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Title: Managing Diabetes in a Happy and Healthy Way: Evaluation of a Diabetes Education Program in a Community Pharmacy
Effectiveness and safety of dipeptidyl peptidase-4 inhibitors and sodium-glucose cotransporter-2 inhibitors for type 2 diabetes in a veteran population

**Purpose:** The American Diabetes Association guidelines recognize metformin as the gold-standard for patients with type 2 diabetes due to efficacy and safety profiles. If A1c targets are not achieved after at least three months of monotherapy, additional agent(s) may be added to patient’s regimens, including dipeptidyl peptidase-4 inhibitors and sodium-glucose cotransporter 2 inhibitors. Studies have shown an A1c reduction of 0.52 to 1.1 percent with the addition of these agents, however, formulary restrictions limits use in many institutions. The purpose of this study is to evaluate clinical outcomes in diabetes patients with the addition of these agents at a veteran’s institution.

**Methods:** Data from January 1, 2015 to October 31, 2016 was retrieved from a computerized patient record system for patients identified as having a clinical diagnosis of type 2 diabetes with a prescription for a dipeptidyl peptidase-4 inhibitors and/or sodium-glucose cotransporter 2 inhibitors between May 1, 2015 and April 30, 2016. The aforementioned patients were evaluated for inclusion into the study based on the inclusion and exclusion criteria. The primary outcome is the mean/median reduction in A1C at first follow up at least 5 months after treatment was initiated. Secondary outcomes will include mean/median reduction in A1C at subsequent follow ups within the study period, mean/median reduction in A1C with pre-specified combination therapy, changes in weight, drug discontinuation due to lack of effectiveness and/or adverse event, and rates of significant adverse reactions defined as: pancreatitis, medullary thyroid tumors, admissions for diabetic ketoacidosis, changes in renal function leading to a change/discontinuation in novel agent, urinary tract infections/genital mycotic infections, and/or life-threatening hypoglycemia defined as emergency department visit or hospital admission.

Primary and secondary outcomes will be evaluated using the appropriate paired t-test, Chi Square analysis and Fisher’s exact test. Descriptive and inferential statistics will be used to evaluate demographic data.

**Results:** 425 unique patients were identified for evaluation of inclusion into this study. Results of this study will be presented at the conclusion of the study.

**Conclusion:** To be presented at the conclusion of the study.
Purpose: Studies have suggested hospitalized, obese patients initiated on standard prophylactic dose heparin may benefit from high dose prophylactic heparin, whereas other studies have shown no difference in the incidence of VTE and increased incidence of bleeding. This project will attempt to evaluate our prophylactic anticoagulation protocol in a specific patient population, obese patients. The primary outcome of this study is to compare the incidence of VTE in hospitalized, obese versus non-obese patients on standard prophylactic dose heparin. Based on findings, institution-specific recommendations will be made regarding prophylactic heparin dosing in hospitalized, obese patients.

Methods: This is a retrospective chart review of patients 18 years of age or older admitted to Banner Baywood Medical Center between July 1st, 2014 and April 1st, 2016 who received at least three consecutive doses of heparin at the standard recommended dose of 5000 units three times daily (TID). Patients were identified using the Cerner database and were further categorized as obese (BMI ≥ 30kg/m²) or non-obese (BMI <30kg/m²). Patients were excluded if they had any of the following: history of VTE, cancer, pregnancy, major surgery (cardiac, bariatric, coronary revascularization, brain/spine, orthopedic), active bleeding, history of heparin induced thrombocytopenia (HIT), acute cerebrovascular accident (CVA), heart failure exacerbation, patients receiving oral anticoagulation therapy, observation patients, or patients who received less than three consecutive doses of prophylactic heparin. Patients receiving thromboprophylactic dosing other than heparin 5000 units TID were also excluded. The following data was collected: weight, height, BMI, past medical history, length of stay, reason for admission, number of missed heparin dose(s), total number of heparin doses prior to VTE diagnosis, discharge VTE diagnosis and death secondary to VTE. Once all data was collected, the incidence of VTE was evaluated. Descriptive statistics was used with continuous variables reported as means, standard deviation and categorical variables as percentages. Fisher exact test was used to compare categorical variables. For all tests, alpha was set at 0.05.

