plug-ins for layered site privileges, e-learning, monetization, and job listings would allow for adaptation to various clinical pharmacy settings such as academic institutions, professional organizations, health systems, or for the provision of virtual pharmacy services.

Significance: As clinical pharmacy continues to advance, our ability to engage in meaningful online collaboration with colleagues must also advance. A highly functional and internationally accessible network dedicated to the profession of clinical pharmacy is feasible and justifiable. Herein provides proof that a scalable networking website with modern communication methods and useful collaborative tools can be developed and launched on a privately hosted and independently moderated platform.

Pain Management/Analgesia

241 | Implementation of a Pharmacist-Led Pain Stewardship Committee at a Multi-Site Academic Medical Center

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Service or Program: The UC Health Pain Stewardship Committee (PSC) aims to optimize prescribing of both opioid and non-opioid analgesics, while reducing opioid-related adverse events within the health system and throughout the community. The PSC focuses on three main components: acute pain, chronic pain, and harm reduction. This is a multidisciplinary committee containing members from pharmacy, nursing, medicine, integrative medicine, and performance improvement, who overlook prescribing practices for UC Health which includes UC Medical Center, West Chester Hospital, Daniel Drake Center, and Outpatient Clinics. The committee was developed as a sub-committee of the Drug Policy and Development Committee for the health system.

Justification/Documentation: In 2018, The Joint Commission created new standards for pain management, requiring hospitals to prioritize safe opioid prescribing [1]. In addition, the Centers for Disease Control, Centers for Medicare and Medicaid Services, and the Department of Health and Human Services, have encouraged hospital systems to implement opioid-related quality improvement programs focused on opioid safety and access to treatment for opioid use disorder (OUD) [2-4]. To track progress, the UC Health Pain Stewardship Committee reviews metrics on a monthly basis, including: total opioid solid doses prescribed, average morphine equivalent daily dose (MEDD) of opioid prescriptions, patients on ≥80 MEDD, patients on opioids and benzodiazepines, post-operative opioid prescribing by procedure type, naloxone prescriptions, prescription drug monitoring program checks, patients receiving treatment for OUD, with additional metrics evolving.

Adaptability: Pain Stewardship Programs are tailored to meet the individual needs of health systems employing evidence-based education and data driven recommendations. The UC Health PSC aims to serve as a model to other health care intuitions, providing a general structure for implementation of opioid-related quality improvement initiatives.

Significance: The UC Health PSC aims to improve management of acute and chronic pain, improve access to treatment for opioid use disorder, and reduce harm related to opioids within the community.

Pharmacogenomics/Pharmacogenetics

242 | 2021 Accomplishments and Future Perspectives of the ACCP Pharmacokinetics/Pharmacodynamics/Pharmacogenomics Practice and Research Network (PRN)

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Service or Program: The Pharmacokinetics/Pharmacodynamics (PKPD) Practice and Research Network (PRN) was established in 1977 and incorporated Pharmacogenomics (PG) into its name in 2011 to reflect increasing member interest in pharmacogenomics. The PKPDPG PRN is an active body of 271 clinicians, scientists, and trainees who contribute to the American College of Clinical Pharmacy through networking, educational programs, precision medicine initiatives, population-based analyses, and drug metabolism studies.

Justification/Documentation: To increase member engagement and understand member interests, a mixed-methods electronic survey was developed and disseminated to PRN members by the PRN Outreach Committee. Discrete data related to member demographics and contributions to clinical practice, service, teaching, and research were collected. Qualitative data describing member perspectives of current and emerging PK/PD/PG challenges were also evaluated.

Adaptability: The survey was administered from April to May 2021. The survey methods utilized may be adapted by other PRNs interested in understanding member activities and interests to better guide PRN resource planning and utilization related to conference programming and PRN resource development.

Significance: This is the first member survey deployed by the PKPDPG PRN. Complete responses for 90 (33%) members were included in the final analysis. 87% of respondents joined the PRN in the last decade. Most respondents completed/are undergoing residency training (60%) or have completed/are undergoing fellowship training (43%). Similarly, 43% reported completing/pursuing a graduate degree (Master's; other doctoral degree). 26% of respondents hold combined academic and clinical practice appointments, with the majority of academic appointments at a pharmacy school. Clinical practice settings spanned inpatient- (29%) and outpatient-based (28%) settings, primarily in the field of PG (42%). Challenges commonly cited by respondents from a PG perspective included economic issues (reimbursement for pharmacy-led services, testing costs), laboratory harmonization, electronic health record integration and clinical decision support. PK/PD issues identified included challenges in converting to Bayesian vancomycin dosing and developing aminoglycoside dosing protocols.

243 | Utilization of electronic health record patient portal to increase patient education avenues for pharmacogenomic results.

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Service or Program: Interpreting pharmacogenetic (PGx) results is often complex and may be difficult for patients to understand. At our institution, recommendations on currently actionable PGx results are relayed through the primary care provider for any possible medication adjustments. However, patients with non-actionable results historically received their results without contact from a healthcare provider. To provide closed loop communication and enhance patient understanding of results with all individuals receiving preemptive PGx, a templated message targeted at those with non-actionable results was created. This message includes a general description of the test results, an explanation of potential for future use of results, and links to videos describing PGx and medication response. The message was approved through standardized processes and governance structure. This service is in addition to our practice of full clinical review consult notes for all patients.

Justification/Documentation: Feedback from providers and patients was received suggesting individuals without current actionable PGx results were not always provided an explanation of their PGx results and implications for their medication regimen. This intervention also provides contact information for patients to discuss results and instructions for finding their genetic information in the patient portal of the electronic health record (EHR).

Adaptability: Templates allow a message to be sent efficiently from a patient result through the patient portal of our EHR. This service could be adapted so pharmacists can send messages for other laboratory results as well by only adjusting the templated message.

Significance: Improving documentation of clinical services, increasing coordination of care, and patient education are all standards of practice for clinical pharmacists. This efficient messaging system affords our team the ability to improve the care provided to our patients and increase their access to pharmacists to discuss their medication related questions. Full analysis of patient satisfaction is under way through utilization of patient satisfaction surveys.

244 | Clinical implementation of *G6PD* genotype to prevent drug-induced hemolytic anemia

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Service or Program: As part of the preemptive Clinical Pharmacogenomics Program at St. Jude Children's Research Hospital (St. Jude), gene/drug pairs with sufficient evidence for implementation are introduced into the electronic health record (EHR), generally utilizing Clinical Pharmacogenetics Implementation Consortium (CPIC) guidelines. Results are integrated into the EHR and coupled with clinical decision support (CDS). Clinical glucose-6-phosphate dehydrogenase (*G6PD*) genotype results were integrated into St. Jude's EHR in 2019, and CDS alerts for G6PD deficient patients were developed to guide pharmacotherapy.

Justification/Documentation: G6PD deficiency predisposes individuals to develop hemolytic anemia in the presence of oxidative stress when exposed to certain medications (e.g., rasburicase). Regulatory agencies worldwide warn against the use of certain medications in the setting of G6PD deficiency, but this information may be conflicting and the clinical evidence may be sparce. As of June 2021, 1,837 St. Jude patients were genotyped; 2% (n = 36) were G6PD deficient and should avoid certain medications due to the risk of hemolysis. CPIC's guideline for *G6PD*/rasburicase is currently being updated to include additional medications. The guideline update will classify medications as high, medium, or low-to-no risk based on a systematic review of the evidence and regulatory agency warnings.

Adaptability: St. Jude is one of many institutions worldwide that has adopted CPIC guidelines for clinical implementation. The CPIC guideline for *G6PD* will provide informatics resources, including a *G6PD* genotype to phenotype translation table, examples of interpretive consults and CDS language pertaining to *G6PD* and affected medications, as well as workflows for implementing *G6PD* genotype into the EHR that any institution can modify for its own use.

Significance: *G6PD*-guided medication therapy has the potential to prevent hemolytic anemia. St. Jude's clinical pharmacogenomics implementation program serves as a model for other institutions that are considering integrating *G6PD* genotype into the EHR to improve patient outcomes.

245 | Development of a Patient-Directed Educational Intervention to Promote Pharmacogenetics-Guided Prescribing

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Service or Program: We developed a patient-directed intervention to educate patients about their PGx information and to encourage them to share this information with prescribers. Patients within our health system who had received PGx testing following cardiac catheterization (*CYP2C19* testing to guide antiplatelet therapy) or kidney transplantation (*CYP2D6*, *CYP3A4*, and *CYP3A5* testing to guide analgesic and immunosuppressant therapy) were selected to receive the intervention. The intervention, delivered by mail via contracting with a commercial printer, consisted of the following: (1) a brochure to educate patients about PGx testing; and (2) a personalized letter and wallet card to share with prescribers that contained their genotype results along with a list of medications predicted to be affected by their results based on Clinical Pharmacogenetics Implementation Consortium recommendations. The intervention was initiated in November 2020 in patients undergoing cardiac catheterization and expanded in March 2021 to include patients undergoing kidney transplantation. To date, 298 patients have received the intervention.

