A Retrospective Evaluation of a Standardized Multimodal Hyperkalemia Treatment Protocol at a Tri-Campus Community Hospital System

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Purpose Northside Hospital has developed a standardized hyperkalemia treatment protocol to ensure adequate evaluation and treatment based on published scientific literature and expert opinion. The primary objective of this study is to evaluate the efficacy of a standardized treatment plan for hyperkalemia in a tri-campus hospital system.

Methods We conducted a retrospective chart review of electronic health records for patients receiving treatment for hyperkalemia. The data collection period for this study is between December 2019 and December 2020. Each patient was first stratified into 2 groups (protocolized treatment vs non-protocolized treatment), then was further stratified into groups based on baseline serum potassium (K+) level drawn at initiation of treatment (mild: serum level 5-6 mmol/L, moderate: serum level >6-7 mmol/L or severe: serum level >7 mmol/L or any ECG changes regardless of level).Patients were evaluated for time normokalemia, completeness & timeliness of therapy, and for follow-up lab monitoring. Statistical analysis was conducted with two-sample unpaired t-test and two-tailed p-value.

Results A total of 150 patients across our tri-campus healthcare system were identified and included in the study. Patients receiving protocolized treatment had shorter time to normokalemia, more complete therapy, quicker time to emergent medications, and more consistent lab monitoring for all categories. There was an overall trend in all categories of patient's receiving protocolized treatment for having better outcomes, even though all of our data did not reach statistical significance.

Conclusions Overall, this retrospective study demonstrated more favorable patient outcomes & that protocols are beneficial not only to the provider, but to the patient and can have an impact on time to treatment and resolution of abnormalities.

Comparison of Three Adjunctive Agents for the Treatment of Benzodiazepine-Refractory Alcohol Withdrawal Syndrome

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Purpose Compare the utilization and efficacy of phenobarbital, propofol, and dexmedetomidine for patients admitted with benzodiazepine-refractory alcohol withdrawal (BRAW). Evaluate the incidence of patients requiring treatment with a second study agent within 24 hours after the initiation of the primary study agent.

Methods Retrospective chart review of patients admitted for alcohol withdrawal syndrome (AWS). Eligible participants were at least 18 years old with a diagnosis of AWS treated with intravenous phenobarbital, propofol, or dexmedetomidine. Efficacy was evaluated by comparing Clinical Institute Withdrawal Assessment for Alcohol-Revised (CIWA-Ar) scores post-study drug administration and need for a second study agent within 24 hours. Treatment success was defined as achieving a CIWA-Ar less than 16 at 24-hours after the initiation of a study agent.

Results Ninety-one patients were included in the study. For the primary objective, 97, 89, and 73 percent of patients receiving phenobarbital, propofol, and dexmedetomidine achieved a CIWA-Ar score less than 16 after administration of the study agent, respectively. Prior to the initiation of the study agent, 32, 58, and 63 percent of patients in the phenobarbital, propofol and dexmedetomidine groups had CIWA-Ar scores greater than 16, respectively. For the secondary objective, 16, 53, and 10 percent of patients in the phenobarbital, propofol, and dexmedetomidine groups required treatment with a second study agent within 24 hours after the initiation of the primary agent, respectively.

Conclusions There was significant difference in the phenobarbital group achieving a CIWA-Ar score less than 16 at 24 hours post-study drug administration. In this evaluation, phenobarbital was typically used in manner to prevent adverse events from AWS rather than in patients refractory to symptom-triggered benzodiazepine therapy. Future studies are needed to determine if phenobarbital would be as effective if utilized more appropriately in BRAW compared to propofol and dexmedetomidine.

Impact of pharmacist intervention on the appropriate prescribing of fentanyl patches

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Purpose The purpose of this study was twofold. First, we evaluated the impact of pharmacist interventions on the appropriate prescribing of fentanyl patches within the Wellstar Health System. Second, we assessed the effectiveness of a workflow change requiring that pharmacists verify and document the appropriateness of fentanyl patch prescribing during order verification. This is in recognition of the severe adverse-event profile of fentanyl patches as recognized by the Institute for Safe Medication Practices (ISMP).

Methods Data was collected through a multicenter retrospective chart review of adult patients initiated on fentanyl patches at Wellstar hospitals from January 1, 2020, to January 31, 2021. Patients were included if they (1) received an initial fentanyl patch for non-cancer and sickle cell pain, (2) were not receiving hospice or palliative care services, and (3) were admitted to inpatient areas or the emergency department. The primary endpoint was the number of appropriate fentanyl patch orders that had pharmacist intervention. Secondary endpoints included (a) the percentage of pharmacist interventions that were compliant with the documentation requirements and (b) the percentage of appropriate fentanyl patch orders.

Results Pre-workflow change, pharmacists intervened in 12 out of 72 fentanyl patch orders. When pharmacists intervened, 58% of orders (i.e., 7/12) were appropriately prescribed (p=0.10). Post-workflow change revision, pharmacists intervened in 5 out of 16 fentanyl patch orders and none of the five orders were appropriately prescribed (p=0.09). However, there was an increase in pharmacist documentation post-policy revision – bringing the compliance rate to 31.25% (i.e., 5/16) vs. 17% (i.e., 12/72) pre-revision.

Conclusions The study's findings remain inconclusive due to lack of statistical significance. This seems to be primarily driven by the insufficient sample size across both arms. However, these initial findings suggest that pharmacist interventions are likely to have a positive impact on appropriate fentanyl patch prescribing.

Evaluation of Hypoglycemia Causes and Treatment at Northside Hospital

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Purpose Hypoglycemia is defined as dangerously low blood glucose levels of less than 70 mg/dL where action, such as administration of glucose, is required to raise the blood glucose levels to the target range. Hypoglycemia is a serious concern and a severe adverse drug event for hospitalized patients due to its life-threatening potential. This retrospective review seeks to analyze hypoglycemic episodes to determine the cause of hypoglycemia, assess treatment, and identify areas for improvement to enhance patient outcomes and prevent hypoglycemia.

Methods This is a retrospective chart review of patients who experienced a hypoglycemic event during their stay between January 2020 to December 2020. Patients who experienced a blood glucose level less than 70 mg/dL were identified and randomly selected for review. Patients under 18 years of age and obstetrical patients were excluded.

Results 120 patients were reviewed, with a median blood glucose of 59 mg/dL. 19.2% of patients experienced a severe blood glucose less than 50 mg/dL. Basal insulin was the most common cause of hypoglycemia along with low feeding status. Average time between last basal insulin dose and hypoglycemia was approximately 10 hours with a majority of basal insulin given in the evening and hypoglycemia occurring in the morning. 95.8% of patients had the institutional standard hypoglycemic treatment protocol orders available for use prior to the hypoglycemic event, and 62.5% of patients were treated per protocol. Of the various treatment routes, 82.4% of patients were treated with IV dextrose. 40% of the patients treated with PO glucose were still hypoglycemic after treatment whereas only 1.3% of those treated with IV were hypoglycemic after treatment. Of the patients who were not treated per protocol, 24.2% did not receive any medication treatment for their hypoglycemia, and 13.3% of patients were over treated. In almost all cases, patients were treated and received glucose rechecks within an appropriate time.

Conclusions Long-acting basal insulin and minimal feeding were the most common causes of hypoglycemia. Patients are generally treated appropriately for hypoglycemia; however, there is still room for improvement. The treatment protocol should always be used to treat hypoglycemia to ensure standardization, and education to nurses on how to use the protocol appropriately is necessary. More frequent glucose checks may also be necessary, especially for patients with feeding status changes and new insulin starts.

Appropriate statin therapy in type-2 diabetes mellitus

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Purpose Atherosclerotic cardiovascular disease (ASCVD) is the primary cause of death in patients with type 2 diabetes mellitus (T2DM). Approximately 92% of individuals with type 2 diabetes who do not have cardiovascular disease (CVD) have dyslipidemia. Hypertension and dyslipidemia are common conditions that coexist in patients with T2DM. The American Diabetes Association Standard of Care Guidelines, American College of Cardiology, and the American Heart Association suggests the use of high-intensity statin therapy for T2DM patients age 50–75 regardless of ASCVD risk. Given the data, it is recommended that T2DM patients are started on statins to reduce their risk of cardiovascular events.

Methods The data was collected at several retail chain stores in the metro-Atlanta area using the Drug Use Reports tool from the data warehouse. Patients who have been prescribed one of the following metformin doses over a 12-month period were selected: 500 mg IR, 500 mg ER, 750 mg ER, 800 mg IR, and 1000 mg IR. Other assumptions were that our population were non-smokers and were not on aspirin therapy. From there, data was collected to confirm the patient's age and the statin intensity therapy the patient is on if there is one that the patient is on at the time of data collection.

Results A cohort of 222 patients with T2DM was analyzed to determine if appropriate statin usage was prescribed for these patients. 26.7% of patients (60/222) were not on statin therapy. 9.46% of patients (21/222) were on a low-intensity statin therapy. 34.7% of patients (77/222) were on a moderate-intensity statin therapy. 28.8% of patients (64/222) were on a high-intensity statin therapy. Among patients with T2DM, there was a 44.6% (99/222) incidence of being aged between 50 and 75. Among T2DM patients aged 50-75, there was an 68.9% (86/99) incidence of being on an inappropriate therapy, or a 38.7% (86/222) incidence from the cohort of patients studied.

Conclusions The primary outcome of the study found that patients were not prescribed appropriate statin therapy or no statin therapy at all based on suggested guidelines described by the ADA. The data from this study could be used to help future T2DM patients reduce their risk of cardiovascular event. Furthermore, this study was inexpensive, posed no additional risk to subjects, and used existing records. Therefore, studies like this can be readily replicated in other areas of patient care. This analysis emphasizes the importance of improving prescribing patterns for statin therapy among T2DM patients.

Evaluating anticoagulation from low molecular weight heparin in hematopoietic stem cell transplant recipients

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Purpose Historically, enoxaparin kinetics have been considered predictable, making anti-Xa monitoring obsolete unless a patient is pregnant, obese, or has poor renal function. However, a 2011 study found that solid organ transplant recipients may be a patient population where anti-Xa monitoring may be necessary. The study found that 67% of the patients receiving therapeutic enoxaparin had supratherapeutic anti-Xa levels requiring dose reductions. Additionally, the study proposed a theoretically drug-drug interaction between enoxaparin and tacrolimus, the standard immunosuppressive used in both solid organ and hematopoietic stem cell transplant (HSCT) recipients.

Methods In an attempt to gain insight on safe and effective low molecular weight heparin (LMWH) dosing in patients who have undergone HSCT, anti-Xa levels are being monitored for HSCT recipients and patients with a leukemia or lymphoma diagnosis who are receiving enoxaparin for a therapeutic indication from December 2020 to April 2021.

Results Between December 2020 and January 2021, fourteen patients received therapeutic enoxaparin at a dose of 1 mg/kg. Seven patients required dose adjustments for supratherapeutic anti-Xa levels. The average weight-based dose for these patients is 0.6 mg/kg. Five of the seven patients requiring a dose adjustment had previously received a stem cell transplant. None of the fourteen patients received tacrolimus while receiving enoxaparin.

Conclusions Data supports the notion that traditional 1 mg/kg enoxaparin dosing may cause supratherapeutic anti-Xa levels in patients who have received a HSCT. Data collection is ongoing as more data is needed to draw any formal conclusions.

Dexmedetomidine Medication Use Evaluation in a Community Hospital Intensive Care Unit

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Purpose Dexmedetomidine is FDA approved for procedural sedation in non-intubated patients and intensive care unit (ICU) sedation in mechanically ventilated patients for less than 24 hours. However, there has been an increase in its use for off label indications. The association of dexmedetomidine with low incidence of respiratory depression has led to its use in other various applications, but it is not well studied in non-intubated patients. This study aimed to collect retrospective data from the electronic medical record to provide insight on the prescribing practices and safety of dexmedetomidine in a community hospital 24-bed mixed ICU.