Results: Three hundred patients were reviewed for inclusion. Overall, two-hundred patients met inclusion criteria, eighty-six of which were obese with a mean BMI of 38 kg/m² and one-hundred and fourteen of which were non-obese with a mean BMI of 23 kg/m². Mean age of sixty-six years in the obese cohort versus seventy-four in the non-obese cohort, p < 0.05. In terms of gender, 47% male in the obese cohort compared to 45% in the non-obese cohort. Regarding past medical history, 49% of the obese cohort had three or more comorbidities compared to 30% of the non-obese cohort, which was statistically significant, p=0.008. Patients in the obese cohort had a shorter length of stay, mean of 5.6 days versus 6.3 days in the non-obese cohort. In terms of the primary outcome, there was one hospital-acquired VTE event in the non-obese cohort (0.88%) compared to zero in the obese cohort. In regards to the one patient with hospital-acquired VTE, no missed heparin dose(s) were noted, but the patient did have multiple risk factors for VTE (sepsis/infection, prolonged hospitalization and immobility). Finally, thirty-four patients in the obese cohort missed three or more doses of heparin compared to forty-two patients in the non-obese cohort, p=0.874.

Conclusion: Based on our review, there was no increased evidence of VTE in obese patients versus non-obese patients while receiving standard dose prophylactic heparin and no reason to suggest a change in our current protocol at this time. However, based on a greater number of missed heparin doses in the non-obese cohort, subsequent reviews should be conducted evaluating trends of missed heparin dose(s) throughout the hospital in order to identify areas that would benefit from more education on the importance of timely administration of heparin, especially in patients at a higher risk for VTE and those with extended length of stay.

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Title: Assessing pharmacist impact on pharmacogenomic testing implementation in a primary care setting

Purpose: Pharmacogenomic (PGx) testing can be performed in primary care setting reactively or preemptively to optimize pharmacotherapy, reduce treatment failures or suboptimal clinical outcomes, and minimize toxicity. The American Society of Health-System Pharmacists (ASHP) described the pharmacists’ unique positioning to lead PGx testing initiatives. Limited information exists regarding integration of pharmacists in primary care PGx workflow. This project was designed to evaluate the practical viability of pharmacist-managed clinical pharmacogenetics service in a primary care setting.

Methods: A PGx testing program was implemented at an integrated, inter-professional primary care-behavioral health center in October 2015 in Tucson, Arizona. The program was designed to facilitate the process of prescribers (a primary care provider and a psychiatrist) ordering category-specific PGx panels for their patients; three panels were available to patients: cardiovascular; neurological; and thrombophilia. A pharmacist was hired to provide clinical services including PGx consultation, beginning in January 2016. To assess the
impact of pharmacist integration into the PGx testing workflow, a retrospective chart review was performed. PGx program data was collected for two time periods: before (October to December 2015) and after (January 2016 to December 2016) integration of the pharmacist into the clinic. Main outcome measures compared: proportion of patients with PGx reports that were reviewed within 30 days; median time from test report availability date to test review date; and PGx-based therapy recommendations. Prescriber acceptance rates of pharmacist recommendations and assessment of recommendation implementation also were assessed. Non-normally distributed continuous data were assessed using a Mann Whitney U test; proportional data were assessed using a chi-square or Fisher’s exact test with an alpha level set at 0.05.

Results: A total of 166 PGx panel reports were reviewed for 137 patients, between October 2015 and December 2016. The pharmacist reviewed 87 reports (n=68 patients) compared to prescribers who reviewed 79 reports (n=69 patients). Of the total reports reviewed, 59 percent (n=98) provided PGx-based therapy recommendations for 109 medications. The most common medication classes identified on PGx reports were: antidepressants (48 percent), opioids (21 percent), and antipsychotics (13 percent). The proportion of patients with PGx reports that were reviewed within 30 days did not differ significantly (p-value equals 0.563) between the pharmacist (88 percent) and prescribers (84 percent). The median turn-around time from report availability to review date for pharmacist (16 days) did not differ significantly (p-value equals 0.06) compared to prescribers (12 days). The pharmacist and prescribers reviewed 73 PGx-based therapy recommendations each identified from PGx reports. There were significant differences (p-value less than 0.0001) in the number of actionable medication-related recommendations made between the pharmacist 68 (93 percent) and prescribers 18 (25 percent). Significant differences in types of recommendations made (p-value less than 0.0001) also were observed between pharmacist and prescribers for: monitoring effectiveness/safety (51 vs. 13), drug change (12 vs. 3); dose change (2 vs. 1); and discontinue therapy (3 vs. 0). Of the 68 recommendations made by pharmacist, 26 (38 percent) were accepted by the physician and resulted in 14 medication discontinuations and 7 medications dose changes.