Justification/Documentation: Pharmacogenetics (PGx) has the potential to enhance medication outcomes, but the clinical adoption of PGx remains limited. Directly engaging patients in the PGx-guided prescribing

process may overcome some barriers to adoption, including challenges in sharing patient PGx information across health systems.

Adaptability: We plan to expand the intervention to include other patients undergoing PGx testing within our health system, including those with psychiatric conditions and patients undergoing heart transplantation. We expect this intervention to be adaptable for use at other health systems.

Significance: We successfully implemented an intervention to educate patients about PGx and to involve them in PGx-guided prescribing of their medications. This intervention may enhance PGx adoption via patient-initiated sharing of PGx information with prescribers within our health system and beyond. Future directions of this project will include surveying patients to assess their acceptance of the intervention.

Substance Abuse/Toxicology

246 | Safe Implementation of a High-dose Insulin Protocol for Calcium Channel Blocker and Beta-blocker Overdose

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Service or Program: High-dose insulin therapy (HDI) is an effective, yet high-risk therapy, for management of calcium channel blocker and beta-blocker overdose. Our institution identified a critical need to implement a HDI protocol in response to patient safety events. A team of emergency department, intensive care unit, and toxicology pharmacists collaborated with multidisciplinary stakeholders to develop a HDI protocol. The protocol standardized dosing and monitoring and provided electronic order support. Multiple safety measures were implemented including standardized concentrated insulin and dextrose preparations, medication labeling and delivery requirements, medication pump changes, vascular access requirements, laboratory procedures, and clinical monitoring parameters. The HDI protocol positions pharmacists at the forefront of dosing and monitoring recommendations.

Justification/Documentation: Prior to protocol implementation, although HDI was used infrequently, it presented a high-risk situation due to complexities in monitoring and operational logistics. In addition, the regional poison center adjusted their guidelines to recommend HDI as first-line treatment.

Adaptability: After protocol implementation at a single center, a change in the electronic medical record expanded protocol availability to the enterprise exposing new safety concerns and complexities. Changes to the protocol are being reviewed to expand therapy to critical access hospitals and allow safe use during patient transport.

Significance: Since 2018, the protocol has been used in 16 patients across 4 health-system sites. Patients received insulin and dextrose for a median (IQR) duration of 33 (22,50) hours and 4 (3,6) days, respectively. Median maximum insulin dose was 8 (4,11.5) units/kg/hr. Four hypoglycemic events in 3 patients were reported, however none in the acute phase of therapy. There was 1 death and 9/15 (60%) of patients were weaned off vasopressors while on HDI. The protocol remains a vital component of effectively managing patients with calcium channel or beta blocker overdose in the ED and the ICU.

CASE REPORTS

Critical Care

388 | Case Report of Cefepime Induced Neurotoxicity Despite Renal Dose Adjustment Based on Cockroft-Gault Equation

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Introduction: Cefepime induced neurotoxicity (CIN) is becoming more recognized. Neurologic effects can manifest as a range of symptoms from confusion to non-convulsive status epilepticus. CIN is commonly associated with renal dysfunction, however there are reports of CIN in patients with normal renal function or renally dose-adjusted regimens. Few case reports of this kind have utilized a cefepime concentration in diagnosing CIN.

Case: A 42-year old female with a complex past medical history transferred to our facility with chief complaint of worsening shock and respiratory failure. The patient was diagnosed with diabetic ketoacidosis (DKA), acute kidney injury (AKI), and was hypernatremic. With the resolution of DKA, hypernatremia and AKI began to improve. As a result, cefepime was dose-adjusted for renal function using the Cockroft-Gault (CG) equation. Her hospital course was complicated by persistent altered mental status (AMS), preventing extubation. Cefepime was discontinued due to concern for CIN, and a concentration was obtained 13-hours after the last dose of an every-8-hour regimen which was elevated at 49 ug/mL. Two days following cefepime discontinuation, the patient's mental status improved and she was successfully extubated. The patient remained stable and was eventually discharged home.

Discussion: Our patient experienced persistent AMS while on cefepime, despite dose-adjustment for renal function based on the CG equation, highlighting the potential inaccuracies of renal function estimating equations in critically ill patients. Her cefepime concentration was well above the established thresholds for CIN. This is one of the few reports utilizing a cefepime concentration to diagnose CIN with renally dose-adjusted cefepime. Therapeutic drug monitoring (TDM) aided in diagnosis of CIN.

Conclusion: CIN should be part of a wider differential diagnosis for patients experiencing encephalopathy, even in the setting of normal renal function or dose adjusted for renal function. TDM may serve as an important clinical tool in diagnosing and managing CIN.

389 | Successful Use of Intravenous Beta-Blocker Therapy in Cardiogenic Shock Supported with Venoarterial Extracorporeal Membrane Oxygenation

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Introduction: Veno-Arterial extracorporeal membrane oxygenation (VA-ECMO) is a rescue intervention in patients with cardiogenic shock (CS). Tachycardia in CS might reduce the cardiac output (CO) by decreasing ventricular filling time. Nevertheless, heart rate (HR) control with agents that possess negative inotropy might decrease the cardiac output. Therefore, controlling the tachycardia in the setting of CS remains controversial.
Case: We herein describe four cases of patients presenting with myocardial infarction (MI) complicated with CS that required rescue VA-ECMO initiation. Tachycardia was present with HR ~130-140 beats per minute (bpm) after VA-ECMO initiation, and hence esmolol was infused continuously at a starting dose of 10-20 mcg/kg/min and titrated according to HR. With the use of esmolol to control the HR in the setting of CS supported with VA-ECMO, lactate cleared, echocardiographic parameters, including ejection fraction and left ventricle velocity time integral improved, allowing the four cases to be successfully decannulated from ECMO.
Discussion: The benefits of HR control in the setting of chronic heart failure through beta-blockers use are well-known and evident. However, the current clinical practice guidelines advice against the use of beta-blockers in the setting of CS or pre-shock as beta-blockers negative inotropy can decrease the cardiac output. Nevertheless, we reported successful use of short-acting beta-blockers possibly through the improvement of diastolic filling and prevention of subsequent arrhythmias in the complex scenario of severe tachycardia while supported with VA-ECMO.
Conclusion: Our report indicates that intravenous short-acting beta-blocker could be safely used in the complex scenario of severe tachycardia while supported with VA-ECMO. Future randomized studies may be required to support our conclusion.

390 | Evaluation of Heparin-Induced Thrombocytopenia in Severe COVID-19 (Case Series)

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Introduction: Thrombocytopenia is associated with severe coronavirus disease-2019 (COVID-19) with the reported incidence rate to be between 5-41.7%. Heparin-induced thrombocytopenia (HIT) is typically considered a minor contributor with low incidence of 0.2-3%. However, one study noted an 8% incidence of HIT in patients with severe COVID-19. Due to the potential higher risk of HIT and the baseline higher risk of thrombosis in severe COVID-19 infection, it is important to evaluate HIT prevalence in severe COVID-19 patients. We reviewed seven potential HIT cases.
Case: All seven patients with positive heparin-PF4 antibodies had severe acute respiratory distress syndrome. D-dimer was elevated in four. Median duration of heparin and/or low-molecular-weight heparin exposure was 16 days. In five cases, HIT diagnosis was made greater than 10 days post exposure. All patients had intermediate to high pretest probability for HIT. Three patients had confirmed thrombosis, and one experienced multiple clotted lines (despite negative imaging for thrombosis). Argatroban was initiated in all patients. Serotonin release assay (SRA) was obtained for two patients - one resulted positive. Only two patients survived to be discharged from the intensive care unit/hospital.
Discussion: HIT may be a larger contributor to thrombocytopenia in severe COVID-19 patients. When reviewing data from pre-COVID-19 years, the incidence rate of those screened for HIT ranged between 0-4.8%. During our study period, the incidence rate of those screened for HIT was 12.9%. 78% of those with positive antibodies had COVID-19. This potential increased incidence may be attributed to patient/disease specific factors or to increased doses of heparin treatment of possible thrombosis. Until it is further characterized, it is important to screen thrombocytopenic patients with severe COVID-19 for HIT.
Conclusion: True incidence of HIT in severe COVID-19 is unclear, but it may be an important contributor to thrombocytopenia that can affect patients' thrombosis risk and anticoagulation choice which merits further review.