Methods The study included data from June 1, 2019 to December 31, 2019. Data was collected using the hospital's electronic medical record. Patients were eligible for inclusion if they were ≥ 18 years of age, admitted to the ICU during the study timeframe and received dexmedetomidine for ≥ 24 hours. Patients were excluded if they received dexmedetomidine in any area outside of the ICU. Pre-determined data points included demographics and prescribing information (indication for use, duration of therapy, infusion rates, concomitant sedatives and reason for discontinuation). The primary efficacy outcome was mean duration of dexmedetomidine therapy in non-intubated patients. Secondary outcomes included concomitant use of any sedative, highest rate of infusion and lowest heart rate charted. After collection of the nominal and continuous data points, descriptive statistics were utilized to analyze data.

Results The study included 75 patients who met the inclusion criteria. The mean duration of dexmedetomidine therapy in non-intubated patients was 48.3 hours. Only 29 (38.7%) patients were mechanically ventilated when dexmedetomidine was first initiated. Sedation was the most common initial indication for use, seen in 28 (37.3%) patients. The second most common indication was delirium/agitation and was seen in 19 (25.3%) patients. Concomitant sedatives were used in 64 (85.3%) of patients, among which 17 (22.7%) of patients received concomitant propofol. The mean highest infusion rate for intubated and non-intubated patients was 1.05 mcg/kg/min and 1.04 mcg/kg/min respectively. The mean lowest heart rate charted while on dexmedetomidine was 59 beats per minute.

Conclusions This study illustrated prescribing patterns, indications, and safety parameters of patients who received dexmedetomidine in a community hospital ICU. Almost two-thirds of the time, dexmedetomidine was initially administered to patients who were not intubated with a mean duration of therapy of 48.3 hours. These findings provide an opportunity to educate providers and optimize practice.

Evaluating the utility of a penicillin allergy reconciliation program within an infectious diseases consult population in a community health system

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Purpose Penicillin allergy reconciliation is an important aspect of antimicrobial stewardship with approximately 10% of the population reporting a penicillin allergy. Our facility utilizes a Penicillin Allergy Reconciliation Program (PARP) led by an Infectious Diseases (ID) Pharmacist and Advanced Pharmacy Practice Experience (APPE) students to identify patients with penicillin allergies to reconcile and intervene when necessary. Information is collected by interview, electronic medical record (EMR) review, and prescription outpatient fill history when available. This study evaluated reconciliations made with and without a PARP in patients in a community health system.

Methods This was a retrospective study that compared reconciliations performed on adult patients admitted in 2019 with a self-reported penicillin allergy and ID consult at a hospital with a PARP (Institution 1) and one without a formal evaluation and intervention program (Institution 2) within the same community health system with same ID physicians. The primary outcome was documented reconciliation of a patient's penicillin allergy. Reconciliation was defined as an edit or clarification (updating the severity, reaction, or comments section, as well as deleting) to a patient's penicillin allergy in the EMR. The secondary outcome evaluated the percentage of total and ID consult patients with a penicillin allergy.

Results There were 281 patients who met criteria and were included in the study, 149 from Institution 1 and 132 from Institution 2. For the primary outcome, there were 118 (79.2%) reconciliations at Institution 1 and 15 (11.4%) reconciliations at Institution 2 ($p < 0.001$). Interventions at Institution 1 and 2 resulted in 74 EMR updates and 44 removals and 14 EMR updates and 1 removal, respectively. Reconciliation was performed on the same visit as the ID consult in 59/82 patients (72%) at Institution 1 and 11/15 patients (73.3%) at Institution 2. All reconciliations at Institution 2 were made by pharmacist (10) or nurses (5). For the secondary outcome, 12.5% of patients with an ID consult and 13.1% of all patients admitted in 2019 had a penicillin allergy.

Conclusions A PARP was an effective method to perform penicillin allergy reconciliations and interventions, even in presence of active ID consultation. Reconciliations and interventions are not routinely being performed without a formalized program.

Safety of Peripheral Administration of 3% Hypertonic Saline in Critically Ill Patients: A Literature Review

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Purpose To evaluate the safety and efficacy of continuous infusion of 3% hypertonic saline via peripheral intravenous administration in critically ill adult patients.

Methods Data were collected from PubMed and Web of Science from database inception to April 7, 2019. Included studies involved adult patients with hyponatremia and/or neurocritical situations and compared administration of 3% hypertonic saline via peripheral administration with standard supportive care (administration through a central intravenous catheter).

Results Of 502 articles identified, 7 were included in the review. Three articles were retrospective studies, 2 were prospective studies, 1 was a case series, and 1 was a case report. Infusion-related adverse events and electrolyte abnormalities due to 3% hypertonic saline administration through a peripheral intravenous catheter were minimal and were limited to phlebitis, erythema, edema, hyperchloremia, and hypokalemia with administration at a high infusion rate (83.3 mL/h) and for a prolonged duration (≥ 6 hours). Infusion rate, duration, catheter gauge, and catheter placement may have a role in infusion-related adverse events.

Conclusions Current recommendations to administer continuous infusions of 3% hypertonic saline through a central intravenous catheter should be reassessed. Peripheral intravenous administration can be used safely and effectively in patients in critical situations.

Assessing the impact of medication adherence packaging at an outpatient primary care provider clinic on hemoglobin A1c and low-density lipoproteins

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Purpose Medication adherence is defined as the extent to which the actions of the patient related to their medication therapy align with the directions from their prescribed regimens. Non-adherence to medication therapy has been shown to have consequences at various levels, such as exacerbation of chronic conditions, recurrent hospitalizations, and negative economic consequences on the sides of both the patient and provider. This project was designed to assess the impact medication adherence packaging has on tangible and future patient outcomes through monitoring of patient laboratory levels, particularly A1c and LDL, hospitalizations, and impact on medication adherence.

Methods The institutional review board approved this retrospective chart review-based study of patients being treated for type II diabetes mellitus and/or dyslipidemia at Abraham's Family and Geriatrics Medicine Clinic, and whose medications are filled by Gwinnett Drugs. A group of 39 patients were identified as candidates for inclusion in this study, due to their current chronic conditions of types 2 diabetes and/or hyperlipidemia. The primary outcome examined in this study was the change in A1c and LDL values at 6 months. Secondary outcomes included the change in A1c and LDL values at 3 months, difference in the number of hospitalizations in each patient 6 months before and 6 months following the use of adherence packaging, difference in patient medication adherence utilizing medication possession ratio (MPR) in the six months prior to initiating adherence packaging compared to six months after initiating adherence packaging, changes in the total number of medications after 6 months, and the total number of side effects as a result of medication adherence packaging. Descriptive and comparative statistics were utilized in examining study and patient-related outcomes.

Results The average A1c for patients with baseline and 3-month readings was 8.4%, with an average A1c of 7.8% at 3 months and an A1c of 8.1% at 6 months. Patient's whose diabetes was initially in poor control, defined as an A1c > 9% had an average baseline A1c of 10.8%. In this subset, the average A1c after 3 months was 9.9%, and the average A1c after 6 months was 8.1%. The average LDL in patients with was 84.5, with an average LDL of 69.1 after 3 months. The average LDL seen in patients with baseline and 6-month readings was 83.8, with an average LDL of 81.7 seen after 6 months in these patients. An average of 1.25 hospitalizations were reported in patients 6 months prior to starting adherence packaging, and an average of 1.22 hospitalizations were reported in patients 6 months following the initiation of adherence packaging. MPR was shown to be 100% in all patients due to Gwinnett Drugs filling and dispensing adherence packaging at monthly intervals.

Conclusions An average decrease in major laboratory levels was seen in all patients after 3 and 6 months, as well as a slight decrease in hospitalization. These overall results did indeed show that medication adherence packaging was a positive intervention in improving patient outcomes related to treatable chronic conditions. Various limitations, such as small sample size and the short period of study were identified.

DEVELOPMENT AND IMPLEMENTATION OF A PERIOPERATIVE AND INTRAOPERATIVE GLYCEMIC MANAGEMENT PROTOCOL IN A COMMUNITY HOSPITAL

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Purpose Poor glycemic management in perioperative and intraoperative surgical phases has been associated with adverse clinical outcomes such as increased rates of infection, length of hospitalization, and mortality. Current guidelines recommend perioperative and intraoperative glycemic targets of 140 – 180 mg/dL. The goal of this review is to determine the prevalence of perioperative hyperglycemia and develop a standardized process for glycemic management in the perioperative setting.

Methods A retrospective chart review is being conducted between July 2019 – July 2021 for diabetic adult patients undergoing surgical procedures. Patients were identified by diabetes diagnosis or insulin administration in the perioperative setting. Data collected includes frequency of blood glucose measurements, percentage of patients within glycemic targets, treatment of hypo- and hyperglycemic events, and length of surgical procedure.

Results Data was collected on 130 patients. 90 patients were identified by diabetes diagnosis and 40 patients identified by insulin administration perioperatively. Of the patients identified by diagnosis, point-of-care testing (POCT) was performed on 74.4% preoperatively and 25.6% post-operatively. 16.1% of preoperative POCT were above goal and 60.8% were above goal post-operatively. 20% of those pre-operative hyperglycemic values were treated whereas 50% of patients were treated postoperatively. Following treatment, no patient reached the glycemic target. No patient experienced hypoglycemia. Of patients identified by insulin administration, 90% had preoperative BG >180 mg/dL (median BG 281 mg/dL). 87.5% had postoperative glucose >180 mg/dL (median BG 235 mg/dL). 7.5% of these patients reached the glycemic target following insulin administration.

Conclusions Preliminary analysis reveal opportunities for improving perioperative glycemic management. Preoperative hyperglycemia was low, but POCT testing was inconsistent. Opportunities for improvement include increasing frequency of POCT monitoring and insulin administration for hyperglycemic events.

Antimicrobial Stewardship in Medical Oncology

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Purpose Antimicrobial resistance is of particular concern to cancer patients because the ability to prevent and cure infection is a cornerstone of cancer therapy. Although pharmacy currently monitors the use of antimicrobials, there are still limited processes in place to prevent antimicrobial resistance with inappropriate antibiotics usage. The purpose of this evaluation is to assess appropriate empiric antibiotic use retrospectively and intervene prospectively with real time feedback to provide appropriate clinical guideline recommendations.

Methods A retrospective chart review was performed from March 2019—March 2020 on oncology patients prescribed antibiotics for pneumonia, febrile neutropenia and UTI. Data was analyzed for appropriate antibiotic selections and will be compared to post implementation data.

Results 105 patients were reviewed retrospectively. Overall, suboptimal empiric antibiotics were selected in 42% of diagnoses. Of those 105 patients, 49% had suboptimal durations of therapy. Antibiotic selection was not optimized in 54% (19) of patients diagnosed with pneumonia, 47% (15) of patients diagnosed with UTI, and 26% (9) of patients diagnosed with febrile neutropenia. Duration of therapy was not optimized in 66% (21) of patients with pneumonia, 41% (14) of patients with UTI, and 43% (15) of patients with febrile neutropenia.

Conclusions Pre-implementation data suggests the need for real-time interventional feedback and prospective data collection. Overall, suboptimal empiric antibiotics were selected in 42% of diagnoses. Of those 105 patients, 49% had suboptimal durations of therapy.

Impact of transitioning IV ceftriaxone to an oral antibiotic in the treatment of urinary tract infections in the inpatient setting

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Purpose To determine if the hospital length of stay was reduced in those patients with a transition of antibiotic therapy from intravenous (IV) ceftriaxone to an oral antibiotic in adult patients with urinary tract infections.