Conclusion: This retrospective evaluation of a pharmacist-managed clinical pharmacogenomics service showed statistically significant differences in types of PGx-based recommendations made by the pharmacist compared to prescribers. The results are also encouraging given that prescribers were receptive to pharmacist-led PGx testing result review and interpretation. This evaluation highlights the leadership role of the pharmacist in a primary care setting and in helping improve patient outcomes, however more research is needed to evaluate these services among more diverse populations and in similar settings.
department and hospitals because of gaps in care. However, the medication reviews failed to significantly impact these rates. The outcome of the project may be positively impacted if: Recommendations are made directly by the pharmacist to physicians and not through case management; claims data and other direct sources of medication records should be utilized to provide a more robust source of data instead of the medication list compiled by non-clinical case managers and; prospective reviews involving patient interviews will help unravel and clarify medication related issues.

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Title: Comparison of blood pressure in diabetic patients managed by pharmacist clinicians in a collaborative care model versus patients managed without pharmacist clinician collaboration.

Purpose: New Mexico requires the additional training of pharmacists to be certified as Pharmacist Clinicians (PhCs) who are given prescriptive authority by the state boards of medicine and pharmacy. Presbyterian Healthcare Services utilizes 17 PhCs in outpatient ambulatory care clinics for various disease states. PhCs manage multiple comorbidities in single patients; however outcomes are reported through primary care physician outcomes without measuring pharmacist interventions directly. The objective of this study is to compare clinical control of blood pressure and A1c in diabetic patients who are managed by PhCs with patients who are managed without PhC collaboration.

Methods: This study is a retrospective cohort study approved by the PHS IRB. Patient information is accessed using the EMR. Medical coding and diagnosis codes along with problem list history identifies all patients with disease state diagnosis of type one and type two diabetes mellitus. Patients who had two or more visits with a PhC or non PhC, or who had their initial visits with a PhC between the dates August 2014 and August 2016 are identified. Excluded patients include pregnancy during study period, under 18 years old at beginning of study, and patients who do not meet the visit criteria. Data collected are: patient age, gender, height, weight, glycated hemoglobin, blood glucose, systolic blood pressure (SBP), diastolic blood pressure (DBP), renal function, medications, and visit types. The primary outcome is A1c and blood pressure lowering in each group with secondary outcomes of acute care visits, number of office visits and lab draws and medication prescribed. All data reviewed is recorded in compliance with institution protected health information regulations. Data are compared between groups using descriptive and inferential statistics.

Results: Three study groups identified included 22973 patients who had not seen a pharmacist clinician, 2699 who had their first clinician visit during the study period, and 753 patients who had seen and followed a pharmacist clinician during the study period. Baseline A1c improved within each group during the study period. However, the patients who began seeing a PhC during the study period decreased significantly more than the other groups. Blood pressure, systolic or diastolic, did not vary significantly between the groups when comparing baseline or final readings. Background population for each groups includes more type 2 diabetics than type 1 with similar distribution of age. With increasing encounters with a PhC, there are increased number of medications, visits, blood pressure measurements, and A1c values.

Conclusion: All three groups decreased A1c values over the course of the study as well as slight decrease in blood pressure. Pharmacist involvement in specific patient populations may be lead to decrease risks from diabetes complications. More data is needed to make conclusions regarding blood pressure interventions in this population.

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Title: Safety and efficacy of early initiation of direct-acting oral anticoagulants after cardioembolic stroke or TIA.

Purpose: There is not currently a consensus regarding the timing of initiation of the direct-acting oral anticoagulants (DOAC) following a cardioembolic ischemic stroke or transient ischemic attack (TIA). The purpose of this evaluation was to compare different early timing of DOAC initiation after an event (cardioembolic ischemic stroke or TIA). The two groups were ‘very-early’ initiation, defined as 0 – 72 hours post-event, and ‘early’ initiation, defined as 4 – 14 days post-event. The primary outcomes used to compare the two groups in regards to efficacy and safety were incidence of recurrent stroke / TIA and hemorrhagic transformation (HT) respectively.