Infectious Diseases

391 | Potential failure of vancomycin AUC/MIC dosing in an adult patient with purulent MRSA pericarditis and associated cardiac tamponade: a case report

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Introduction: Definitive management of purulent pericarditis due to methicillin resistant staphylococcus aureus (MRSA) with vancomycin has been scarcely reported in the literature. This case report describes the first documented utilization of AUC/MIC dosing of vancomycin in a patient with MRSA purulent pericarditis.
Case: A 57-year-old Caucasian male with a medical history of atrial fibrillation status-post ablation in 2017, hypertension, and venous

thromboembolism, presented with cardiac tamponade and pulmonary emboli. During admission, the patient developed worsening dyspnea and an echocardiogram showed a moderate - large pericardial effusion with signs of early tamponade physiology. Pericardiocentesis removed 600 mL of serosanguinous, straw yellow fluid which was cultured. Blood cultures revealed MRSA with a vancomycin MIC of 1; pericardial cultures also resulted positive for MRSA. Patient was then initiated on a 3-gram loading dose of vancomycin and was subsequently transitioned to AUC/MIC dosing at 1.5 g q 12 hours with an initial AUC of 415. MIC of repeat blood cultures varied between 1 and 2 throughout admission. After 8 days of persistent bacteremia, the patient was then transitioned to daptomycin and ceftaroline with blood culture resolution within 48 hours.

Discussion: Literature regarding treatment of MRSA purulent pericarditis is scarce. Guidelines recommend AUC/MIC vancomycin dosing in most patients with serious MRSA bacteremia. However, obtaining goal AUC/MIC targets for isolates with MICs of >1 is unlikely. No data is available to suggest what AUC/MIC can be obtained in the pericardial space. In this case report of a patient with variable vancomycin MIC results and persistent bacteremia, the decision was made to change antibiotic therapy with subsequent rapid culture clearance.

Conclusion: Further data on the use of AUC/MIC use in MRSA purulent pericarditis is prudent to provide appropriate therapy in these patients as mortality is high.

392 | Successful use of cefiderocol for a decubitus ulcer infected with carbapenem-resistant *Acinetobacter*: a case report

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Introduction: With the advent of increasing antimicrobial resistance, there is an imperative need for clinical experience with new antimicrobial agents to treat multi-drug resistance gram-negative pathogens such as *Acinetobacter sp*. Limited data is available on the use of cefiderocol for skin and soft tissue infections (SSTIs) attributed to difficult to treat gram-negative organisms. We describe the use of cefiderocol that was successfully used to treat an extensive decubitus ulcer infected with a carbapenem-resistant *Acinetobacter*.

Case: A 78 year-old female presented to the surgery service for debridement of a large stage IV ischio-sacral decubitus ulcer that had developed skin necrosis and subacute osteomyelitis. A wound culture grew multi-drug resistant *Acinetobacter spp*. on day 3 of hospitalization although it retained susceptibility to meropenem. Meropenem was continued along with serial debridements. On day 31 of hospitalization, wound culture grew *Acinetobacter spp*. that resistant to all agents tested and the patient was initiated on cefiderocol. No further surgical debridements were performed and local wound care was continued. Cefiderocol was discontinued on day 49 of hospitalization and no further *Acinetobacter spp*. was isolated.

Discussion: With its novel mechanism of action, cefiderocol is indicated for the treatment of complicated urinary tract infections and nosocomial pneumonia. Our case provides clinical experience with cefiderocol for an infection that has limited data – SSTIs caused by a carbapenem-resistant *Acinetobacter*. A recent prospective study noted higher mortality was observed with cefiderocol when used to treat serious carbapenem-resistance infections. In our case, the patient remained clinically stable throughout her course and thus the benefit of cefiderocol was decided to outweigh this concern.

Conclusion: Cefiderocol may be considered as an option for skin and soft tissue infections caused by carbapenem-resistant *Acinetobacter spp*. in clinically stable patients. Additional data are needed in this area to further elucidate the role of cefiderocol for this indication.

393 | *Legionella pneumophila* intraabdominal abscess post-laparoscopic adrenalectomy: a culture-confirmed case report

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Introduction: *Legionella pneumophila*, an aerobic, gram negative bacilli, remains a common cause of community-acquired pneumonia. Although extrapulmonary *L. pneumophila* infections are uncommon, cellulitis, endocarditis, splenic rupture, and myositis complicated by *Legionella* pneumonia have been reported. Thus, we describe a case of a patient who had *L. pneumophilia* intra-abdominal abscess post-adrenalectomy.

Case: A morbidly obese 43-year-old Caucasian male with psoriasis was admitted for a laparoscopic adrenalectomy. On post-op day (POD) 2, the patient developed septic shock due to gastric perforation, and fluconazole 400mg IV q24h, linezolid 600mg IV q12h, and piperacillin/tazobactam 4.5g IV q8h were empirically initiated. The patient underwent abdominal lavages and closure. On POD 6, the patient developed an abdominal wall abscess in the left lower quadrant. Patient underwent incision and drainage, and the aspirated fluid was cultured. Gram-negative bacilli failed to grow on routine culture media, and *Legionella pneumophila* were detected by molecular diagnostic. The patient's therapy was de-escalated to doxycycline 100mg PO q12h for 7 days. Patient completed the regimen and infection successfully resolved without any adverse reactions.

Discussion: Diagnosis of extrapulmonary *Legionella* infections requires multidisciplinary efforts from clinicians and microbiologists as *Legionella* species require special media and are very slow growing. Fatalities due to *Legionella* has been reported in the elderly, immunocompromised hosts, and patients with underlying renal disease. A major risk factor for mortality in *Legionella* infections is inadequate

antimicrobial therapy. Optimal antimicrobial therapies for atypical pathogens include macrolides, tetracyclines, and fluoroquinolones. Typical duration of treatment ranges from 7-14 days; disseminated *Legionella* infection may require more than 14 days depending on patient clinical status.

Conclusion: Although extrapulmonary *L. pneumophila* infections are uncommon, clinicians should be cognizant of *L. pneumophila* to avoid delay of adequate antimicrobial therapy. Prompt identification of *L. pneumophila* remains a challenge due to the need for specialized culture media or molecular testing.

394 | *Campylobacter gracilis* bacteremia secondary to colonic abscess: a case report

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Introduction: *Campylobacter gracilis*, previously *Bacteroides gracilis*, is an anaerobic, non-motile, Gram-negative bacilli which is commonly found in the oral cavity. *C. gracilis* has been implicated in a wide variety of periodontal diseases, but extraoral infections are rarely reported. Thus, we describe a case of *C. gracilis* bacteremia (BSI) secondary to sigmoid colon abscess.

Case: A 79-year-old Caucasian male on warfarin for atrial fibrillation presented to the emergency department with bilateral lower extremity ischemia due to arterial occlusive disease, hemorrhagic shock secondary to severe coagulopathy (INR > 10), and an undiagnosed liver mass. Vancomycin and meropenem were empirically initiated when the patient clinically deteriorated. The patient was subsequently diagnosed with sigmoid colon abscess. On Day 3, blood cultures (two sets) grew *C. gracilis*. The patient was hemodynamically unstable for surgical interventions; instead, he was managed with meropenem 1g IV q8h. On Day 5 of therapy, the patient improved clinically, meropenem was switched to piperacillin/tazobactam 3.375g IV q8h. After treatment for a total of 14 days of antibiotic, the abscess and bacteremia resolved and patient was transferred to a rehabilitation facility.

Discussion: *C. gracilis* was reclassified in 1995 as the genotypic and phenotypic characteristics closely related to *Campylobacter spp*. *Campylobacter* BSI has been reported with fatal outcomes in the elderly, immunocompromised hosts, and patients with underlying liver disease. *C. jejuni* and *C. fetus* have been the predominant species isolated from *Campylobacter* BSI. A major risk factor for mortality among *Campylobacter* BSI patients is receiving 3rd generation cephalosporins with various resistance profiles. An optimal antimicrobial treatment for *C. gracilis* has yet to be determined.

Conclusion: *Campylobacter gracilis* infections other than periodontal disease remains rare. A paradigmatic antimicrobial treatment for *C. gracilis* remains to be established. Due to conflicting reports of resistance profiles, further investigations are warranted.