Methods A computer-generated list identified adult patients admitted to St Joseph's and Candler hospitals diagnosed with an ICD-10 code indicating UTI diagnosis initially treated with IV ceftriaxone. Patients were excluded for: inability to receive oral therapy at 48 hours, antibiotic for a source of infection other than UTI, pregnancy, three or more organisms present in urine culture. Treatment outcomes were evaluated if the patient was able to be switched from an IV to oral antibiotic while inpatient. Length of stay, length of antibiotic treatment, positive bacterial culture, presence of urinary catheter and eligibility for existing IV to oral transition criteria were recorded.

Results The computer-generated list identified 101 patients who were given intravenous ceftriaxone for a urinary tract infection over a five-year span, and only 27 met our inclusion/exclusion criteria. Two out of the 27 patients were switched from intravenous ceftriaxone to an oral antibiotic. Due to this small sample size, we were unable to determine any link between length of stay and the switch from intravenous to oral antibiotics.

Conclusions Further studies are needed to evaluate the relationship between transitioning from intravenous to oral antibiotics for the treatment of urinary tract infections in the inpatient setting. More patients than expected remained on IV ceftriaxone even though criteria to transition to oral therapy were met. This represents a stewardship opportunity for our institution.

Evaluation of hypersensitivity reactions with the use of paclitaxel

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Purpose Paclitaxel is an alkaloid chemotherapy agent most commonly used at Memorial Health University Medical Center (MHUMC) for the treatment of gynecologic cancers as well as non-small cell lung cancer. Paclitaxel has a black box warning for hypersensitivity reactions, thus it requires premedication with corticosteroids, diphenhydramine, and histamine H2-receptor antagonists. Recently, an increase in incidence of hypersensitivity reactions to paclitaxel at MHUMC has been observed. The aim of this review is to evaluate the incidence and severity of hypersensitivity reactions with paclitaxel at MHUMC.

Methods This was a retrospective chart review of adult patients who received paclitaxel infusions from November 11, 2019 to September 18, 2020. Both inpatient and outpatient infusions were included in the review. Data points collected included type of malignancy, body surface area, number of infusions the patient received, premedications, timing of premedications, dose of paclitaxel, infusion rate, manufacturer, lot number, grade of reaction, time to reaction, and other chemotherapy the patient received.

Results 190 patients received paclitaxel from November 11, 2019 to September 18, 2020. During the first 5 months, 1 of 95 (1.05%) experienced hypersensitivity reactions. During the second 5 months, 6 of 95 (6.32%) of patients had a reaction. There were four CTCAE grade 2 reactions, two grade 3, and one grade 4. No consistencies were seen in any of the data points collected indicating a cause of this increase. There were no similarities between the patients who reacted in terms of type or severity of their malignancy. Premedications were dosed and administered appropriately to all patients with reactions. Paclitaxel was dosed and infused at an appropriate rate.

Conclusions Based on the data points collected, there is no clear cause of the increase in hypersensitivity reactions with paclitaxel. MHUMC has purchased paclitaxel from the same manufacturer for the past 2 years. The manufacturer states they have not made any changes to their manufacturing of paclitaxel since 2015. Given the substantial increase in reactions and severity of the reactions it is crucial to further investigate the cause.

Implementation of an Oral Amoxicillin Challenge Program for Medical ICU Patients to De-Label Unnecessary Penicillin Allergies

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Purpose Approximately 10% of patients in the United States report a history of a penicillin allergy, however 95% of these allergies are unable to be confirmed through repeat testing. Patients with a listed penicillin allergy have increased usage of alternative antibiotics such as vancomycin and fluoroquinolones, increased rates of infections with resistant organisms, prolonged hospital length of stay, and increased readmission rates. The purpose of this project is to institute an oral amoxicillin challenge in the medical ICU at an academic medical center for patients with low-risk penicillin allergies to de-label unnecessary allergies and improve patient outcomes.

Methods A penicillin challenge program was designed as a pilot program for the medical ICU (MICU) after a retrospective review of patients admitted to the MICU with documented penicillin allergies. The review included all patients admitted to the MICU with a penicillin allergy from April-July 2020 and was conducted to estimate how many patients would likely be eligible for this challenge once the program was initiated. Patients are eligible for an oral amoxicillin challenge if they are admitted to the MICU, are hemodynamically stable, and have a low-risk history of an allergic reaction to a penicillin antibiotic. The definition of a low-risk allergic reaction is based on a literature review of previously published oral amoxicillin challenges and their selected inclusion criteria. Patients receive amoxicillin 250mg and are monitored for 2 hours post-dose for signs of an allergic reaction.

Results Forty-eight patients with documented penicillin allergies were included in the retrospective review, and 24 of these patients had the specific allergic reaction documented. Documented allergic reactions included rash (33%), remote childhood reaction/unknown (25%), anaphylaxis/shortness of breath (25%), itching (13%), and burning sensation (4%). Twelve patients would have met inclusion criteria for the oral challenge by having a low-risk reaction (rash, itching, or remote childhood reaction/unknown) and being hemodynamically stable. An estimated 36 patients per year would be eligible for an oral amoxicillin challenge at our institution. To implement the oral amoxicillin challenge, an orderset including as needed medications for allergic reactions was created along with a standardized allergy assessment questionnaire, consent documentation, and instructions for monitoring (blood pressure, oxygen saturation, and signs/symptoms of an allergic reaction) for two hours post-oral challenge. Additionally, a patient letter to explain the results of the challenge was created. Education was provided to the MICU providers and nurses on the process of determining if patients are eligible for the challenge, documenting consent, and conducting the challenge.

Conclusions At least 50% of patients admitted to the MICU with a penicillin allergy would likely be eligible for an oral challenge based on hemodynamic stability and classification of their allergic reaction as low-risk. The oral amoxicillin challenge is currently available in the MICU and will hopefully expand to other areas of the hospital in the near future. This oral challenge will decrease the number of patients with a documented penicillin allergy and will likely improve patient outcomes.

Evaluation of the key potentially inappropriate drugs in pediatrics list

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Purpose Medication errors occur in every patient population, with errors being more common in pediatric patients compared to adults. The Pediatric Pharmacy Association (PPA) recently published the Key Potentially Inappropriate Drugs in Pediatrics: The KIDs List. This list, similar to the Beers criteria for geriatrics, outlines medications that can be associated with severe adverse drug reactions in the pediatric population. The purpose of this review was to evaluate the use of inappropriate medications in pediatric patients at an academic medical center to establish the need for additional safety measures.

Methods A single site retrospective chart review was completed in pediatric patients ≤ 18 years old admitted from September 1, 2019 – September 1, 2020 who were prescribed at least one of the eighteen medications selected from the KIDs List. Patients were excluded if they received a one-time dose of a medication in the operating room. Data collection included: patient demographics as well as dose, dosage form, frequency, indication, duration, adverse drug reactions, and age cut-offs of the specific medication found on the KIDs List. Medications were also evaluated for continuation of home medication while inpatient. This project was part of the health system medication improvement program, which has been reviewed by the Institutional Review Board.

Results A total of 122 patients were included in the study. There were active orders for 11/18 (61%) of the selected medications from the KIDs list: codeine (3%), daptomycin (5%), metoclopramide (26%), fluphenazine (1%), haloperidol (6%), prochlorperazine (7%), lamotrigine (20%), lidocaine 2% viscous (16%), meperidine (1%), tramadol (5%), and valproic acid and derivatives (10%). Of the six patients who received daptomycin, three of the patients were < 1 year old (50%). Metoclopramide was prescribed to 32 patients, with 25 (78%) of the patients being < 2 years old. Codeine and tramadol were prescribed in a total of 9 pediatric patients less than < 18 years old. Dosage range alerts were found on 10 of the 18 (56%) medications when ordered by physicians. Four of the eighteen medications do not have pop-up alerts for pharmacists when verifying orders.

Conclusions The results indicated there were many opportunities for improvement regarding the prescribing of medications found on the KIDs List, such as pop-up alerts for both physicians and pharmacists, medication removals from pediatric order sets, and new product builds specifically for pediatric patients. Preventing medication errors in the pediatric population is upmost importance to keep these patients safe in and out of the hospital. With this review, pediatric physicians and pharmacists will continue to document and share experiences. This list serves as a step in the right direction for assessing the risks of adverse drug reactions in the pediatric population.

Characterization of Loading Dose Strategies for Phenytoin/Fosphenytoin in Obese Patients at an Academic Medical Center

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Purpose The status epilepticus guidelines recommend a 20 mg/kg loading dose of phenytoin equivalents for status epilepticus. The appropriate dosing weight to utilize in obese patients is unknown. A small study of phenytoin loading doses in obese patients found that they have a higher volume of distribution and increased half-life. Dosing strategies, including utilization of adjusted body weight or implementation of a 2000 mg dose cap have been suggested, although there is limited data for these practices. This study characterizes loading dose strategies at an academic medical center to describe trends in practice for loading patients >120% of their ideal body weight.

Methods Patients who received a loading dose of fosphenytoin or phenytoin between January 2005 and December 2020 at Augusta University Medical Center (AUMC) were retrospectively reviewed. Patients were included in the analysis if they were ≥18 years old, had an actual body weight (ABW) >120% of their ideal body weight (IBW), and received a loading dose of at least 10 mg/kg based on their ABW. Patients were excluded if they received intramuscular fosphenytoin, were on phenytoin prior to the loading dose, or did not have a phenytoin level drawn within 6 hours of loading dose administration. Patients were separated into an adjusted body weight (AdjBW) or actual body weight (ABW) group based on which dosing strategy was closest to 20mg/kg. Demographic data, including ABW, height, body mass index (BMI), drug and dose received, were collected for each patient. This study was determined to be exempt by the Augusta University Institutional Review Board.

Results Of the 2077 patients screened, 218 met criteria for inclusion. The sex, height, weight, and BMI were similar for both groups. Patients who were dosed using ABW were older (61.3 years vs. 55.2 years, p=0.01) compared to those dosed using AdjBW. More patients were dosed based on AdjBW (n=152, 69.7%) than ABW (n=66, 30.3%) at our institution. Patients with higher actual body weight were more likely to receive doses based on AdjBW. The average loading dose was higher in the ABW group (1744 mg vs. 1335 mg, p=<0.001). Patients in the ABW group also received higher doses in milligrams/kilogram (19.3 mg/kg vs. 17.7 mg/kg, p=<0.001). While many patients were eligible for a dose over 2000mg based on a 20mg/kg load using their actual body weight (30.3% of all patients), few patients received doses greater than 2000mg (10.6% of eligible patients). Six patients (2.8% of those included) received doses greater than 20 mg/kg based on ABW.

Conclusions Patients >120% of their IBW who received loading doses of phenytoin/fosphenytoin at Augusta University Medical Center were more likely to be dosed based on AdjBW than ABW. Patients dosed based on ABW received higher doses in both milligrams and milligrams/kilogram. Very few patients received doses exceeding 2000 mg, suggesting partial adherence to dose capping. Providers at our institution tend to utilize AdjBW for calculation of loading doses of phenytoin/fosphenytoin. However, further research is needed to address the efficacy and safety of this approach.

Hepatitis B, influenza, and PPSV23 vaccination rates compared to national standards in pharmacist managed patients with type 2 diabetes mellitus

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Purpose Determine the differences in vaccination rates for patients with type 2 diabetes mellitus managed by an outpatient family medicine pharmacist compared to national standards and averages by HealthyPeople 2020 and CDC.

Methods This retrospective, cross-sectional chart review examined if patients received any hepatitis B or PPSV23 vaccinations prior to September 2, 2020, and if they received an influenza vaccine within the last calendar year.Established patients of the outpatient family medicine clinical pharmacist as of September 1, 2020, referred to outpatient family medicine clinical pharmacist for type 2 diabetes mellitus management, diagnosis of type 2 diabetes mellitus, and age 18 to64 were included. Exclusion criteria consists of diagnosis of type 1 diabetes mellitus, pregnancy, or 65 years of age and older.