Methods: Using the Cerner database, adult patients with a diagnosis of cardioembolic stroke or TIA and non-valvular atrial fibrillation, who received a DOAC were indentified between November 1, 2013 and October 1, 2016. Data was collected through retrospective chart review. Patients included were aged 18 – 89 at Banner Baywood Medical Center (BBMC) treated with DOAC for cardioembolic stroke / TIA in the first 14 days following the event. Patients were excluded if they were being treated with any therapeutic anticoagulant prior to the start of DOAC, had a history of intracerebral hemorrhage (ICH) or ICH prior to initiation of DOAC. The following data was collected: age, sex, past
medical history (congestive heart failure, hypertension, diabetes, dyslipidemia, stroke or TIA, myocardial infarction, peripheral artery disease), CHADS2 and CHADS2Vasc scores, National Institutes of Health Stroke Scale (NIHSS) score, thrombolysis, onset of DOAC, antiplatelet therapy, creatinine clearance, recurrent stroke or TIA and HT. Banner facilities, as listed in the protocol, were searched for study outcomes up to 14 days post-event for those patients enrolled through BBMC. A formal sample size calculation was not performed. Descriptive statistics were used to report continuous variables as means and standard deviations and categorical variables as percentages. Continuous variables were analyzed using t-tests or Mann-Whitney U tests as appropriate, and categorical variables using Fisher exact tests. A two-tailed $p < 0.05$ was considered significant.

**Results:** Seventy-one patients were included in the analysis: 8 in the ‘very-early’ initiation of DOAC group and 63 in the ‘early’ initiation group. Based on NIHSS scores, 67 patients had a mild stroke / TIA (score 0 – 10), 3 had a moderate stroke / TIA (score 11 – 20), and 1 had a severe stroke / TIA (score > 20). The average NIHSS scores were 3.4 for all patients, 6 for the ‘very-early’ group, and 3 for the ‘early’ group. Recurrent stroke / TIA occurred in one patient, which was an incidence of 1.41%, (95% CI, 0.04 to 7.6). That patient was in the ‘very-early’ group, the DOAC was started 59.5 hours post-event and the patient had an initial NIHSS score of zero. HT occurred in one patient, which was also an incidence of 1.41%, (95% CI, 0.04 to 7.6). That patient was in the ‘very-early’ group, the DOAC was started 59.5 hours post-event and initial NIHSS score was zero.

**Conclusion:** In this evaluation, one patient had recurrent stroke / TIA within 14 days of the initial event and one patient had HT after initiation of DOAC, both from the ‘very-early’ initiation group. The low number of patients in the ‘very-early’ group makes it challenging to compare the groups. In addition, the incidence of primary outcomes was so rare that there could be no difference between the groups. Despite these limitations, the results suggest initiation of DOAC within 2 weeks post-event may be safe and effective. Prospective randomized controlled trials with a larger sample size would help to confirm these results.

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**Title:** Safety and efficacy of intravenous regular insulin for the treatment of hyperkalemia

**Purpose:** Hyperkalemia is an electrolyte disturbance with potentially life-threatening complications requiring immediate medical treatment. Medical management commonly consists of intravenous (IV) regular insulin with dextrose. The purpose of this study was to describe the safety and efficacy of utilizing regular IV insulin for the treatment of hyperkalemia.

**Methods:** This retrospective chart review was conducted in patients at a large academic medical center between January 1, 2016 and September 30, 2016. Inclusion criteria consisted of the following: (1) 18 years of age or older (2) administered at least one dose of IV regular insulin (3) baseline serum potassium concentration greater than 5.2 mmol/L. Insulin dose administered, baseline potassium and glucose levels, post-insulin potassium and glucose levels, the use of concomitant glucose, alternative agents used for treatment of hyperkalemia, as well as use of renal replacement therapy were collected. The primary endpoint was rate of hypoglycemic events, defined by blood glucose less than 70 mg/dL. The secondary endpoints included reduction in potassium following insulin administration, time to potassium within normal limits, and time to hypoglycemic event.

**Results:** A total of 146 patients with 212 insulin administrations were assessed for efficacy and safety for treatment of hyperkalemia. The rate of hypoglycemia overall was 7.2% of insulin administrations, with 1.9% percent of administrations experiencing mild hypoglycemia (blood glucose levels between 55 and 70 mg/dL) and 5.2% of administrations experiencing severe hypoglycemia (less than 55 mg/dL). Hyperkalemia resolved within 24 hours in 69.3% of all insulin administrations.