395 | Eravacycline Infusion-Related Hypoesthesia: A Case Report

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Introduction: Eravacycline (ERV) is often used for resistant gram-negative and nontuberculous Mycobacterium (NTM) infections and infusion site reactions are a potential adverse reaction. We report a case of severe hypoesthesia secondary to ERV leading to drug discontinuation.

Case: A 74-year-old man presented with dyspnea, shortness of breath, and hemoptysis after being treated previously for a community-acquired pneumonia. Based on respiratory cultures from several weeks prior to index hospitalization, he was diagnosed with *Mycobacterium chelonae* pneumonia. On hospital day (HD) 2, the infectious diseases consult team, guided by susceptibilities, initiated a regimen of azithromycin, levofloxacin, and eravacycline 80mg (1mg/kg) IV every 12 hours infused over 1 hour in 250 mL of normal saline. Approximately 25 minutes after the ERV infusion began, the patient reported a tingling and numbness in his fingers, hands, and mouth, with shooting pain in his head. Symptoms resolved with the cessation of the ERV infusion. On HD 3, the same ERV dose and volume was administered with an extended infusion time of 2 hours. The patient experienced the same reaction after 58 minutes, ceasing shortly after stopping the infusion. The ERV was subsequently discontinued

Discussion: The Naranjo adverse drug reaction probability scale score was 9, indicating a definite reaction. A review of the FDA Adverse Event Reporting System through March of 2021 shows 22 ERV-associated events. Among those, 18% appear related to ERV infusions, including phlebitis and extravasation. Published results from Phase III clinical trials did not document any hypoesthesia or numbness/tingling. It is unknown if there is a correlation between concentration, dose, or infusion time and associated reactions.

Conclusion: This is the only known reported case of severe hypoesthesia secondary to ERV infusion leading to drug discontinuation. More data are needed to determine effective mitigation strategies, such as increased infusion time or dilution of the IV solution.

Neurology

396 | Acute Disseminated Encephalomyelitis Secondary to Rubeola Infection Masquerading as New Onset Multiple Sclerosis in an Elderly Woman: Case Report

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Introduction: Following an alarming surge of measles cases from declining immunization rates, it is important that clinicians recognize measles as a possible cause of otherwise unexplained symptoms, especially in patients with uncertain immunological status.
Case: Over a 4-month period, a 76-year-old woman with a history of treated breast cancer experienced rapidly progressive and fluctuating focal weakness and numbness primarily affecting her lower extremities. Initially complaining of vague gastrointestinal symptoms upon returning from an extended stay in Florida, she was found to have active demyelinating lesions of her brain, cervical, and thoracic cord on MRI. This was initially thought to be new onset multiple sclerosis. CSF analysis showed critically high protein and, upon repeat analysis, positive rubeola and herpes IgM, which were elevated despite high dose steroid infusions and a steroid taper. Alternative diagnoses were ruled out, including: other infectious etiologies; endocrine/metabolic disorders; drug toxicity; malignancy; paraneoplastic disorders; transverse myelitis; multifocal cord infarction; stroke; seizure; and others. Repeat images displayed improvement of lesions and the patient was discharged to acute rehab with close neurological follow-up without steroids.
Discussion: Acute disseminated encephalomyelitis is more likely in children, though cases are rare. This case of disseminated measles underscores the critical need for continued vaccination of at-risk populations, especially in those who are elderly or immunocompromised. Previous titers for immunity were not known, a potential limitation. Recent evidence demonstrates measles' ability to cause immune system "amnesia," potentially explaining this patient's concomitant herpes. As COVID-19 cases continue to present, recent evidence has linked the protective effect of the MMR vaccine against COVID-19's spread and severity.
Conclusion: It is imperative that measles and other severe, preventable diseases continue to be closely monitored. Clinicians should assess benefits of proactively measuring rubeola titers in patients of all ages or in those who have previously received extensive immunosuppressive therapy.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

397 | Managing the drug-interaction with apixaban and primidone: A case report

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Introduction: Apixaban, a direct oral anticoagulant, is primarily metabolized by CYP3A4 and is a substrate of P-glycoprotein. Primidone, a barbiturate, is a moderate to strong CYP3A4 inducer. Due to the shared metabolic pathway, along with the prolonged half-life and enzyme inducing effects of primidone's active metabolite phenobarbital being up to 150 hours, the drug interaction between these agents is complex. Limited evidence and clear guidance are lacking for the management of this interaction.
Case: A 65-year old male presented with weakness and falls. His past medical history was significant for tremor for which he took primidone. On hospital day 5, apixaban was initiated for an acute deep vein thrombosis (DVT). A drug interaction was noted with apixaban and primidone; alternative anticoagulation options were explored. The treatment team tapered primidone over 2-days while providing a 2-week bridge with enoxaparin to allow for clearance of primidone and its metabolites. Apixaban was then initiated at 5 mg twice daily for the indefinite treatment of his DVT. On day 45, he was discharged with no evidence of DVT recurrence, bleeding events or worsening tremor.
Discussion: The apixaban package insert recommends to avoid the concomitant use of P-glycoprotein and strong CYP3A4 inducers due to a decrease in apixaban serum concentrations. No guidance is provided for moderate CYP3A4 inducers. The American College of Cardiology notes it may be reasonable to avoid apixaban with enzyme inducers, such as primidone. While no data is available on the clinical outcomes associated with the interaction of primidone and apixaban, one case report describes apixaban failure with concomitant phenobarbital. This case generates evidence to support a strategy for the successful avoidance of a potentially significant drug interaction with apixaban and primidone.
Conclusion: Additional evidence is needed to better manage this specific drug-drug interaction, particularly given the limited ability to monitor apixaban concentrations or anti-Xa levels.

Substance Abuse/Toxicology

398 | False-positive cocaine UDS with indeterminate confirmation in inpatient psychiatry: A case report

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Introduction: Immunoassay urine drug screens (UDS) are used widely in healthcare. Pharmacists are expected to interpret UDS results and advise the healthcare team on potential deviations. One axiom repeated in medical literature and anecdotally is the absence of false positives for cocaine.
Case: A 45-year-old female with history of substance use disorder presented to the inpatient psychiatry unit with UDS positive for cannabinoids, opiates, and cocaine. Because post-discharge disposition was dependent on a negative UDS, a repeat UDS was ordered and returned positive for cocaine on both hospital days 6 and 7. The specimen was then sent for a cocaine confirmation test, which resulted as negative for cocaine and indeterminate for benzoylecgonine due presence of an unknown interferant. On hospital day 8, the UDS was negative for all substances. While the patient did endorse recent cocaine use prior to admission, various factors while inpatient would have prevented further use and methods of contamination were ruled out.
Discussion: Substances previously reported to cause a false-positive UDS for cocaine were not reported in our patient, and the timing of the UDS would make a true-positive implausible. Although the etiology was ultimately undetermined, our findings are consistent with a false-positive UDS for cocaine. Indeterminate lab assay results are not uncommon, but there are limited reports of substances that interfere with cocaine detection. We hypothesize the patient's concomitant medications may have interfered due to biochemical similarities and existing literature. A repeat assay under identical conditions would be required to confirm this.
Conclusion: The axiom of a cocaine-positive UDS having minimal likelihood of a false-positive may be incorrect. This brings into question the accuracy and practical utility of the UDS as a single data point. Further studies are needed to identify substances capable of producing false positives and assay interference with cocaine and benzoylecgonine.

ENCORE PRESENTATIONS

Cardiovascular

399E | Evaluations of Daily Activity Duration in Patients with Heart Failure during the COVID-19 Pandemic

Hua Ling, Pharm.D., MS, BCPS, BCCP, AACC, CLS[1] and Ugochukwu Egolum, MD, FACC[2]
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Presented at the ACC's 70th Annual Scientific Session, May 15-17, 2021 in Atlanta, Georgia

400E | The longer-term efficacy and safety of evinacumab in patients with homozygous familial hypercholesterolemia

Frederick J. Raal, MD, Ph.D.[1], Robert S. Rosenson, MD[2], Laurens F. Reeskamp, MD[3], G. Kees Hovingh, MD[3], John J.P. Kastelein, MD, Ph.D.[3], Paolo Rubba, MD[4], *Shazia Ali, Pharm.D.*[5], Poulabi Banerjee, Ph. D.[5], Kuo-Chen Chan, Ph.D.[5], Nagwa Khilla, MS[5], Robert Pordy, MD[5], Yi Zhang, Ph.D.[5] and Daniel Gaudet, MD, Ph.D.[6]
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Presented at the American Heart Association Congress, Virtual, November 13–17, 2020

Critical Care

402E | Nephrotoxicity with Vancomycin in Combination with Piperacillin-Tazobactam or Cefepime/Meropenem