Results 200 patients were screened for inclusion and final sample size was 141. Pharmacist-managed patients had higher rates of vaccination for PPSV23 (87.2%) and hepatitis B (41%) than the HealthyPeople2020 goals and the CDC national average. Influenza rates (61%) were lower when compared to HealthyPeople 2020 goals and not significantly different from the CDC national average. There were no statistically significant associations of health disparities with influenza vaccination rate. For every one-year increase in pharmacist management, subjects were less likely to get a hepatitis B vaccine. For every one-year increase in pharmacist management, subjects were more likely to get a PPSV23 vaccine.

Conclusions Due to sample size, correlation between pharmacist management and vaccination rates could not be established. More research utilizing a larger sample size and examining
reasons for vaccine refusal should be conducted to further understand the pharmacist role in vaccination status.

Assessment of a Best Practice Alert in Managing Patients on Anticoagulation

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Purpose The use of Best Practice Alerts (BPAs) to encourage prophylaxis will reduce the frequency of VTE among high-risk hospitalized patients as well as educating medical clinicians and adhering to guidelines. BPAs are clinical support tools accessible through EHR to alert the clinicians about a particular element of a patient's care, such as improper dosing or platelet counts. The usage of BPAs integrated with the EHR can bring attention to clinicians when prescribing anticoagulants to non-indicated patients and better educate physicians.The following were determined: the accuracy of the BPAs firing related to VTE prophylaxis and the providers' acceptance of BPA recommendation.

Methods Single-center, retrospective, chart review study assessed eligible adult patients who were prescribed anticoagulants for VTE prophylaxis. Eligible adult patients were 18 years old and older and were at increased risk for venous thromboembolism.
A VTE prophylaxis report was processed through EPIC® at Grady Memorial Hospital between July 27, 2019 – August 26, 2019. One hundred patients were identified, and 207 BPAs were fired during this period. Electronic orders were searched for VTE prophylaxis and mechanical prophylactic measures, including sequential compression devices. Patient notes were screened for past/present medical history, accidents, providers, surgeries/procedures, length of stay, or social history. A list of active and discontinued medications was also screened for the presence of prophylactic pharmacologic measures, including UFH/Lovenox, aspirin, DOACs, or Warfarin.

Results One hundred patients identified and 207 BPAs. The number of BPAs was fired per unique patient weekly and by floor unit. The firing of the BPAs related to VTE prophylaxis was 94.5% accuracy for 36 patients. The provider could not prescribe each unique patient with anticoagulation therapy due to having PCI, dementia, or timing when the BPA fired.

Conclusions During the study period, BPA was accurately fired and assessed. The assessment showed that VTE prophylaxis was not needed due to a specific event that the patient may have had. This specific BPA improved the appropriate management of anticoagulation for VTE prophylaxis in patients.

Evaluating the Appropriate Use of Parenteral Iron Therapy in Iron Deficiency Anemia in a Primary Care Setting

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Purpose Iron deficiency is the most common cause of anemia and can be treated with adequate iron replacement therapy and managing the underlying cause. Parenteral iron therapy is indicated when patients are unable to absorb or tolerate oral iron, comorbid disease states affect the ability to tolerate or absorb iron, or a patient's need exceeds the capacity of oral therapy. The objective of this medication use evaluation was to evaluate the appropriate use of parenteral iron therapy, specifically iron sucrose and ferric carboxymaltose, in iron deficiency anemia as prescribed by internal medicine primary care providers at an academic medical center.

Methods This study was a retrospective chart review of patients 18 years and older who received parenteral iron sucrose and ferric carboxymaltose between January 1, 2019 and December 31, 2019 from an internal medicine provider in the outpatient setting. Patients were identified through the use of the electronic medical record. Of the 60 identified patients, 19 patients were included. Patients were excluded if the parenteral therapy was administered in the inpatient setting or if the anemia was managed by a specialist. Data collection included patient demographics, any concomitant disease states including gastrointestinal conditions, heart failure, chronic kidney disease (dialysis versus non-dialysis dependent), and pregnancy. An appropriate diagnosis of iron deficiency anemia as well as hemoglobin, ferritin, transferrin saturation (TSAT), and mean corpuscular volume (MCV) values were observed before and after completion of therapy. Descriptive statistics were used to analyze data collected. This project is part of the Institutional Medication Use Evaluation and Improvement Program, which has been reviewed by the institutional review board and determined not to be human subjects research.

Results Of the 19 patients included in this study, 89.5% (n=17) were female with 10.5% (n=2) being male with the average age being 49 years. Eighty-four percent of the included patients did not have any other concomitant disease states while 10.5% (n=2) had a history of gastrointestinal conditions and 5.2% (n=1) had heart failure. All patients had an appropriate diagnosis of iron deficiency anemia based on labs. An increase in the median hemoglobin values were observed before and after therapy to be 9.9 g/dL and 12.6 g/dL respectively. The median ferritin values showed an increase from 10 ng/mL before infusion to 71.8 ng/mL afterwards. TSAT values also showed an increase after infusion. Twenty-six percent of patients received iron sucrose and 74% received ferric carboxymaltose. After therapy, 68.4% of patients had iron studies drawn appropriately and 84.2% completed the full course of therapy. All but one patient received the appropriate dose of medication and only one patient received repeated therapy. Regarding the appropriateness of receiving intravenous iron therapy, 42% were given an adequate trial of oral iron prior to receiving treatment and 58% were not.

Conclusions In this study, the majority of patients did not receive oral therapy before parenteral. This study also revealed a lack of consistency in follow-up lab values. The gap in follow-up care could be a result of the lack of electronic order sets for iron studies as well as a use of a paper medication administration record for outpatient infusions that have to be scanned into the electronic record. Potential solutions include provider education on the appropriate use of intravenous iron in the outpatient setting as well as education on proper follow-up and monitoring parameters as it pertains to iron studies.

Evaluation of Blood Pressure Following Alteplase Administration for Acute Ischemic Stroke

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Purpose Blood pressure (BP) intervention plays a vital role in the management of acute ischemic stroke patients following alteplase administration. The 2019 AHA/ASA Guidelines for the Early Management of Acute Ischemic Stroke recommend a BP of < 185/110 before administration of alteplase and < 180/105 following alteplase administration. While the optimal blood pressure is not known surrounding alteplase administration, some studies suggest that the risk of hemorrhage after administration of alteplase is greater in patients with higher BPs. Additional studies have shown an association between lower BPs and worse outcomes. This chart review evaluated BP management surrounding alteplase administration.

Methods This was a prospective, single-center chart review approved by the institutional review board. Adult patients admitted to a 622-bed comprehensive stroke center from June 1, 2019 to June 30, 2020 and administered alteplase for acute ischemic stroke were included. On December 10, 2019, our institution implemented blood pressure goal ranges in the Stroke Thrombolytic Pre and Post Alteplase Administration order set. The previous order set did not have floor blood pressure parameters, and subsequently low blood pressures would not prompt antihypertensive dose reduction or discontinuation. Data were collected prior to the order set update and after the update to assess for order set adherence and incidence of SBP < 165. Interventions prior to and after alteplase administration were analyzed and included but not limited to the need for PRN and continuous infusion antihypertensives.

Results A total of 64 patients met inclusion criteria and were reviewed, 33 prior to the order set update and 31 after the order set update. Of those 64 patients, 36 required intervention with BP lowering medications. Within the interventions, 19 patients required intervention prior to alteplase administration, while 34 patients required intervention after alteplase administration. Before the order set update, 8 of 12 (66.7%) of infusions were stopped for a BP < 165/90, compared to 11 of 16 (68.8%) after the order set update. The average time in the emergency department after alteplase infusion for those infusions that were not stopped secondary to SBP < 165 was 7.7 hours.

Conclusions Findings prior to the order set update suggest that BP management infusion adjustments are not acknowledged as frequently for diastolic BP compared to systolic BP. Implementation of BP goal ranges on continuous infusions of BP management medications following alteplase administration has improved the initiation rate of BP management infusions based off high diastolic BP. Implementation of the order set has not reduced the incidence of antihypertensive continuation despite SBP < 165 or DBP < 90.

Evaluation of chronic opioid prescribing by family medicine physicians

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Purpose Georgia law requires patients receiving more than thirty morphine milligram equivalents of chronic opioid therapy daily to be seen face-to-face by their prescriber at least every ninety days. Prescribers must also check the Georgia prescription drug monitoring program (PDMP) at least every ninety days, conduct at least four random urine drug screens a year, and sign a controlled substance agreement with the patient annually. Previously, investigators at a family medicine clinic found educational intervention increased appropriate controlled substance prescribing. The purpose of this project was to evaluate the clinic on physician adherence to state regulations for controlled substance prescribing.

Methods This was a retrospective chart review that was part of a medication use evaluation and improvement program and was reviewed by the institution's Pharmacy and Therapeutics Committee. A report on patients prescribed a controlled substance within the family medicine clinic between July 1, 2019 and June 30, 2020 was generated. The report was filtered to include patients at least eighteen years of age who were prescribed a schedule II opioid for chronic pain. Patients were excluded if they received chronic opioids for cancer pain, terminal illness, or hospice care. Two patients were randomly selected per provider for data collection and analysis. Data collection included patient demographics; prescriber status; average morphine milligram equivalents; frequency of signed controlled substance agreements, PDMP checks, and face-to-face encounters; urine drug screen completion and results; and use of a controlled substance template. Descriptive statistics were performed for data analysis.

Results A total of 61 patients were included in the study. There were 34 physicians assessed on adherence to Georgia state regulations regarding controlled substance prescribing, with 47% of them attending physicians. The average patient age was about 61.5 years, and 60% of patients were female. The overall adherence rate to Georgia regulations was 1.6% (n=1). The physician who was adherent to all components of Georgia regulations was an attending. Individual adherence rates were 42.6% (n=26) for controlled substance agreements signed within the last twelve months, 52.6% (n=32) for appropriate frequency of urine drug screens, 14.8% (n=9) for encounter every ninety days, and 27.9% (n=17) for documented PDMP checks every ninety days. Utilization of a controlled substance template within the electronic health record was done by 63.9% (n=39) of physicians.

Conclusions Adherence rates to Georgia chronic opioid prescribing regulations were exceedingly low within the family medicine clinic. The lowest adherence rates included random urine drug screens at least four times annually and face-to-face encounters at least every ninety days. Study limitations include lack of documentation of hardship for patients to come to the clinic, and part of the study period took place during the COVID-19 pandemic, which may have deterred patients from coming for urine drug screens and face-to-face encounters. This data is being presented to institutional committees, with a goal to standardize processes and improve adherence to Georgia law requirements.

Pharmacist-Led Medication Histories Reduce Antiretroviral Medication Errors in Hospitalized Patients

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Purpose Patients with human immunodeficiency virus (HIV) are at increased risks for medication errors during hospitalization compared to those without HIV. Antiretroviral (ARV) medication errors can lead to adverse effects, resistance, and increased healthcare costs, making this an important target for patient safety and stewardship. In an effort to reduce ARV medication errors, clinical pharmacists at our urban academic medical center were provided structured education and a guide for obtaining accurate medication histories prior to order verification. We sought to evaluate the impact of medication histories conducted by pharmacists prior to ARV order verification on medication errors in this patient population.

Methods This was a single-center, quasi-experimental study evaluating the rate of ARV medication errors before (01/01/2018 – 12/31/2018) and after (01/01/2019 – 12/31/2019) implementation of a quality initiative aimed to reduce ARV medication errors at our health institution. Secondary outcomes include proportion of patients with at least one ARV medication error, type of error, errors occurring upon initial order entry, after pharmacist verification, and on subsequent days after medication verification. This study included patients who were at least 18 years of age with ARVs ordered during hospitalization for HIV treatment. Patients were excluded if they never received ARVs prior to admission or if ARVs were ordered for a non-HIV indication.