**Conclusion:** Although our rate of hypoglycemia was low, the majority of hypoglycemic events were classified as severe in patients receiving insulin for the treatment of hyperkalemia. Despite the multi-modal approach observed, a substantial amount of patients did not achieve normalization of potassium within 24 hours.

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**Title:** Cost and hemoglobin A1C outcomes of medication therapy management (MTM) services provided by advanced-practice pharmacists

**Purpose:** Medicare Part D programs are required to offer Medication Therapy Management (MTM) services to a defined subset of their beneficiaries. These services consist of an annual comprehensive medication review with a qualifying provider, with the goal of optimizing therapeutic outcomes and reducing adverse events with medication use. Insurers may utilize their own personnel to conduct these visits, or can contract with outside personnel. This study seeks to evaluate the MTM services provided for a specific insurer by a group of pharmacists, termed Pharmacists
Clinicians (PhCs) that hold advanced practice licenses allowing prescriptive authority.

**Methods:** This retrospective pre-post study will be submitted to the Institutional Review Board. Patients were targeted for inclusion in the MTM program in 2015 if they had been diagnosed with at least 2 eligible chronic disease states, were on at least 6 medications from eligible classes, and met cost criteria. Patients will be considered for inclusion in the study if they met the above criteria and completed an MTM visit with a PhC. The study will compare outcomes of interest in patients in the year prior and the year after their MTM visit. The primary outcomes will be the cost of medication to the insurer and to the patient for each patient. In the subgroup of patients with a diagnosis of Type 2 Diabetes, an interrupted time-series will be used to compare hemoglobin A1C in the year prior to MTM visit. A mean of 2.6 drug therapy problems were identified in each MTM visit, with the most common type being compliance (37.6%). PhCs resolved 20.7% of drug therapy problems themselves, whereas in the remaining 20.7% they made a recommendation to the patient or to the patient’s physician.

In the year after the MTM visits, the median amount patients paid for medications was $117.03 less than in the year before. The median total medication cost was $84.6 less per patient in the year after the MTM visits than in the year before. However the median amount paid for medications by the insurer increased by $32.43 in the year after the MTM visit. In the diabetes subgroup, patients had a mean hemoglobin A1C of 7.82 in the year prior to the MTM visit compared to 7.49 in the year after. Of note, inferential statistics have not yet been run on either hemoglobin A1C or cost outcomes.

**Conclusion:** The preliminary results of this study suggest that MTM visits conducted by a group advanced practice pharmacists with prescriptive authority may lead to modest decreases in medication costs. However, in this analysis the insurer paid a greater percentage of the medication cost for included patients in the year after MTM visits. It appears that the level of hemoglobin A1C control was maintained in the year after the MTM visits. In the evaluated visits, PhCs were able to resolve drug therapy problems identified. The most common interventions were related to compliance, and a large portion of these were driven by medication costs.

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**Title:** Affect of atypical antipsychotic medications on QTc prolongation in the intensive care unit

**Purpose:** Atypical antipsychotic use in the intensive care unit (ICU) has been increasing to treat delirium. Some studies suggest that atypical antipsychotics (AAP) can be used to reduce the duration of delirium. Dose dependent alterations in electrocardiograms (ECGs) have been associated with almost all AAP. The prevalence of QTc prolongation with AAP in the ICU is not well defined. The purpose of this study is to describe the changes in QTc associated with the administration of atypical antipsychotics in ICU patients.

**Methods:** This study was a single-center, retrospective chart review including subjects in the adult ICU’s at University Medical Center of Southern Nevada (UMCSN) between January 2013 and September 2016. Patients 18 years of age or older were included if an AAP was initiated in the ICU and received for ≥ 48 hours. Patients must have had at least two documented QTc intervals on a 12-lead ECG with one at baseline and the second prior to drug discontinuation. Baseline QTc was defined as within 2 weeks prior to administration of the first AAP dose. Patients were excluded if they were taking antipsychotic medications at home, were on > 1 AAP during the study period, or had baseline ECG rhythm consistent with atrial fibrillation, atrial flutter, or pacemaker. Patient demographic information included sex, age and weight. Additional data points collected were baseline and maximal QTc interval on a 12-lead ECG while receiving AAP, serum potassium and magnesium levels within 24 hours preceding the maximal prolonged QTc, concomitant medications associated with QTc prolongation, dose administered within 24 hours preceding the maximal QTc, AAP study drug utilized and dose of AAP administered.