Mitchell Buckley, Pharm.D., FASHP, FCCM, FCCP, BCCCP[1], Ivan Komerdelj, Pharm.D.[2], Paul D'Alessio, Pharm.D.[3], Pooja Rangan, MBBS, MPH[4], Sumit K. Agarwal, MBBS, MBA[5], Delia Ziadat, Pharm. D.[4], Melanie Yerondopoulos, Pharm.D.[4], Emir Kobic, Pharm.D.[4] and Sandra Kane-Gill, Pharm.D., MS, FCCP, FCCM[6]
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403E | Impact of pharmacist monitoring of serum triglycerides for critically ill patients receiving propofol

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Presented at the American Society of Health System Pharmacists Midyear Clinical Meeting. Virtual; December 7, 2020

Hematology/Anticoagulation

404E | Real-world clinical outcomes among US veterans with oral factor Xa inhibitor-related major bleeding treated with andexanet alfa or 4-factor prothrombin complex concentrate

S. Scott Sutton, Pharm.D.[1], Joe Magagnoli, MS[1], Tammy H. Cummings, Ph.D., MSPH[1], *Theresa Dettling, BSN, JD, MPH*[2] and James Hardin, Ph.D.[3]

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Presented at the 39th Annual Emergencies in Medicine (EIM) Conference; Park City, UT; March 7-12, 2021

Herbal/Complementary Medicine

405E | Evaluation of solvent and temperature effect on green accelerated solvent extraction (ASE) and UHPLC quantification of phenolics in fresh olive fruit(Olea europaea)

Mohammed Alyousef, Pharm.D.; Imam abdulrahman bin faisal university, Dammam city, Saudi Arabia

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Presented at SIPHA conference (Saudi International Pharmaceutical Sciences), kingdom of Saudi Arabia, FEB 9-11, 2021.

HIV/AIDS

406E | Switching to bictegravir/emtricitabine/tenofovir alafenamide (B/F/TAF) in adults aged 65 years or older: Week 96 results from an international, phase 3b, open-label trial

Franco Maggiolo, MD[1], Giuliano Rizzardini, MD[2], Jean-Michel Molina, MD[3], Federico Pulido, MD[4], Stephane DeWit, MD[5], Linos Vanderkerckove, MD[6], Juan Berenguer, MD[7], Michelle D'Antoni-Brogan, Ph.D.[8], Christiana Blair, M.S.[9], Susan Chuck, Pharm.D.[8], Hal Martin, MD, MPH[8], *Ian McNicholl, Pharm.D.*[10], Richard Haubrich, MD[10] and Joel Gallant, MD[10]

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Presented at IAS 2021 July 18-21

407E | Potent antiviral activity of lenacapavir in phase 2/3 in heavily ART-experienced PWH

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Presented at Virtual CROI 2021. Conference on Retroviruses and opportunistic infections, March 6-10, 2021

408E | DISCOVER: No effect of Hormones on F/TAF or F/TDF PK, Efficacy & Safety in Transwomen

Michelle Cespedes, MD, MS[1], Maria Prins, Ph.D.[2], Deqing Xiao, Ph.D.[3], Pamela Wong, MPH[4], Jason Hindman, Pharm.D., MBA[5], Christoph C. Carter, MD, Ph.D.[5], Moupali Das, MD[5], Peter Ruane, MD[6], John Phoenix, APRN[7], *Jarrod Coffey, Pharm.D.*[8] and Jason Halperin, MD[9]

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Presented at Virtual CROI 2020, Conference on Retroviruses and opportunistic infections, March 8-11, 2020

409E | Safety and Efficacy of F/TAF and F/TDF for PrEP in DISCOVER Participants Taking F/TDF for PrEP at Baseline

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Presented at International AIDS Conference 2020, Virtual, July 6-10

Infectious Diseases

410E | Impact of Beta-Lactam Allergy Assessment on Preoperative Antibiotic Selection

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Presented at the Making a Difference in Infectious Diseases, Virtual Conference, May 20-22, 2021

411E | Current State of Infectious Diseases Pharmacist OPAT/COpAT Practice in the United States

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Presented at IDWeek 2021 (virtual meeting - Sept 29-Oct 3, 2021)

412E | Analysis of Safety from STRIVE Phase 2 Trial of Rezafungin Treatment of Candidemia and/or Invasive Candidiasis: Assessment of Adverse Events and Laboratory Values

George Thompson III, MD[1], Alex Soriano, MD[2], Patrick Honore, MD, Ph.D.[3], Juan Pablo Horcajada, MD, Ph.D.[4], Anita Das, Ph.D.[5], *Taylor Sandison, MD, MPH*[6] and Peter Pappas, MD[7]
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Presented at the European Congress of Clinical Microbiology & Infectious Diseases of the European Society of Clinical Microbiology and Infectious Diseases, Virtual, July 9-12, 2021

413E | Analysis of Efficacy from STRIVE Phase 2 Trial of Rezafungin Treatment of Candidemia and/or Invasive Candidiasis: Outcomes During Initial Days of Treatment

Alex Soriano, MD[1], George Thompson III, MD[2], Jose Vazquez, MD[3], Paloma Merino-Amador, MD[4], Anita Das, Ph.D.[5], *Taylor Sandison, MD, MPH*[6] and Peter Pappas, MD[7]
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Presented at the European Congress of Clinical Microbiology & Infectious Diseases of the European Society of Clinical Microbiology and Infectious Diseases, Virtual, July 9-12, 2021

414E | Efficacy and Safety By Renal Function in the Phase 2 STRIVE Trial of Rezafungin in Treatment of Candidemia and Invasive Candidiasis

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Presented at the European Congress of Clinical Microbiology & Infectious Diseases of the European Society of Clinical Microbiology and Infectious Diseases, Virtual, July 9-12, 2021

415E | Does calculation method matter for targeting vancomycin AUC?

Jack Chang, Pharm.D.[1], Dhara Patel, Pharm.D. Candidate[1], Kimberly Claeys, Pharm.D., BCPS[2], Marc H. Scheetz, Pharm.D., MSc, FCCP, BCPS-AQ ID[3] and Emily Heil, Pharm.D., BCPS AQ-ID AAHIVP[4]
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Presented at IDWeek 2021, September 28- October 2, 2021 (virtually)

Medication Safety

416E | Effect of multiple central nervous system active medications on fall risk in patients 45-85 years of age

Jeffrey Mikolay Jr., Pharm.D., BCPS[1], Shawn Staples, Pharm.D. Candidate 2021[2], Mariann Churchwell, Pharm.D., BCPS, FCCP[2] and *Julie Murphy, Pharm.D., FASHP, FCCP, BCPS*[2]
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Presented at the 2020 American Society of Health-System Pharmacists Midyear Clinical Meeting, Virtual, December 6-10, 2020

Neurology

417E | Cumulative Plasma Exposure, Not Singular Concentrations, Yields a Best Correlation for Brivaracetam, Levetiracetam to Photoparoxysmal Abolition in Photosensitive Epilepsy: Results of a Randomized, Double-blind, Crossover Study

Ronald Reed, BS Pharm, Pharm.D., FCCP, FAES[1], William Rosenfeld, MD, FAES[2], Susan Lippmann, MD, FAES[2], MJC (Rene) Eijkemans, Ph. D.[3] and Dorothee Kasteleijn- Nolst Trenite, MD, Ph.D., MPH[4]
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Presented at American Epilepsy Society Annual Meeting (Virtual), December 4th–8th, 2020

Nutrition

418E | Iodine Deficiency in the PN dependent pediatric patient: A case study.

Hannah Heredia, MS, RD[1] and *Courtney Wood, Pharm.D.*[2]
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419E | Gastric Feeding Intolerance in Critically Ill Patients During Sustained Pharmacologic Neuromuscular Blockad

Catherine Corley, Pharm.D.[1], Whitney Holmes, Pharm.D.[1], Dina Filiberto, M.D.[2], Gayle Minard, M.D.[2] and *Roland Dickerson, Pharm.D.*[3]
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Presented virtually at the ASPEN (American Society for Parenteral and Enteral Nutrition) 2021 Nutrition Science & Practice Conference. March 22, 2021. Published in JPEN Journal of Parenteral and Enteral Nutrition.2021:45(Suppl 1):S161-S163

420E | Predictability of nitrogen balance for critically ill patients with severe traumatic injuries

Roland Dickerson, Pharm.D.[1], Edward Van Matre, Pharm.D., MS[2], Dina Filiberto, M.D.[3], Peter Fischer, MD[3] and Gayle Minard, M.D.[3]
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Presented virtually at the ASPEN (American Society for Parenteral and Enteral Nutrition) 2021 Nutrition Science & Practice Conference. March 22, 2021 JPEN Journal of Parenteral and Enteral Nutrition.2021:45 (Suppl 1):S152-S155

Oncology

421E | Management of Select Adverse Events With Capmatinib: Institutional Experiences From the GEOMETRY mono-1 Trial

Kelly Goodwin, NP[1], *Blanca Ledezma, MSN, NP*[2], Rebecca S. Heist, MD[3] and Edward B. Garon, MD, MS[4]
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Presented at the International Association for the Study of Lung Cancer - 2020 North America Conference on Lung Cancer, Virtual, October 16-17, 2020

Other

422E | What affects pharmacy students' likelihood of reporting peers' academic dishonesty?