Results We randomly selected 400 patient encounters in the pre- and 400 patient encounters in the post-initiative group for inclusion. The medication error rates were 39.8% and 25.5% ($p=0.0009$) in the pre- and post-initiative groups, respectively, resulting in an absolute reduction of 14.3%. Patients were less likely to have at least one medication error in the post-initiative group (20.0% vs. 37.0%, $p<0.0001$). The medication error rates on subsequent days after medication verification was 11.3% pre-initiative and 2.8% post-initiative ($p<0.0001$). The overall number of medication errors decreased across all error types during the post initiative period, with the largest impact on drug-drug interactions and drug omission. In both arms, patients were less likely to have a medication error if their outpatient ARV regimen was a single combination tablet compared to multiple-tablet regimens.

Conclusions Pharmacist-led medication histories significantly reduced ARV medication errors in hospitalized patients with HIV one year after implementation of the quality initiative. Pharmacist interventions can help reduce ARV medication errors across all error types, with significant impact on drug-drug interactions and drug omission. The results of this study demonstrate that dedicated pharmacist training and review of ARVs can decrease the number of medication errors associated with HIV/AIDS.

Predictability of social determinants of health on linkage to and receipt of HIV care

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Purpose Social determinants of health can affect various aspects of disease prevention and acquisition. Individuals' abilities to connect to and attain Human Immunodeficiency Virus (HIV) care may be associated with their social determinants of health. The purpose of this study was to evaluate associations among selected social determinants of health in the context of linkage to and receipt of HIV care.

Methods A retrospective analysis ensued using data populated on AIDSVu.org. The social determinants of health identified for evaluation were percent of population uninsured, median household income, percent living in poverty, percent high school education, percent unemployed, and percent living with food insecurity. Data collection targeted 50 states and the District of Columbia (DC). Multiple linear regression procedures evaluated the independent variable, social determinants of health, with the dependent variables, linkage to and receipt of HIV care, over the data-reporting period of 2018. Statistical significance was set at $p<0.05$.

Results Of the 50 states and DC identified for analyses, nine states (18%) did not factor into the analyses because the state health departments refrained from releasing data to AIDSvu below a specified population limit. The mean percentage of populations linked to HIV care and receipt of HIV care were 83% and 78%, respectively. Collectively, social determinants of health were predictive of both linkage to HIV care percentages ($p=0.023$) and receipt of HIV care percentages ($p=0.016$). There were no individual social determinants of health predictive of linkage to HIV care percentages ($p > 0.05$). However, median household income ($p=0.005$) and percent of population unemployed ($p=0.039$) both were individually predictive of receipt of HIV care.

Conclusions Relationships between social determinants of health and linkage to along with receipt of HIV care may be substantial. Certain social determinants of health might be more indicative of HIV care considerations. Pharmacists and pharmacy students have the training and expertise to advocate for persons living with HIV to have improved access to the healthcare system with an emphasis on retention in care to foster optimal health outcomes.

Examining connections between HIV Pre-Exposure Prophylaxis prescribing parameters and literacy rates among Georgia counties

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Purpose Pre-exposure prophylaxis (PrEP) is a therapeutic strategy designed to prevent the acquisition of Human Immunodeficiency Virus (HIV). Aspects of prevention among most disease states include patients' self-awareness and their comprehension levels. The purpose of this study was to evaluate whether HIV PrEP prescribing patterns were associated with percentages of populations lacking basic prose literacy skills.

Methods A retrospective analysis occurred through data presented by the National Center for Education Statistics (NCES) and AIDSVu.com. Percent lacking basic prose literacy rates and the number of PrEP users, PrEP prescribing rates, and PrEP-to-Need Ratios (PnRs), at the county level in Georgia, emanated from NCES and AIDSVu.com, respectively. PnR refers to the ratio of the number of PrEP users in a certain year to the amount of people newly diagnosed with HIV in the previous year. Data reporting was restricted to 2003 and 2018 findings from NCES and AIDSVu.com, respectively. Linear regression techniques assessed percent lacking basic prose literacy skills as the predictor variable with the number of PrEP users, PrEP prescribing rates, and PnRs, as the outcome variables. Statistical significance was set a $p < 0.05$.

Results Of the 159 counties slated for analyses, 117 (74%) comprised the analyses of the number of Georgia PrEP users by county and the rate of Georgia PrEP users by county. Forty-four of the 159 counties (28%) constituted the analyses of Georgia PnRs by county. Omission of counties from these analyses resulted from data not being available to safeguard privacy due to limited number of HIV cases or too few people in a particular county. Percent of individuals lacking basic prose literacy was not predictive of the number of GA PrEP users by county ($p=0.128$). Percent of individuals lacking basic prose literacy was predictive of the rate of Georgia PrEP users and PnR by counties, $p=0.024$ and $p=0.001$, respectively.

Conclusions Components of HIV PrEP prescribing parameters were associated with percent of individuals lacking basic prose literacy among certain Georgia counties. Data evaluated were not entirely robust due to concerns over individuals' privacy in areas that are less populated. Pharmacists and pharmacy students are equipped to raise awareness about HIV and to contribute educational insights to different knowledge levels in both rural and urban populations within the state of Georgia and beyond.

Impact of SGLT2 Inhibitors on Metabolic Parameters and Healthcare Utilization in Patients with Type 2 Diabetes Mellitus

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Purpose Patients with type 2 diabetes mellitus (T2DM) are at higher cardiovascular (CV) risk, which can be decreased with medications and lifestyle changes. Sodium-glucose cotransporter-2 inhibitors (SGLT2i) are associated with improved metabolic parameters, but have been associated with adverse events such as diabetic ketoacidosis and amputations. The clinical impact of SGLT2i on metabolic parameters and adverse events in a general population may differ than that observed in clinical trials.

Methods A retrospective, single-center chart review of patients at The Emory Clinics. Patients with T2DM and initiated on an SGLT2i between July 1, 2016 to December 31, 2017 were included in this study. Patient demographics, past medical history, medications, healthcare utilization, and metabolic parameters were collected at 6 and 12 months following medication initiation. Data were characterized using descriptive statistics.

Results The results (n = 108) include patients who were Caucasian (43.5%) and female (55.6%). Patients were taking an average of 2.89 medications for diabetes, and 70.4% of patients were taking a statin at baseline. Hemoglobin A1c decreased significantly over the study period (8.8 ± 1.7% at baseline versus 8.1 ± 1.7% at 12 months, $p < 0.05$). Systolic blood pressure and LDL also decreased over the 12 month study period by 4 mmHg and 12 mg/dL, respectively ($p < 0.05$). Average weight also decreased from 95.9 kg to 91.5 kg at 12 months ($p < 0.05$). A total of 13 patients (12%) were hospitalized during the study period with 44.4% of these admissions attributed to glycemic control. No amputations were identified.

Conclusions The use of SGLT 2 inhibitors resulted in significant but less reduction in HbA1c, weight, and systolic blood pressure compared to previous studies In contrast to previous studies, LDL was decreased at 12 months Limitations of this study include its retrospective nature, limited time frame, and single center focus Factors such as medical compliance, medication cost, and patient lifestyle may impact metabolic parameters in a real word patient population.

Characterization of antimicrobial prophylaxis for outpatient acute myeloid leukemia induction regimens

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Purpose Patients with acute myeloid leukemia (AML) are often functionally neutropenic at presentation and continue to have neutropenia through induction chemotherapy. NCCN and IDSA/ASCO infection prevention guidelines make strong recommendations regarding infection prophylaxis for intense induction regimens (e.g. 7+3). For patients who undergo induction with lower intensity regimens (hypomethylating agents +/- venetoclax, low dose cytarabine, or gemtuzumab-ozogamicin), guidelines do not make specific recommendations on which antimicrobial prophylaxis to use and our institutional practices are not well characterized. The purpose of this medication use evaluation is to characterize infection prophylaxis at our institution for patients receiving low intensity outpatient AML regimens.

Methods This is a retrospective chart review. Patients who received the following regimens between January 2018 to January 2020 for treatment of AML were included: low dose cytarabine with venetoclax, azacitidine or decitabine with or without venetoclax, and gemtuzumab ozogamicin. For each regimen the following were assessed: patient demographics, antimicrobial prophylaxis, incidence of hospital admissions and emergency department visits, and infection rates.

Results Forty patients were identified, of which twenty patients received azacitidine-containing regimens, 17 decitabine-containing regimens, and 3 gemtuzumab-ozogamicin. No patients were identified for low dose cytarabine. Initial antimicrobial prophylaxis rates ranged from 25-66% (antibacterial), 56-67% (antifungal), and 69-100% (antiviral) depending on induction regimen. Overall prophylaxis rates increased by the end of the induction period. The most common prophylactic antibiotic utilized was ciprofloxacin (40%), followed by levofloxacin (30%) and TMP-SMX (30%). The most common initial fungal prophylaxis was fluconazole (55%), followed by posaconazole (28%) and isavuconazonium (17%). All patients with antiviral prophylaxis received acyclovir. Interestingly, those with no infection-related hospital admission had a higher rate of antibiotic prophylaxis when compared to those who did have an admission (48% vs 9%).

Conclusions Viral prophylaxis is consistently prescribed at our institution. Fungal and bacterial prophylaxis prescribing is inconsistent in use and chosen agent. Patients receiving bacterial prophylaxis at the start of induction had lower rates of hospitalizations for bacterial infection than those not on prophylaxis (9% vs 48%). Increasing prescribing of antibacterial prophylaxis at the start of outpatient induction regimens may reduce hospital admissions for bacterial infection at our institution.

Evaluation of the utilization of ceftaroline at an academic medical center

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Purpose Ceftaroline is a bactericidal cephalosporin antibiotic active against methicillin-resistant Staphylococcus aureus (MRSA). The judicious use of ceftaroline is critical to reduce the development of drug-resistant bacteria. The objective of this study is to evaluate the recent use of ceftaroline before and after criteria for use were implemented at our medical center. Criteria for use include persistent MRSA bacteremia despite source control, polymicrobial skin/soft tissue infections, and treatment of MRSA pneumonia when vancomycin and linezolid cannot be used. The objective of this study is to improve utilization of ceftaroline and promote antimicrobial stewardship.

Methods This retrospective chart review has been approved by the Institutional Review Board. Adult patients who received ceftaroline from January 1, 2019 to July 31, 2020 have been assessed. Demographic and clinical data has been collected using electronic health records. The following patient data has been collected: age, gender, and weight (total body weight and ideal body weight). The indication for use, dose, duration of therapy, previous and concurrent antimicrobials, criteria for use, and outcomes have been collected. All data has been recorded without patient identifiers to maintain confidentiality.

Results After implementation of criteria, the percentage of patients treated with ceftaroline for an unapproved indication did not change. Fifty-five percent of patients met criteria before it was implemented and fifty-two percent of patients met criteria after it was implemented. Eighty-seven percent of utilization was ordered by infectious diseases. Primary indications for use included persistent MRSA bacteremia and MRSA pneumonia.

Conclusions We aim to modify criteria to promote appropriate use of ceftaroline among Infectious Diseases and pulmonary critical care physicians. The addition of reasons for why other agents cannot be used will be implemented into our electronic health record. Limitations include a larger sample size and seasonal variation within the pre-criteria patient population.

Benefits paid for home or outpatient INR monitoring versus facility INR monitoring

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Purpose Criteria for billing and scope of supervision surrounding facility or home and outpatient INR monitoring services are different, but evidence supports that clinical outcomes are similar. Given the therapeutic equivalence and enhanced patient satisfaction with home and outpatient INR monitoring, the purpose of this study was to compare the healthcare dollars benefit paid for patients receiving facility INR monitoring to home and outpatient INR monitoring services.