**Results:** Eighty-eight patients were included in the analysis: twelve patients received olanzapine, seventy-two patients received quetiapine, three patients received risperidone, and one patient received ziprasidone. The dose range was 2.5 to 20 mg/day of olanzapine, 12.5 to 800 mg/day of quetiapine, 0.5 to 2 mg/day of risperidone, and 80 mg/day of ziprasidone. There was no correlation between dose and QTc change for quetiapine and olanzapine ($R^2= 0.0092$ and 0.0027). The overall percent change in QTc from baseline to subsequent ECG was 3.8% ($p=0.0015$). Females patients with normal baseline QTc included in the analysis was twenty-four with a percent change of 7% ($p=0.0004$), and a prevalence of QTc prolongation 25%. Male patients included with a normal baseline QTc was thirty-five with a percent change of 7% ($p=0.0002$), and a prevalence of QTc prolongation 54%. There were a total of forty-seven patients who received concomitant QT prolonging medications prior to ECG. The

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**Title:** Impact of antipsychotic use in the intensive care unit on the QT interval

**Purpose:** Antipsychotic use in the intensive care unit (ICU) is increasing. Some studies suggest that antipsychotics can be used to reduce the duration of delirium. Dose dependent alterations in electrocardiograms (ECGs) have been associated with almost all antipsychotics (AAP). The prevalence of QTc prolongation with AAP in the ICU is not well defined. The purpose of this study is to describe the changes in QTc associated with the administration of antipsychotics in ICU patients.

**Methods:** This study was a single-center, retrospective chart review including subjects in the adult ICU’s at University Medical Center of Southern Nevada (UMCSN) between January 2013 and September 2016. Patients 18 years of age or older were included if an AAP was initiated in the ICU and received for ≥ 48 hours. Patients must have had at least two documented QTc intervals on a 12-lead ECG with one at baseline and the second prior to drug discontinuation. Baseline QTc was defined as within 2 weeks prior to administration of the first AAP dose. Patients were excluded if they were taking antipsychotic medications at home, were on > 1 AAP during the study period, or had baseline ECG rhythm consistent with atrial fibrillation, atrial flutter, or pacemaker. Patient demographic information included sex, age and weight. Additional data points collected were baseline and maximal QTc interval on a 12-lead ECG while receiving AAP, serum potassium and magnesium levels within 24 hours preceding the maximal prolonged QTc, concomitant medications associated with QTc prolongation, dose administered within 24 hours preceding the maximal QTc, AAP study drug utilized and dose of AAP administered.

**Results:** Eighty-eight patients were included in the analysis: twelve patients received olanzapine, seventy-two patients received quetiapine, three patients received risperidone, and one patient received ziprasidone. The dose range was 2.5 to 20 mg/day of olanzapine, 12.5 to 800 mg/day of quetiapine, 0.5 to 2 mg/day of risperidone, and 80 mg/day of ziprasidone. There was no correlation between dose and QTc change for quetiapine and olanzapine ($R^2= 0.0092$ and 0.0027). The overall percent change in QTc from baseline to subsequent ECG was 3.8% ($p=0.0015$). Females patients with normal baseline QTc included in the analysis was twenty-four with a percent change of 7% ($p=0.0004$), and a prevalence of QTc prolongation 25%. Male patients included with a normal baseline QTc was thirty-five with a percent change of 7% ($p=0.0002$), and a prevalence of QTc prolongation 54%. There were a total of forty-seven patients who received concomitant QT prolonging medications prior to ECG. The
TTP was 6.0 months. For the 49 cases of first re-challenge, the Partial or minor responses occurred in 33 (50.7%) cases. The challenge with 69.7% on oxaliplatin-based and 87.5% on were identified in 49 patients. The overall CBR was 70.8%.

Results:

progression (TTP).

benefit rate (CBR), which was defined as the proportion of chemotherapy cycles were required to define the initial exposure to the same regimen. A minimum of four regimens at least nine months from the end of the initial exposure to the same regimen. A minimum of four chemotherapy re-challenge in a third- or fourth-line setting was identified in 49 patients. The overall CBR was 70.8%. Partial or minor responses occurred in 33 (50.7%) cases. The TTP was 6.0 months. For the 49 cases of first re-challenge, the CBR was 75.5% and TTP was 6.5 months. During the first re-challenge with 69.7% on oxaliplatin-based and 87.5% on irinotecan-based therapy experienced CBR. Interestingly, a second re-challenge occurred in 13 patients. The CBR for second re-challenge was 61.5% and TTP was 4.1 months.