Myo-Kyoung Kim, Pharm.D., BCPS[1], Rachelle Hackett, Ph.D.[2], Miki Park, Ph.D.[1] and Justin Low, Ph.D.[2]
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Presented at American College of Clinical Pharmacology Virtual Annual Meeting (Sep 13-17)

423E | **Peer-reporting of academic dishonesty in classroom and online examinations**

Myo-Kyoung Kim, Pharm.D., BCPS[1], Rachelle Hackett, Ph.D.[2], Miki Park, Ph.D.[1] and Justin Low, Ph.D.[2]
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Presented at American Association of College of Pharmacy Virtual Pharmacy Education 2021 Meeting

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

424E | **Evaluation of Monoclonal Antibody and Immune Globulin Administration with Therapeutic Plasma Exchange**

Lauren Breite, Pharm.D., BCPS[1], Margaret Hastings, MD[2], Katherine March, Pharm.D., BCPS[1] and Joanna Hudson, Pharm.D., BCPS, FASN, FCCP[1]
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Presented at the Spring Clinical Meeting of the National Kidney Foundation, virtual meeting, April 6-10, 2021

Pulmonary

425E | **Physicochemical Stability and Compatibility of Long-acting Muscarinic Antagonist Revefenacin Inhalation Solution and Inhaled Corticosteroid Budesonide Inhalation Suspension**

Janny Zhang, MS[1], Claudine Ooi, MS[2], *Lauren Cochran, Pharm.D., BCPS*[2] and Kenley Ngim, Ph.D.[2]
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Presented at ATS 2021, Virtual, May 14-19, 2021

426E | **Improvements in Patient-Reported Outcomes With Revefenacin for Nebulization in Women vs Men With Moderate to Very Severe Chronic Obstructive Pulmonary Disease (COPD): Subgroup Analyses From Phase 3 Clinical Trials**

Gary T. Ferguson, MD[1], Gregory Feldman, MD[2], Krishna K. Pudi, MD[3], David A. Lombardi, Ph.D.[4], Jill A. Ohar, MD[5] and *Karmon Johnson, Pharm.D.*[6]
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SYSTEMATIC REVIEWS/META-ANALYSIS

Cardiovascular

427 | **Comparing Inappropriately Low Dose versus Standard Dose of Direct Oral Anticoagulants in Patients with Atrial Fibrillation: A Meta-analysis**

Kazuhiko Kido, Pharm.D., M.S.[1], Masayuki Hashiguchi, Ph.D.[2], Mikiko Shimizu, Ph.D.[3] and Tsuyoshi Shiga, M.D., Ph.D.[4]
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Background: The appropriateness of direct oral anticoagulant (DOAC) dosing has been the issue in the real-world setting and inappropriately lower off-label DOAC dose may not be as effective or safe as the standard dose in patients with atrial fibrillation (AF). Multiple real-world studies compared the inappropriately lower DOAC dose *versus* the standard dose but their main findings were contradictory.
Methods: A meta-analysis was performed to compare the efficacy and safety of the inappropriately lower DOAC dose with the standard DOAC dose in patients with AF. Database searches through February 10, 2021 were performed using the Cochrane Library, Google Scholar, and MEDLINE. The primary efficacy outcome was stroke or systemic embolism and the primary safety outcome was major bleeding. The secondary outcome was all-cause mortality.
Results: A total of 14 studies were included in this meta-analysis. It revealed that the inappropriately lower DOAC dose was significantly associated with higher event rate of stroke or systemic embolism compared to the DOAC standard dose (OR 1.22; 95% CI: 1.01-1.48; p=0.04; $I^2 = 70\%$). There was no significant difference in the major bleeding event rate between these groups (OR 1.04; 95% CI: 0.94-1.15; p=0.43; $I^2 = 15\%$).
Discussion: Although this is the first meta-analysis to address the effect of the DOAC inappropriately lower dose and it included large number of patients analyzed in this analysis, multiple limitations exist in this meta-analysis. First, the included studies were all observational studies. Second, severe heterogeneity for all-cause mortality and moderate heterogeneity for stroke or SE were detected among the included studies. The inappropriately lower off-label DOAC dosing should be avoided to optimize DOAC effectiveness in patients with atrial fibrillation.
Other: No funding was received for this project. Dr. Shiga is a member of the speakers' bureaus for Bristol-Myers Squibb. Other authors have nothing to disclose.

428 | Meta-Analysis of Clinical Outcomes of PCSK9 Modulators in Patients with Established ASCVD

Azita H. Talasaz, Pharm.D., Ph.D.[1], Ai-Chen (Jane) Ho, Pharm.D.[2], Fawzia Bhatty, Pharm.D.[3], Rachel Koenig, MA, MLS[4], Dave Dixon, Pharm.D.[5], William Baker, Pharm.D., FCCP, FACC, FAHA[6] and Benjamin Van Tassell, Pharm.D.[7]

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Background: The advent of monoclonal antibodies targeting proprotein convertase subtilisin/kexin type 9 (PCSK9) ushered in a new era of dyslipidemia pharmacotherapy. The first two Food and Drug Administration approved antibodies (evolocumab, alirocumab) provided significant reductions in atherogenic lipids and a reduced risk of atherosclerotic cardiovascular disease (ASCVD) events. More recently, phase 3 trials of inclisiran–a small interfering RNA-based agent targeting PCSK9–reported similar lipid lowering effects and preliminary evidence of ASCVD risk reduction, although significant questions remain regarding the extent of benefits across cardiovascular outcomes.

Methods: We conducted a systematic review and meta-analysis (random effects model) of the available data on lipid lowering, ASCVD events, and safety of pharmacologic agents targeting PCSK9. We searched PubMed/Medline, Embase, and the Cochrane CENTRAL for randomized clinical trials of at least 1 year of duration that reported ASCVD event rates (updated May 5, 2021).

Results: We observed a significant and consistent reduction in low-density lipoprotein cholesterol (LDL-C) across all agents (-52%, [95%CI: -61%, -41%]). Despite the impressive reduction in LDL-C, the effects on mortality [RR (95%CI): 0.86 (0.62-1.19)], cardiovascular death (CVD) [RR (95%CI): 0.95 [0.82-1.09]), myocardial infarction (MI) [RR (95%CI) 0.75 (0.55-1.03)], and stroke [RR 0.79 (95%CI): 0.79 (0.62-1.01)] remained inconclusive. However, we observed a consistent reduction in the composite outcomes of MI, stroke, and CVD [RR (95%CI): 0.80 (0.73-0.87)] and MI, stroke, unstable angina (requiring revascularization), and CVD [RR (95%CI): 0.85 (0.74-0.97)]. In terms of safety outcomes, there was not a significant difference in severe adverse events, new onset diabetes, or neurocognitive disorders. Meanwhile, injection site reaction was more frequent in patients received these agents compared to placebo [RR 2.11 (95%CI): 1.26-3.54].

Discussion: These findings suggest a class effect for agents targeting PCSK9 along with a clear need for evaluation of longer-term follow-up to truly determine their impact on cardiovascular outcomes.

Other: none.

Drug Information

429 | A systematic literature review of the safety and efficacy of solriamfetol for the treatment of excessive daytime sleepiness in patients with narcolepsy or obstructive sleep apnea

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Background: Excessive daytime sleepiness (EDS) is associated with an increase in workplace and motor vehicle accidents, and current treatment options are limited. The purpose of this research was to assess the safety and efficacy of solriamfetol for the treatment of EDS in patients with narcolepsy or obstructive sleep apnea (OSA).

Methods: A literature search was conducted using PubMed. Any randomized or clinical trials that looked at the safety and efficacy of solriamfetol in narcolepsy or OSA, published in the last 10 years, were considered for inclusion. Bias was minimized by analyzing validity and reliability of each study.