Methods This single-center, retrospective study evaluated male and female patients 18 years of age or older receiving chronic warfarin therapy management at the Center for Medication Management via facility INR monitoring or home and outpatient INR monitoring services. Data was assessed by final claims analysis for total healthcare dollars benefit paid (defined as the amount paid by a third-party company and patient) and total out of pocket costs for patients receiving home and outpatient INR monitoring and facility INR monitoring. INR results for September 2019 through September 2020 were collected to calculate time in therapeutic range (TTR) and validate current evidence outcomes.

Results Forty-six patients were included in this IRB-approved study. Sixteen patients were included in the home/outpatient INR monitoring group and 30 patients were included in the in-clinic INR monitoring group. Average healthcare dollars paid (each visit) for home/outpatient INR monitoring and in-clinic INR monitoring were $5.91 and $94.20, respectively. Average out of pocket cost (each visit) for home INR monitoring and in-clinic INR monitoring were $0.71 and $25.33, respectively. TTR for home INR monitoring and in-clinic INR monitoring were 70% and 71%, respectively.

Conclusions Reimbursement rates differ considerably for these two therapeutically equivalent interventions. Results reveal that patients who monitor INR at home have reduced co-payment costs and improved quality of life while achieving equivalent therapeutic outcomes when compared to in-clinic INR monitoring.

Xifaxan™ (Rifaximin) Medication Use Evaluation

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Purpose Rifaximin is a rifamycin analogue that has seen expanding use in gastrointestinal conditions since its FDA approval in 2004. In the WellStar Health System, its use is restricted to infectious disease and gastroenterology services. This antibiotic has been identified as one of WellStar Kennestone Hospital's highest expenditure antibiotics. This MUE seeks to assess appropriateness, safety, efficacy, cost of use, and potential cost savings with stricter formulary restriction observation at WellStar Kennestone Hospital.

Methods A drug utilization report was be generated of patients that received treatment with rifaximin at WellStar Kennestone Hospital from July 1st, 2019 to June 30th, 2020. These patient charts were reviewed for appropriateness of use, safety, and efficacy as defined as treatment failure resulting in change to a different antibiotic regimen. Data collection and analysis using descriptive statistics was conducted using Microsoft Excel®. Cost data was calculated using average wholesale prices (AWP).

Results A total of 176 patient charts were reviewed. Patients receiving rifaximin therapy during the 2020 fiscal year were receiving therapy as part of a regimen for definitive or suspected hepatic encephalopathy treatment and prophylaxis. During the 2020 fiscal year, a total of 3,533 tablets were dispensed. The total cost of rifaximin use was found to be $177,721.11. With more stringent observation of the formulary restrictions, there was a potential cost savings of $43,576.11. Per chart review, two patients were noted to have experienced side effects, ascites (1) and headache (1). Zero patients experienced treatment failure requiring the use of an additional or alternative antibiotic.

Conclusions At WellStar Kennestone Hospital, rifaximin use was found to be appropriate, safe, and effective during the 2020 fiscal year. However, more stringent application of existing formulary restriction guidelines could have reduced cost without negatively impacting patient outcomes.

Evaluation of clinical pharmacist utilization of cardioprotective antidiabetic agents in patients with diabetes

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Purpose Glucagon-like peptide-1 receptor agonists (GLP-1) and sodium-glucose co-transporter 2 inhibitors (SGLT2) are antidiabetic medications with proven morbidity and mortality benefits in diabetic patients with cardiovascular disease. Clinical pharmacists working in collaboration with physicians in the primary care setting have a significant impact on diabetes management, specifically with hemoglobin A1c reduction. This study aimed to determine the utilization of cardioprotective antidiabetic medications by clinical pharmacists working in collaboration with physicians in a primary care setting.

Methods This study was a retrospective, observational chart review of adult patients seen in three primary care offices in the SJ/C health system from September 1, 2019 to February 29, 2020. Patients were included if they had uncontrolled type II diabetes mellitus and cardiovascular disease or risk factors for cardiovascular disease. Patients were excluded if they had a contraindication, allergy, or adverse reaction to both a GLP-1 and SGLT2. Study patients were stratified and number matched based on patient encounters with a physician only or collaborative care from a physician and a clinical pharmacist. The primary outcome was the rate of cardioprotective antidiabetic medication usage. The secondary outcome was the change in hemoglobin A1c. Data was also collected on medication access issues that were resolved, such as prior authorizations, drug samples, and medication assistance forms.

Results A total of 232 patients were identified in the study period. There were 116 patients in the physician only group and 116 in the physician and clinical pharmacist group. In the physician only group, 29 patients (25%) received a cardioprotective antidiabetic medication versus 66 patients (56.9%) in the physician and clinical pharmacist group ($P < 0.000001$). The number of patients who achieved a reduction in A1c was 39 (33.6%) in the physician only group versus 62 (53.4%) in the physician and clinical pharmacist group ($P = 0.002$). There was no overall change in A1c in the physician only group, whereas the average percent change in A1c in the physician and clinical pharmacist group was -1.04% (negative number indicating a reduction). There were 49 medication access issues resolved in the physician and clinical pharmacist group.

Conclusions Under the collaborative care of a physician and clinical pharmacist, there was a statistically significant increase in the utilization rate of cardioprotective antidiabetic medications compared to a physician alone. Also, the physician and clinical pharmacist group had a significantly higher number of patients achieve A1C reduction compared to the physician only group, and the clinical pharmacist was able to resolve a clinically relevant number of medication access issues.

Evaluating different regular insulin doses for the treatment of hyperkalemia

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Purpose Regular insulin treatment is a part of the treatment regimen for reversing hyperkalemia, as it shifts potassium intracellularly. Studies have shown that several factors can influence a patient's risk for experiencing hypoglycemia and may impact the efficacy and safety of insulin use for hyperkalemia treatment. Recognizing this, it is important to determine if there is a difference in treatment efficacy and safety outcomes when using ≥10 units or <10 units regular insulin dosing in the treatment of hyperkalemia.

Methods A computer generated list identified adult patients seen at St. Joseph's/Candler Health System who experienced hyperkalemia and were treated with regular insulin. Eligible patients that were included in the study were those who were inpatient, ≥18 years of age who were not pregnant and had not experienced hypoglycemia from other causes. Key data points were collected in order to determine if patients were treated effectively and safely with either ≥10 units or <10 units of regular insulin in the treatment of hyperkalemia.

Results Four hundred and three patients were included in the IRB-approved study. Of those, 86% treated for hyperkalemia received 10 units insulin or more for their first dose and 45% achieved a serum potassium of <5.4mg/dL. Of the 14% of patients who received less than 10 units for their first dose, 47% achieved a serum potassium of <5.4mg/dL. Using a chi-square analysis, the efficacy of ≥10 units or <10 units regular insulin for hyperkalemia treatment was determined to be not statistically significant (p=0.79). The rate of hypoglycemia in patients receiving ≥10 units of insulin was 8%, whereas 5% of those receiving <10 units experienced hypoglycemia (p=0.39). Of those patients who had experienced hypoglycemia, 87.5% received 25g of dextrose within 1.5 minutes of insulin administration. All patients underwent follow-up potassium and blood glucose checks, with the average potassium check taking place 11 hours after insulin administration and the average blood glucose check taking place 5 hours after.

Conclusions Patients experienced similar efficacy and safety outcomes when treated with ≥10 units or <10 units regular insulin for the treatment of hyperkalemia. Though hypoglycemia occurred more often in patients receiving ≥10 units, the overall incidence (8%) was low and not statistically significant. Based on the results, the regular insulin treatment dose should be driven by a physician's clinical determination of patient status and need for treatment.

Hidden Fluids Stewardship: Pharmacy-driven Recommendations for Critically Ill Patients with COVID-19

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Purpose Intravenous fluids (IVFs) are routinely administered in the intensive care unit (ICU). This includes hidden fluids, which are defined as fluids requisite to routine care, but the volumes are not explicitly prescribed (e.g., medication diluents, flushes). With the overwhelming number of patients in the ICU with coronavirus disease 2019 (COVID-19), proper management of fluids is crucial to minimize risks associated with fluid overload. The purpose of this study was to identify pharmacy recommendations related to hidden fluids in the treatment of critically ill patients with COVID-19.

Methods This single-center, retrospective observational study included adult patients with COVID-19 admitted to the ICU. Recommendations were made by pharmacists on the interdisciplinary rounding team at a community hospital. The primary outcome was to determine the percentage of pharmacy recommendations related to hidden fluids. Secondary outcomes classified the types of recommendations contributing to hidden fluids based on categorizations established by investigators a priori. Descriptive statistics were used to report outcomes.

Results A total of 79 patients totaling 420 patient days were evaluated. There were 1138 pharmacy recommendations, 177 (13.2%) of which were related to fluid stewardship. Of the 85 (48%) recommendations related to hidden fluids, 59 were to convert medications from IV to non-IV, 16 to adjust dose of enteral fluid, 6 to discontinue enteral water, 2 to adjust volume of parenteral nutrition, 1 to change albumin concentration, and 1 to concentration infusions.

Conclusions Nearly half of pharmacy fluid-related recommendations were related to hidden fluids. This demonstrates the potential impact that pharmacists can have on minimizing the volume of this oftentimes unrecognized hidden fluids. The study was limited by its single center and retrospective design as well as potential for inaccurate classification of recommendations by reviewers. Future research will compare hidden fluid recommendations in patients with and without COVID-19.

Evaluation of pharmacist-driven remote patient monitoring in a primary care setting of a community health system

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Purpose To evaluate the impact of pharmacist-performed remote patient monitoring in a community health system.

Methods This retrospective, observational study evaluated encounters of patients contacted for RPM. A computer-generated list identified 99457 RPM codes billed by SJC Primary Care from April 1st to September 30th, 2020. Subjects were identified through eClinicalWorks. Encounters were evaluated based on disease state and intervention.

Results Using average estimated revenue of $49.50 per 99457, SJC revenue increased by approximately $5,400 during 109 encounters. Pharmacists were involved in 72% of encounters and generated around $3,800. Diabetes was encountered most often (64 patients) and interventions completed most frequently included medication initiations and dosage increases.

Conclusions RPM within primary care offices of community health-systems provides another viable option to promote patient care and generate revenue. Annual updates to the PFS can change requirements to any HCPCS or CPT code. The 2021 update for RPM services requires at minimum, a real-time synchronous, two-way audio interaction that is capable of being enhanced with data transmission. Utilizing pharmacists to provide this service is a unique opportunity to provide pharmacist value in a virtual health care setting.

Continuous epinephrine infusion compared to standard bolus dosing in advanced cardiac life support

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Purpose Epinephrine is the primary medication administered during advanced cardiac life support (ACLS). During ACLS, epinephrine is most commonly administered by a standard IV push dose of 1 mg every 3 to 5 minutes. Guidelines suggest that epinephrine infusion is a potential option that is comparable to push dose. There are theoretical benefits to administering epinephrine as a continuous infusion during ACLS like maintaining ROSC and blood pressure post cardiac arrest. At our institution, the use of continuous epinephrine infusion is commonly implemented at the provider's discretion. This will be the first study to our knowledge to evaluate this comparison.

Methods This was a single center, observational, retrospective study. All adult patients that experienced a cardiac arrest and had complete code documentation that received either epinephrine continuous infusion or standard bolus dosing from January 1st, 2019 to December 31st, 2020 were included. The primary outcome was mortality at 24 hours after cardiac arrest. Secondary outcomes were any achievement of ROSC, ICU mortality, survival to hospital discharge with a favorable neurologic outcome (mRS of 3 or less), ICU length of stay, hospital length of stay, and need for renal replacement therapy.

Results A total of 176 patients were included (136 in continuous infusion group and 40 in bolus group). Mortality was 69% in the bolus group compared to 87.5% in the continuous infusion group, which was statistically significant (p=0.021). There were no statistically significant differences between groups in secondary outcomes.