Conclusion: The use of AAP increased the QTc with and without the addition of confounding variables, however the change in QTc was likely not clinically significant. The addition of concomitant medications plus AAP increased the QTc, but did not increase the likelihood of an electrophysiological adverse event.

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Title: Chemotherapy re-challenge response rate in metastatic colorectal cancer.

Purpose: Patients with metastatic colorectal cancer (mCRC) have limited treatment options after progressing on standard chemotherapy. FDA approved third- and fourth-line options include regorafenib or trifluridine-tipiracil. However, the efficacy is modest, as progression free survival (PFS) is 1.9 months for regorafenib (Grothey A et al. 2103) and 2.0 months for trifluridine-tipiracil (Mayer RJ et al. 2015). Another option utilized in this setting is re-initiation of previously used chemotherapy but there is limited data to support the efficacy of this approach. We conducted a retrospective study to assess the clinical benefit of chemotherapy re-challenge in a third- or fourth-line setting for mCRC.

Methods: This was a retrospective, cohort study assessing patients with mCRC who received re-challenge chemotherapy after progression on a second or third-line therapy. Re-challenge chemotherapy was defined as re-initiation of oxaliplatin- (FOLFOX or XELOX) or irinotecan-based (FOLFIRI) regimens at least nine months from the end of the initial exposure to the same regimen. A minimum of four chemotherapy cycles were required to define the initial exposure. The key endpoints of this study were clinical benefit rate (CBR), which was defined as the proportion of patients with partial response or stable disease; and time-to-progression (TTP).

Results: A total of 65 events of chemotherapy re-challenge were identified in 49 patients. The overall CBR was 70.8%. Partial or minor responses occurred in 33 (50.7%) cases. The TTP was 6.0 months. For the 49 cases of first re-challenge, the CBR was 75.5% and TTP was 6.5 months. During the first re-challenge with 69.7% on oxaliplatin-based and 87.5% on irinotecan-based therapy experienced CBR. Interestingly, a second re-challenge occurred in 13 patients. The CBR for second re-challenge was 61.5% and TTP was 4.1 months.

Conclusion: Oxaliplatin and/or irinotecan-based chemotherapy re-challenge may be a viable alternative as a third- or fourth-line treatment in patients with metastatic colorectal cancer. CBR, and especially TTP endpoints compare favorably to those seen with approved third-line therapies such as regorafenib and trifluridine-tipiracil.

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Title: Impact of pharmacist intervention on optimization of cardiovascular pharmacotherapy in patients receiving statin refill text message reminders

Purpose: Therapy with HMG-CoA reductase inhibitors, or statins, improves cardiovascular outcomes in patients who fall into one of four statin benefit groups. However, effective statin therapy requires ongoing medication adherence. According to a 2013 article by Maningat, approximately 50% of patients discontinue statins within one year of treatment initiation and adherence decreases with time. Patient nonadherence is associated with poor therapeutic outcomes, progression of disease, and avoidable direct healthcare costs. The objective of this study is to determine if text messaging improves statin adherence and to evaluate the impact of pharmacist intervention on statin adherence and optimization of cardiovascular pharmacotherapy.

Methods: Using QS/1 pharmacy software, patients aged 40 to 75 years were identified as meeting criteria by filling a statin prescription between April 19, 2016 and January 19, 2017 at North Country HealthCare (NCHC) in Flagstaff, AZ. Patients were excluded if they did not fall into one of four statin benefit groups, were pregnant, had decompensated cirrhosis, or had acute liver failure, according to their electronic medical record. Patients were also excluded any time during the study period, January 20, 2017 to April 19, 2017, if their statin was discontinued or transferred to another pharmacy. For patients who qualified for the study, the text message feature was enabled in their QS/1 profiles, allowing them to receive text message reminders when their statin prescription was ready for pick up. As part of this prospective interventional/control study, NCHC pharmacists provided education to half of the study patients on the topics of statins and atherosclerotic cardiovascular disease (ASCVD). A one-page, front and back handout on these topics was provided for the patient as well. If patients declined text message reminders or did not have a cell phone, they were excluded from the study. The primary outcome is statin adherence after text messaging. Medication possession ratio (MPR), calculated by the QS/1 software, is used to measure
Purpose: The average MPR for all study patients at the end of the study is compared to baseline. Furthermore, the average MPR in the group receiving pharmacist education and text message reminders is compared to the average MPR in the group just receiving text message reminders at baseline and at the end of the study. In addition, the 10-year ASCVD risk was calculated for patients who received pharmacist education based on the following data collected: age, gender, race, total cholesterol, high-density lipoprotein, systolic blood pressure, diabetes status, smoking status, and hypertension treatment status. The secondary outcomes include the number of patients on appropriate statin intensity, the number of patients on appropriate aspirin therapy, and the number of patients who were up-to-date on their fasting lipid panel, all of which are assessed at the beginning and end of the study. The final secondary outcome is provider acceptance rate of pharmacist-initiated recommendations on statin therapy, aspirin therapy, and/or a fasting lipid panel.