Results: Seven articles were selected for inclusion due to their design. Five articles were utilized to identify efficacy (n= 935). Measurements of efficacy were determined using the Epworth Sleepiness Scale (ESS), Maintenance of Wakefulness Test (MWT) and Patient Global Impression of Change (PGI-C). Six studies were utilized for evidence of safety (n=967). Solriamfetol showed a statistically significant decrease on the ESS when compared to placebo (-6.90 vs -2.44, $p<0.0001$). All doses, besides 75 mg in patients with narcolepsy (+4.7 min vs +2.1 min, $p=0.1595$), showed a significant increase on the MWT when compared to placebo (+9.96 min vs +1.34 min, $p<0.0001$), and all doses besides 37.5 mg (55% vs 49.1%, $p=0.4447$), showed a statistically significant difference from placebo on the PGI-C (82.13% vs 42.88%, $p<0.0001$). Common adverse effects included headache, nausea, and insomnia. No serious adverse effects were deemed to be related to solriamfetol.

Discussion: Solriamfetol should be considered a safe and effective treatment option for patients with EDS. A limitation of this study is that a minimal number of randomized control trials have been conducted about solriamfetol which proves the importance of completing research about this topic.

Other: The researchers received no funding, have no conflicts of interest, registration number, or registry name for this research.

Endocrinology

430 | Frequency of acute pancreatitis associated with glucagon-like peptide-1 use: a systematic review

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Background: Investigators reviewed evidence for incidence of acute pancreatitis with GLP-1s in patients with type 2 diabetes mellitus (T2DM) compared to standard care. Guidelines recommend against GLP-1 use in patients with acute pancreatitis history despite inconclusive evidence demonstrating increased risk.

Methods: Literature searches were performed per PRISMA protocol. EMBASE® and PubMed databases were searched for clinical trials reporting measurement of pancreatitis in humans with T2DM exposed to GLP-1 therapy. Only full papers available in English of randomized, comparator trials with duration of at least 12 weeks and incidence of acute pancreatitis as a defined outcome were included. Eligible interventions were GLP-1 agents; comparators could be placebo, active comparator, or the same intervention at a different dose.

Each article identified was screened by two primary reviewers for inclusion, initially using title and abstract, and subsequently full text review. A second two-reviewer-set independently evaluated each article for inclusion. Discrepancies from independent reviewers were resolved by a fifth reviewer. Duplicate and irrelevant articles were excluded in this stage.

Results: Literature search identified 211 unique references with 83 studies meeting inclusion criteria. A total of 93,196 patients were included, 53,252 (57%) in GLP-1 groups and 39,944 (43%) in comparator groups. Included primary literature was analyzed with descriptive statistics. Studies showed low overall incidence of acute pancreatitis in both groups with no statistical difference identified (GLP-1s - 144 events (0.27%); comparator - 92 events (0.23%)).

Discussion: Strengths are inclusion of a breadth of data sources unlike meta-analysis reviewing pancreatitis incidence in narrow trial types or populations.

Incidence in individual trials varied, with most incidences of acute pancreatitis differing between GLP-1 and comparators groups by less than two occurrences. Interpretation suggests that GLP-1 therapy does not increase risk for acute pancreatitis.

Other: No conflicts of interest nor outside funding were applicable to this review. The review is not currently registered.

431 | A systematic review evaluating the difference in efficacy of SGLT2-inhibitors in patients with higher vs. lower baseline A1c levels for the treatment of uncontrolled type 2 diabetes

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Background: Sodium-glucose cotransporter type 2 inhibitors (SGLT2i) have a glucose-dependent mechanism of action that protects against hypoglycemia. The published efficacy of these agents may be underestimated at ~0.5-1% due to a lower mean baseline A1c of the study populations. The objective of this systematic review is to compare the efficacy of SGLT2i in adult patients with type 2 diabetes who have higher vs. lower A1c levels at baseline.

Methods: Records were identified using PubMed, Embase, and ClinicalTrials.gov. Eligibility criteria for inclusion included randomized controlled trials which evaluated a primary outcome of mean change in A1c from baseline after addition of an FDA-approved SGLT2i for a duration of at least 12 weeks with results stratified by baseline A1c. Risk of bias was assessed using the Cochrane Risk of Bias Tool.

Results: After the database search on September 1, 2020, 2892 records were assessed for eligibility. Eighteen studies with ranges of 80-769 participants in the SGLT2i treatment arm(s) were included in the qualitative synthesis. All showed a pattern of greater changes in A1c after treatment with FDA-approved doses of SGLT2i in those with higher baseline A1c levels. Sixteen studies that had a subgroup with baseline A1c ≥8.5% showed mean changes in A1c > 1%. Six studies with a mean A1c at baseline ≥10% showed a mean change in A1C > 1.5%, with majority having a mean change in A1c > 2%

Discussion: The strength of this systematic review is that the majority of studies were large and well-designed. Limitations include the heterogeneity in the studies in the type of antihyperglycemic background therapy permitted. Prior to use of SGLT2i, consideration should include the expected efficacy of SGLT2i may be higher in those with higher baseline A1c levels.

Other: The authors have declared that no conflicts of interests exist and received no specific funding for this work.

Hematology/Anticoagulation

432 | Comparison of 3-Factor versus 4-Factor Prothrombin Complex Concentrate for Emergent Warfarin Reversal: A Systematic Review and Meta-Analysis

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Background: Patients requiring emergent warfarin reversal (EWR) have been prescribed three-factor prothrombin complex concentrate (PCC3) or four-factor prothrombin complex concentrate (PCC4). We conducted a systematic review (SR) and meta-analysis (MA) of studies directly comparing PCC3 and PCC4. The primary objective was to determine the effectiveness of achieving the study-defined target INR goal after PCC3 or PCC4 administration. Secondary objectives were to determine any differences in safety endpoints, thromboembolic events (TE), or survival during hospital stay.

Methods: PRISMA guidelines were followed. Studies comparing PCC3 and PCC4 for INR correction in adult patients needing EWR, reporting INR before and after PCC administration, and achievement of goal INR were included. Cochrane Library, EMBASE, and Scopus were searched from database inception to August 20th, 2020. The risk of bias was assessed using a Newcastle-Ottawa scale. Random-effects models estimated the odds ratios (OR), and heterogeneity associated with the primary and secondary outcomes.

Results: Ten manuscripts and five abstracts were included in the SR and nine manuscripts and three abstracts were included in the MA. Patients requiring EWR had more than three times the odds of reversal to goal INR when given PCC4 compared to PCC3 (OR = 3.61, 95% CI: 1.97-6.60, p < 0.001). There was no meaningful clinical association or statistically significant result between PCC4 and PCC3 groups in TE (OR = 1.56, 95% CI: 0.83-2.91, p = 0.17), or survival during hospital stay (OR = 1.34, 95% CI: 0.81-2.23, p = 0.25).

Discussion: PCC4 is more effective than PCC3 in meeting specific predefined INR goals and has similar safety profiles in patients requiring emergent reversal of the anticoagulant effects of warfarin. Study limitations include all studies were observational and there was high study heterogeneity.

Other: There was no funding for this project. The project was not registered.

Infectious Diseases

433 | Cefazolin or anti-staphylococcal penicillins versus ceftriaxone for the treatment of severe methicillin-susceptible *Staphylococcus aureus* infections: a meta-analysis

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Background: Anti-staphylococcal penicillins, nafcillin and oxacillin, and cefazolin are typically considered standard of care (SOC) for methicillin-susceptible *Staphylococcus aureus* (MSSA) bacteremia and osteomyelitis. Ceftriaxone, a less frequently dosed agent, is effective against MSSA in vitro and is often considered for outpatient use. However, its high protein binding raises concerns for potential clinical failure. This meta-analysis aims to assess the use of ceftriaxone for MSSA bacteremia and osteomyelitis compared to SOC in adult patients for the outcome of clinical success.

Methods: Three investigators performed a systematic search of MEDLINE and Scopus through 6/1/2021 using the following search terms: "ceftriaxone," "osteomyelitis OR bone and joint infection," "methicillin-susceptible staphylococcus aureus OR MSSA," and "bacteremia OR blood stream infection." Studies including adult patients with MSSA bacteremia or osteomyelitis and comparisons of ceftriaxone to SOC (nafcillin, oxacillin, or cefazolin) for the outcome of clinical success or failure were included. Rates of clinical success were calculated if clinical failure was reported. Tests for heterogeneity, Q and I^2, were used to measure variance between studies. Bias was assessed by examining funnel plots.