Conclusions Continuous epinephrine infusion in cardiac resuscitation was associated with higher mortality than the standard bolus dosing.

Fluid Stewardship and the Four Rights: Pharmacy Recommendations in the Treatment of Critically Ill Adults with COVID-19

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Purpose Intravenous fluids (IVFs) are widely used in the intensive care unit (ICU) to maintain hydration and organ perfusion. However, inappropriate use of IVFs can lead to volume overload. In the past year, a significant proportion of critically ill patients have had coronavirus disease 2019 (COVID-19). The purpose of this study was to identify pharmacy recommendations related to the four rights (right patient, right drug, right dose, and right route) of fluid stewardship in the treatment of critically ill adults with COVID-19.

Methods A retrospective study was conducted at a single community hospital. The study included all COVID-19-positive adults followed on academic rounds in the ICU. All pharmacy recommendations for each patient-day were reviewed for relevance to fluid stewardship and were classified based on the four rights using pre-determined definitions. Successive reviewers were used until two agreed upon the identification of fluid stewardship recommendations for each patient-day. The primary outcome was the percentage of recommendations relevant to fluid stewardship. The secondary outcomes were the percentage of fluid recommendations belonging to each of the four rights. All outcomes were analyzed using descriptive statistics.

Results Pharmacy recommendations were reviewed for 420 patient-days and 79 patients. A total of 1,338 recommendations from pharmacists, residents, or students were identified. Of the total recommendations, 177 (13.2%) were relevant to fluid stewardship. Of the fluid stewardship recommendations, 60 (33.9%) were related to the right patient, 18 (10.2%) to the right drug, 26 (14.7%) to the right dose, and 74 (41.8%) to the right route.

Conclusions Fluid stewardship accounted for more than 1 in 8 pharmacy recommendations for critically ill adults with COVID-19. Fluid stewardship is a timely intervention that pharmacists can make in the ICU during the COVID-19 pandemic. The risk of acute respiratory distress syndrome (ARDS) in COVID-19 patients underscores the importance of these opportunities for more conservative fluid management. This study was limited by its single-center design and lack of comparator group. Due to the retrospective nature, only documented recommendations could be considered. Future research should compare IVF recommendations for critically ill patients with and without COVID-19.

Improving Inpatient Utilization of Oral Contrast

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Purpose An evaluation of oral contrast media at AU Medical Center was conducted to identify opportunities for improvement in their related medication management standards.

Methods A review of oral contrast practices was conducted between August and October 2020. Departments included were nursing, radiology, fluoroscopy, pharmacy, and computerized tomography (CT). A process map was created to describe current practices and identify strategies to align with best practices.

Results Oral contrast media is not included in the hospital formulary, nor does contrast populate in the medication administration record. There are not formal policies in place regarding dispensing and prescribing of oral contrast. Due to lack of MAR documentation, there is room for improvement for monitoring and evaluating oral contrast procedures.

Conclusions There are opportunities to align oral contrast with existing medication policies. Opportunities exist within standardized formulary selection, electronic prescribing, medication administration record documentation, and barcode scanning.

Evaluation of a non–intensive care unit nurse-driven magnesium protocol

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Purpose Magnesium is an intracellular cation that is stored within the body's skeletal system. Hypomagnesemia is seen in approximately 7-11% of hospitalized patients. Electrolyte replacement protocols are commonplace within Intensive Care Unit (ICU) settings as well as on non-ICU floors. Memorial Health University Medical Center instituted a non-ICU based magnesium nurse-driven protocol in 2018. The aim of this medication use evaluation (MUE) is to determine if the protocol is effective at replacing magnesium in patients with hypomagnesemia.

Methods This was a single-center, retrospective chart review with IRB approval. We included adult patients on medical or surgical floors from January 1st, 2020 to June 28th, 2020 with a subtherapeutic magnesium level in which replacement was indicated from the non-ICU nurse driven magnesium protocol. The primary outcome was to determine whether the current protocol dosing results in a level within normal limits (defined as 1.7 to 2.2 mg/dL) by the next morning lab draw. The secondary outcomes to be assessed were whether the protocol was followed correctly and time to replacement.

Results Ninety-four patients were included in the evaluation. When the correct dose was given, we found that the subsequent lab draw was within normal limits 50% of the time, however the magnesium protocol was only followed correctly 45.7% of the time with respect to dosing and 56.5% of the time with respect to follow-up lab ordered. Lack of dose given by nursing staff was the most common reason this protocol was not followed correctly. When the correct dose was given, we found that the subsequent lab draw was within normal limits 50% of the time.

Conclusions Due to the low rate of proper use of the non-ICU magnesium protocol at our institution, we cannot evaluate the dosing strategy of our protocol. However, we have discovered that education to nursing staff is essential to promote correct use of this protocol and to treat hypomagnesemia in our patient population. Nursing education has been conducted on the importance of following the magnesium protocol.

Impact of Clinical Pharmacists on Type 2 Diabetes Mellitus outcomes in the primary care setting before and during the Public Health Emergency surrounding COVID-19

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Purpose Determine the impact of ambulatory care pharmacists on Type 2 Diabetes Mellitus outcomes prior to and during the COVID-19 pandemic.

Methods A computer-generated list identified patients whose Type 2 Diabetes Mellitus was managed by pharmacists from August 2019-October 2020. Patient outcomes pre-pandemic were compared to those during-pandemic, as pharmacists explored tele-health opportunities. Data collected included comorbidities, hemoglobin A1C, statin and diabetes medication history/adherence, HEDIS and MIPS measures, and billing codes generated.

Results Ninety-one patients had their Type 2 Diabetes Mellitus managed by pharmacists from August 2019-October 2020 and met the inclusion criteria of initial A1C greater than or equal to 8%. In the pre-pandemic group (N=30), the average 3 and 6 month A1C reduction was 1.4% and 1.2%, respectively. The average 3 and 6 month A1C reduction in the during-pandemic group (N=61) was 2.3% and 2.2%, respectively. Each outcome is described as pre-pandemic versus during-pandemic. The percentage of patients appropriately initiated or maintained on a statin was 96.7% versus 86.9%. Statin use and adherence related to HEDIS measures was 83.3% versus 72%. A1C control related to HEDIS measures was 41.7% versus 54%. A1C control related to MIPS measures was 60% versus 73.8%. Diabetic medication adherence as it relates to HEDIS measures was 100% for both groups. Medication reconciliation as it relates to MIPS measures was 100% for both groups.

Conclusions Data demonstrates pharmacists can improve clinical outcomes related to Type 2 Diabetes Mellitus through implementation of opportunities provided by a Public Health Emergency.

Impact of probiotics on the development of Clostridioides difficile infection in patients receiving fluoroquinolones

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Purpose Fluoroquinolones are associated with an increased risk of Clostridioides difficile infection (CDI) due to disruption of normal gastrointestinal flora. Probiotic supplementation has been shown to reduce risk of antibiotic-associated diarrhea and primary CDI. Primary prevention of CDI is of interest due to the risk of recurrence (25%) and clinical consequences, including increased morbidity and mortality, hospital length of stay, and healthcare costs. Currently, probiotic selection is unstandardized within our hospital formulary. The objective of this study was to evaluate receipt of probiotics on the development of primary CDI among patients receiving fluoroquinolones compared to those who did not receive probiotics.

Methods Retrospective analysis of adult patients admitted to St. Joseph's/Candler Health System from August 1, 2018 to August 31, 2020 that received at least 72 hours of definitive monotherapy with levofloxacin or ciprofloxacin within 72 hours of admission. Patients who received IV or oral fluoroquinolones were divided into 2 groups based on concomitant use of at least 1 dose of probiotics during antibiotic treatment versus those that did not receive probiotics. Patients were randomized to include 100 patients in each group. Patients with a history of CDI, antibiotic use within 90 days of hospitalization, immunocompromised, or co-administration of systemic antibiotics for more than 24 hours during definitive therapy were excluded. The primary outcome was incidence of CDI. Key secondary outcomes included rates of C. difficile diagnostic stool testing performed, additional infectious diagnostic testing preformed (defined as gastrointestinal PCR panel, microbiology, and other related stool tests), and non-CDI related gastrointestinal side effects.

Results Patients on fluoroquinolones who received probiotics had a non-statistically significantly lower incidence in overall cases of CDI compared to those who did not receive probiotics (0% vs. 3%, p=0.246). Patients on fluoroquinolones who received probiotics had statistically significantly fewer C. difficile diagnostic stool tests performed compared to those who did not receive probiotics (4% vs. 15%, p=0.008). Additionally, patients receiving probiotics had fewer additional infectious diagnostic testing ordered (4% vs. 10%, p=0.096). Non-CDI related gastrointestinal side effects occurred in 30% and 35% of patients receiving fluoroquinolones with and without probiotics, respectively. Rates of reported nausea (11% vs. 13%, p=0.663) and non-CDI related diarrhea (17% vs. 20%, p=0.585) were similar among both groups. However, a statistically significant reduction in rates of vomiting (2% vs. 9%, p=0.030) among patients receiving probiotics was observed.

Conclusions Rates of CDI in patients receiving a fluoroquinolone without probiotics were consistent with the current literature. While a statistically significant decrease in incidence of CDI was not observed, probiotic use was associated with a statistically significantly lower incidence of C. difficile diagnostic stool tests performed with similar overall side effects. Limitations of this study include its retrospective nature and low sample size to detect a difference between groups. Further research is warranted to optimize and standardize probiotic prescribing in high-risk patients, such as patients receiving fluoroquinolones.

De novo use of LCP-Tacrolimus in kidney transplant recipients

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Purpose LCP-tacrolimus (Envarsus XR) is a narrow therapeutic index immunosuppressant used in kidney transplant recipients to prevent organ rejection and is dosed based on levels. The package insert recommends an initial dose of 0.14 mg/kg/day for de novo use immediately after transplant. However, a great degree of intra- and inter-patient variability is seen in doses required to achieve therapeutic levels. Because of this, many centers do not follow the FDA-approved labeling for de novo dosing. The objective of this project is to describe de novo dosing of LCP-tacrolimus at Augusta University Medical Center and time to achieve a therapeutic level.

Methods This single center retrospective chart review included adult patients who underwent a kidney transplant between October 2019 and July 2020 and received de novo LCP-tacrolimus as part of their immunosuppression regimen. Patients were excluded if they received a different tacrolimus formulation following transplantation, received any interacting medications, or passed away within 30 days post-transplant. At our center, LCP-tacrolimus is initiated once serum creatinine is trending down and urine output is adequate with a goal of 8 to 10 ng/ml for the first three months; initial dosing is provider-specific. Data on the following variables were collected: age and weight at the time of transplant, gender, race, starting dose, dose at first therapeutic level, whether or not a therapeutic level was achieved prior to hospital discharge, time to reach therapeutic drug level, and any episodes of supratherapeutic levels within 30 days post-transplant. Descriptive statistics were used to analyze the data collected.

Results A total of 48 patients started LCP-tacrolimus de novo. 16 patients were excluded, and 32 patients were included for analysis. Out of the 32 patients, 65.6 percent were male and 34.4 percent were female. The demographics are as follows: 84.4 percent African-American, 9.4 percent Caucasian, and 6.2 percent Hispanic; the median age at time of transplant was 46.5-years-old (IQR 37.3, 55 years). The median weight-based starting dose was 0.08 mg/kg/day (IQR 0.06, 0.09 mg/kg/day), and the median weight-based therapeutic dose was 0.12 mg/kg/day (IQR 0.10, 0.14 mg/kg/day). 62.5 percent of patients did not achieve a therapeutic level prior to hospital discharge. 50 percent of patients experienced a supratherapeutic level within 30 days following transplantation. The median post-operative time to start LCP-tacrolimus was 2 days (IQR 2, 3.75 days), and it took a median of 8 days (IQR 2, 16.5 days) on therapy to reach the first therapeutic level.