Results: Six retrospective studies, 3 evaluating bacteremia and 3 osteomyelitis, were included (n=899). There was no difference in rates of clinical success between ceftriaxone (337 of 451; 74.7%) and SOC (325 of 448; 72.5%) [OR 1.04 (95% CI: 0.76-1.4)]. Heterogeneity as measured by I^2 was 44%, however this was not significant (p=0.11) and was driven by 1 study with an elevated risk of bias.

Discussion: This meta-analysis does not show a difference in clinical success between ceftriaxone and SOC for adult patients with MSSA bacteremia or osteomyelitis. Limitations include variations in SOC, infection source, and the definition of clinical success between studies. Ceftriaxone may be a suitable alternative, however, prospective data is needed.

Other: Authors have no conflicts of interest or funding sources to disclose. This study was not registered.

Neurology

434 | Effectiveness of intravenous antihypertensives on blood pressure control in acute neurological emergencies: a systematic review

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Background: Intravenous (IV) antihypertensives are utilized for blood pressure (BP) management in acute neurologic emergencies, though the optimal agent is unclear. The objective of this systematic review was to investigate the comparative effectiveness of IV antihypertensives in this patient population.

Methods: We searched Ovid EBM Reviews, Ovid Embase, Ovid Medline, Scopus and Web of Science Core Collection from inception through August 2020. Eligibility criteria included original research comparing IV antihypertensives (nicardipine, clevidipine, labetalol, esmolol, and nitroprusside) for BP management in acute neurological emergencies dictating specific goal BPs in adults. Our primary

endpoint was time to goal BP. Risk of bias was evaluated with the Cochrane risk of bias tool for randomized controlled trials (RCT) or modified Newcastle-Ottawa scale tool for non-randomized trials.

Results: A total of 3878 citation were reviewed and 10 studies (2 RCTs, 8 observational) met inclusion criteria, all including a nicardipine group. Five studies compared nicardipine with labetalol, 3 with clevidipine, and 2 with nitroprusside. There were variable (>20) outcomes reported to assess effectiveness. Six studies reported time to goal BP. Three studies compared time to goal BP between nicardipine and labetalol with 2 studies finding a faster time to goal BP with nicardipine (mean difference −60 minutes (p=0.001) and −21 minutes (p=0.0314)). All included studies comparing nicardipine and clevidipine found no difference for time to goal BP. Studies comparing nicardipine to nitroprusside did not compare time to goal BP.

Discussion: There is limited evidence on the comparative effectiveness of IV antihypertensives on BP control in acute neurological emergencies. Most available studies had poor quality and they reported variable BP endpoints. Nicardipine appears to reach goal BP faster than labetalol, however randomized trials are needed to determine the optimal IV antihypertensive for acute neurologic emergencies.

Other: The overall quality of studies was poor with most being rated at high risk of bias.

Oncology

435 | Title: Impact of the microbiome on chemotherapy toxicities in subjects receiving 5-fluorouracil and oxaliplatin: a systematic review

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Background: Chemotherapy-related oral and gastrointestinal (GI) toxicities are common in cancer patients and result in suboptimal treatment and have a major impact on quality of life. Recent preclinical and clinical studies suggest that human microbiome may also influence these toxicities. However, how the microbiome relates to these toxicities are poorly understood. We aim to review published human clinical trials and experimental evidence on the role of the microbiome on chemotherapy-related oral and GI toxicities caused by fluorouracil and oxaliplatin.

Methods: PubMed, MEDLINE, and EMBASE were searched for relevant studies through May 2021. Primary search criteria included search and MeSH terms 'microbiome', 'cancer', 'fluorouracil', and 'oxaliplatin'. PRISMA guidelines for systematic reviews were used for complete reporting. Inclusion criteria included patients or animal models of cancer treated with fluorouracil and/or oxaliplatin. Abstracts without manuscripts were excluded from the study.

Results: Seven studies were included in this systematic review (human; n=2: animal; n=5). After exposure to 5-FU and/or oxaliplatin, both human and animal studies demonstrated an increased proportion in certain bacterial Phylum namely Proteobacteria (Fusobacterium spp., Prevotella spp., E. coli), Verrucomicrobia , and Actinobacteria. Increased proportion of these Phylum were more common in humans/animals with chemotherapy-related toxicities. All studies showed activation of an inflammatory process with evidence of serum inflammatory cytokines.

Discussion: The oral and gut microbiome changes after receiving fluorouracil/oxaliplatin, resulted in alteration of oral and gut function and the implementation of intestinal damage through inflammatory cytokines consequentially leading to chemotherapy toxicities specifically mucositis and chemotherapy-induced diarrhea.

Other: There are no funding, conflicts of interest, or registrations to report.

Pediatrics

436 | Ethanol Lock for CVC Related Bloodstream Infection in Pediatrics: A Systematic Review and Meta-Analysis

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Background: Ethanol lock therapy (ELT) can be utilized in patients with an indwelling central line to assist in prevention of central venous catheter (CVC) associated infections. However, its efficacy has not been consistently demonstrated in the pediatric population. The purpose of this study is to compare the rates of CVC-related infections in pediatric patients with and without use of ELT, as well as to examine safety endpoints of ELT.

Methods: PubMed, Cochrane Library, Academic Search Premier, and other databases were searched through October 31, 2020 for studies reporting incidence of CVC related infections with ELT in pediatric patients. Data extraction was performed independently by two researchers who resolved disagreements by consensus. Meta-analyses used random effects models according to the heterogeneity of all included studies.

Results: Of 735 studies, 24 met inclusion criteria for review and nine for inclusion in the meta-analysis. The meta-analysis included 497 patients and showed that use of ELT significantly decreased mean CVC-related infections compared to pre-treatment with no ELT with a mean difference of -4.94 (95% CI -8.23 to -1.66, p=0.003). The number of CVC infections also significantly decreased (OR 0.42, 95% CI 0.23 to 0.75, p=0.004). Increased risk of thrombosis and increased frequency of catheter breakage, repair, and replacement was noted in several studies.

Discussion: Ethanol lock therapy is effective in preventing infection related to central venous catheter use in pediatric patients. Variability in definition of CVC infection and ELT protocols utilized makes conclusive determination about the optimal ELT protocol challenging. Further study is warranted to determine the optimal procedure for, and incidence of adverse events related to use of, ELT.

Other: No funding was secured for this study. The authors have no conflicts of interest to disclose. There is no affiliated registration number and registry name with this study.

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Pharmacogenomics/Pharmacogenetics

437 | Association between *CYP2B6* genetic polymorphisms and bupropion exposure: A systematic review and meta-analysis

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Background: Bupropion is metabolized by CYP2B6 to its major active metabolite, hydroxybupropion (HB). The objective of the present study was to investigate the association of bupropion exposure with *CYP2B6* alleles and *CYP2B6* genotype-derived metabolizer phenotypes.

Methods: A systematic literature search was conducted using MEDLINE, EMBASE, Web of Science, Scifinder, PsycINFO, and Cochrane (last search: February 2021). Study screening was performed by two independent reviewers with the following inclusion criteria: (1) exposure (AUC) to bupropion and/or HB in relation to *CYP2B6* genotypes was studied, and (2) *CYP2B6* was genotyped for common variant alleles including at least *CYP2B6*6*. Risk of bias in each included study was assessed by using modified Newcastle-Ottawa Scale. Meta-analysis of the ratio of means (RoM) for bupropion exposure was conducted for *CYP2B6*6* genotype or *CYP2B6* genotype-defined phenotypes.

Results: Eleven studies were included in this systematic review, of which 10 (N=413) were analyzed in the meta-analysis. Most studies involved healthy volunteers aged 18-64 years. The majority of the participants were male and either Asian or Caucasian. The AUCs of HB and the active moiety (bupropion+HB) were substantially decreased in *CYP2B6*6* carriers compared to the non-carriers (HB: RoM 0.77, 95%CI 0.71-0.83; active moiety: RoM 0.82, 95%CI 0.77-0.87), without a significant difference in bupropion AUC. The analysis of CYP2B6 phenotypes (N=276) revealed that poor and intermediate metabolizers combined had significantly reduced exposures to HB (RoM 0.80, 95%CI 0.73-0.87) and the active moiety (RoM 0.85, 95%CI 0.79-0.92) than normal metabolizers.

Discussion: Compared to non-carriers, *CYP2B6*6* carriers exhibited 23% and 18% decreases in HB exposure and active moiety exposure, respectively. Additionally, exposures to HB and the active moiety were 20% and 15% lower in CYP2B6 poor and intermediate metabolizers than normal metabolizers. Our findings suggest bupropion dosing based on *CYP2B6* genotype may improve dosing precision.

Other: The protocol of this review was registered in PROSPERO (CRD42018106234).