Conclusions Although the FDA-recommended initial de novo dosing for LCP-tacrolimus is 0.14mg/kg/day, we found that patients required approximately 0.12 mg/kg/day to achieve a therapeutic level. Half of patients experienced a supratherapeutic level at some point within the first 30 days after transplant even on this lower dosing, which further supports our current practice. However, we should re-evaluate our initial dosing strategies in order to achieve a therapeutic level more quickly, as it took a median of 8 days to titrate to goal levels when starting at 0.08 mg/kg/day.

Fluid Stewardship and the ROSE Model: Pharmacy Recommendations in the Treatment of Critically Ill Adults with COVID-19

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Purpose Intravenous fluids (IVFs) are the most commonly administered drug in critically ill adult patients, but if used inappropriately can negatively impact patient outcomes. In 2020, intensive care units (ICUs) were inundated with patients with SARS-CoV-2 (COVID-19), in which fluid optimization may be particularly important based on the risk of the acute respiratory distress syndrome (ARDS) and fluid overload. The purpose of this study was to categorize pharmacy recommendations related to fluid stewardship in patients with COVID-19 according to the ROSE (Rescue, Optimization, Stabilization, Evacuation) model, which consists of four dynamic phases of fluid therapy during the patient's hospital stay.

Methods This single-center, retrospective study was performed in a community hospital ICU. All COVID-19 positive patients being followed by the academic rounding team were assessed. The primary outcome was the percentage of pharmacy recommendations related to fluid stewardship. Secondary outcomes included the number and percentage of recommendations stratified by the stages of the ROSE model. Categorization of recommendations was determined a priori, and descriptive statistics were used for all outcomes.

Results A total of 1,338 recommendations were made by a pharmacist, resident, or student over 420 patient days, consisting of 79 unique patients. Of these recommendations, 177 (13.2%) were related to fluid stewardship. In regard to the ROSE model, 12 (6.8%), 11 (6.2%), 121 (68.4%), and 19 (10.7%) of these recommendations were related to the rescue, optimization, stabilization, and evacuation phases, respectively.

Conclusions Out of all pharmacy recommendations in critically ill COVID-19 positive patients, 13.2% were related to fluid stewardship. It is suggested that COVID-19 patients with ARDS benefit from conservatively managed IVFs. However, dehydration in these patients can also lead to poor outcomes. Pharmacists have an important role to play in regard to fluid stewardship in COVID-19 positive patients. The limitations of this study include the single-center design and lack of comparator group. Future research should compare fluid stewardship recommendations in critically ill patients with and without COVID-19.

Impact of granulocyte colony stimulating factor administration after autologous stem cell transplant in patients with lymphoma

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Purpose Patients undergoing autologous stem cell transplant (ASCT) after high-dose chemotherapy are at risk for infectious complications due to prolonged neutropenia. Use of granulocyte colony stimulating factor (GCSF) post-ASCT is endorsed by national oncology practice guidelines, though clinical benefit beyond reducing time to neutrophil engraftment is not well characterized. Thus, this practice has not been standardized for all ASCT recipients at Emory Healthcare and is at the discretion of the oncologist. The purpose of this project was to evaluate institutional outcomes among lymphoma patients who received GCSF vs. those who did not receive GCSF post-ASCT in an attempt to standardize use.

Methods This was a single-center, medication use evaluation including patients ≥18 years of age with lymphoma who underwent ASCT at Winship Cancer Institute of Emory University from July 2015 and July 2020 and followed through any hospital visits within the Emory Healthcare System. A random sample of patients who received GCSF starting day +7 (7 days post-transplant) vs. those who did not receive any GCSF post-ASCT were then randomly selected for inclusion. An initial analysis (#1) of patients conditioned with carmustine, etoposide, cytarabine, and melphalan (BEAM) was performed, though patients who received GCSF were of younger age whereas patients in the no GCSF group were of older age. Thus, a follow-up analysis (#2) of patients conditioned with either BEAM or busulfan, cyclophosphamide, and etoposide (Bu/Cy/VP-16) was later conducted to balance groups and assess the impact of conditioning regimen on outcomes. Outcomes of interest included post-ASCT hospital length of stay (LOS), time to absolute neutrophil count (ANC) and platelet-20 (PLT) engraftment, and incidence of febrile neutropenia (FN). Time to FN onset was evaluated as an exploratory outcome.

Results For analysis #1, median post-ASCT LOS was 13 vs. 14 days in the GCSF and no GCSF groups, respectively (p=0.22). Median time to ANC engraftment was 11 vs. 12 days in the GCSF and no GCSF groups, respectively (p<0.001). Median time to PLT engraftment was 19 vs. 20 days in the GCSF and no GCSF groups, respectively (p=0.66). The overall incidence of FN was 18/25 (72%) and 22/25 (88%) in the GCSF and no GCSF groups, respectively (p=0.14), with similar culture-positive infection rates. For analysis #2, median post-ASCT LOS was 13 vs. 14 days in the GCSF and no GCSF groups, respectively (p-value not assessed). Median time to ANC engraftment was 11 vs. 12 days in the GCSF and no GCSF groups, respectively (p<0.001). Median time to PLT engraftment was 19 vs. 17 days in the GCSF and no GCSF groups, respectively (p=0.2). The overall incidence of FN was 18/25 (72%) and 43/50 (86%) in the GCSF and no GCSF groups, respectively (p=0.15) with similar culture-positive infection rates. The majority of patients in both analyses had FN onset on days +5 or +6.

Conclusions Use of GCSF post-ASCT was associated with a shorter time to ANC engraftment and post-ASCT LOS and lower incidence of FN. Most patients had FN onset on day +5 or +6 (i.e. prior to start of GCSF). Based on these findings, use of GCSF starting day +5 and continued until ANC > 500 cells/mcL or patient discharge was standardized for all lymphoma patients undergoing ASCT. An annual cost of $15,000 was estimated but is justified by the potential benefits described above. A follow-up analysis will be conducted in 6-12 months to evaluate the impact of this practice change.

The Impact of Pharmacist Integration in the Primary Care Setting on Transitions of Care Outcomes

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Purpose To determine the financial impact of ambulatory care pharmacists on transitional care management.

Methods A computer-generated list identified adult patients discharged from St. Joseph's/Candler (SJ/C) with a listed primary care provider within the SJ/C Primary Care Medical Group at Eisenhower. Patients discharged from the hospital that received a post-discharge phone call from a pharmacist were compared to those that received a call by another staff member. Data was collected regarding the financial and non-financial impact of pharmacist involvement.

Results There were 104 patients discharged from the hospital between November 2019-March 2020 meeting above mentioned criteria. Twenty-four patients were contacted by a pharmacist with 20 hospital follow up appointments scheduled. Total amount billed for those appointments was $4,220 (average of $211 per visit). Twenty-five calls were made by non-pharmacist staff with 23 appointments scheduled. Total amount billed for those appointments was $2,445 (average of $106 per visit). Of the patients contacted by someone other than the pharmacist, only 5 calls were by other clinical staff. Pharmacists made 33 clinical interventions including medication reconciliation, medication procurement, referrals, lab orders, and education. One intervention was made by non-pharmacist staff. The 30-day readmission rate for pharmacist contacted patients was 8% versus 12% for non-pharmacist contacted patients.

Conclusions Pharmacist involvement in transitional care management services in the outpatient setting while integrated into a primary office of a health system is not well described. This data highlights an opportunity for pharmacists to contribute to increased revenue, reduced readmissions, and optimize clinical interventions upon hospital discharge.

Assessment of Calcitonin Utilization for Hypercalcemia of Malignancy

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Purpose Hypercalcemia of malignancy (HCM) is an oncologic emergency. Treatment selection is guided by degree of calcium elevation and symptoms. Calcitonin (Miacalcin®) is an adjunctive treatment option, which decreases serum calcium by 1 to 3 mg/dL within 24 hours. In 2015 the price per vial escalated from $68 to $2750. The high cost, wide dose range, and tachyphylaxis has prompted stewardship measures. A recent study found formulary restrictions provide an estimated cost savings of $290,000 to $513,000 annually. Identifying current prescribing habits and clinical outcomes may improve calcitonin utilization and provide cost savings without affecting patient outcomes.

Methods Retrospective chart review was performed on 22 patients with documented HCM at AU Medical Center prior to January 2020. This study was approved by local institutional review board through the Medication Use and Evaluation Program. Data collection included demographics, primary malignancy, calcitonin dose, frequency, duration, laboratory values, symptoms, and concomitant interventions. Descriptive statistics were utilized.

Results Calcitonin is commonly prescribed as 4 unit/kg every 12 hours with 86% of orders discontinued prior to 48 hours. Concomitant therapies, such as intravenous fluids (82%) and bisphosphonates (92%), were often prescribed with calcitonin. Half of patients receiving calcitonin had a corrected serum calcium < 14 mg/dL and were asymptomatic, had non-severe symptoms, or had no documentation of symptoms at calcitonin initiation. Calcitonin continuation beyond 48 hours resulted in an estimated cost of $35,404. The majority of orders were not rounded to the nearest vial size (77.27%). If doses were to be rounded to the nearest vial size, no doses would have exceeded the recommended dosing range of 4 to 8 units/kg

Conclusions Calcitonin prescribing at AU Medical Center falls within the recommended dosing range. Calcitonin continuation beyond 48 hours and doses not rounded to the nearest vial size are associated with significant health-system costs. A dose rounding protocol and an automatic stop date may improve calcitonin prescribing practices and optimize calcitonin cost-effectiveness. Stewardship strategies, such as criteria for use, can also be implemented to ensure appropriate prescribing based on indication, symptoms, and serum calcium level.

Evaluation of thromboembolic events after SARS-CoV-2 infection

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Purpose SARS-CoV-2 infection (COVID-19) puts patients into a known hypercoagulable state. Current guidelines suggest the use of prophylactic anticoagulation in all hospitalized patients, but do not make a recommendation on dosing. Further, they currently do not recommend the use of prophylactic anticoagulation for discharged patients. This trial aimed to evaluate readmissions for thromboembolic events within 90 days in patients who were diagnosed with COVID-19.

Methods This was a retrospective analysis of adult inpatients diagnosed with an ICD-10 code indicating COVID-19 from 1/1/2020 through 10/2/2020, and followed for a 90-day period for readmission. Patients were excluded if they had a history of thromboembolism or receipt of therapeutic anticoagulation prior to COVID-19 diagnosis. The primary outcome was hospital readmission within 90-days for COVID-19. Key secondary outcomes included the effect of COVID-19 therapeutics on thromboembolism, and incidence of any thromboembolic event within 90-days of COVID-19 diagnosis.

Results There were 650 patients who met inclusion/exclusion criteria. The primary outcome occurred in 4 patients (0.6%). Any thrombosis occurred in 58 patients (8.9%). These were made up of 33% pulmonary emboli (PE), 48% deep vein thromboses (DVT), 7% cerebrovascular accidents, and 12% mixed PE/DVTs. Age, gender, ethnicity, ferritin, and COVID-19 pharmacotherapies were not correlated with increased risk of thromboembolism. Lower fibrinogen was associated with increased risk of thromboembolism (441 vs. 558, $p=0.014$). Advanced-dose prophylaxis had a higher rate of bleed than standard-dose ($p<0.001$). Patients who had a thrombosis were more likely to have expired at 90 days (33% vs. 19%, $p=0.014$), required vasopressor support (35% vs. 13%, $p<0.001$), and received convalescent plasma (21% vs 2%, $p=0.005$).

Conclusions This study supports the current recommendation to not routinely discharge COVID-19 patients on prophylactic anticoagulation. The high incidence of thromboembolic events while inpatient, and its association with increased mortality, highlights the need for effective inpatient prophylactic anticoagulation. Limitations to this study include the retrospective design, and the nearby trauma hospital, where patients may have been readmitted for thromboembolisms without our knowledge.