Results: Data collection is in progress; results are pending.

Conclusion: Data collection is in progress; conclusion is pending.

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Title: Evaluation of allopurinol regimens on the effect of uric acid levels to prevent acute gout flares

Purpose: Gout is a debilitating form of arthritis that is caused by crystallization of uric acid in the joints. The American College of Rheumatology guidelines recommend a reduction of serum uric acid (UA) to less than 6mg/dL to prevent relapse of gouty flares. The purpose of this retrospective study is to evaluate the treatment of gout within the Phoenix VA Health Care System in order to determine if patients have been receiving optimal therapy.

Methods: Data was retrieved from a computerized patient record system which identified patients who had a clinical diagnosis of gout being started on allopurinol between January 1, 2012 and December 31, 2012. The following data was collected: age, gender, race, total cholesterol, high-density lipoprotein, systolic blood pressure, diabetes status, smoking status, and hypertension treatment status. The secondary outcomes include the number of patients on appropriate statin intensity, the number of patients on appropriate aspirin therapy, and the number of patients who were up-to-date on their fasting lipid panel, all of which are assessed at the beginning and end of the study. The final secondary outcome is provider acceptance rate of pharmacist-initiated recommendations on statin therapy, aspirin therapy, and/or a fasting lipid panel.

Results: Data collection is in progress; results are pending.

Conclusion: Data collection is in progress; conclusion is pending.

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Title: Changes in adherence to angiotensin converting enzyme inhibitors and angiotensin II receptor blockers among Arizona community pharmacy patients following conversion to a 90-day supply.

Purpose: The purpose of this study is to determine if there is a change in patient adherence rates to antihypertensives after a conversion to a 90-day supply. Medication non-adherence is a large contributor to poor disease state management and hospitalizations. Community pharmacists play a vital role in maintaining the health of patients, particularly those with chronic diseases including hypertension. Adherence issues are often associated with late refills, delayed approvals from physicians, or patient forgetfulness. Community pharmacists attempt to eliminate such adherence issues on a daily basis due to the gaps in therapy.

Methods:
This study is a retrospective cohort analysis using community pharmacy database reports. Data was collected from two sources: (1) OutcomesMTM TIPs (Targeted Intervention Program) completed and (2) Safeway pharmacies prescription dispensing report for ACE inhibitors and Angiotensin Receptor Blockers (ARBs). The OutcomesMTM platform data was queried looking at completed “Adherence – Needs 90-day fill (Hypertension)” TIPs for ACE inhibitors and ARBs. A custom dispensing report was created to compile a second data set using the drug name. These data were used to determine fill and refill dates of each patient from which adherence was calculated. Both data sets were matched and manually de-identified by one investigator by assigning a random unique 4-digit code.

Medication Possession Ratio (MPR) was used to quantify adherence three fills before and three fills after conversion. The MPR represents the total number of days in which the patient had medication available divided by the total number of days between the first and last fill (three fills total).
Results:
A total of 94 TIPs were identified as completed and were included when compiling both data sets as potential subjects. Of these 94 potential subjects, 35 met the minimum time frame of having three fills before TIP completion and three fills after. 10 subjects fully met inclusion criteria, filling three 30-day prescriptions prior to conversion and three 90-day prescriptions post-conversion. MPR was calculated for these 10 patients restricting it to the 90-day pre- and 270-day post-conversion time period. The pre-conversion period mean MPR was 0.738, with a standard deviation of 0.232 and range between 0.312-0.989. The pre-conversion adherence rate was 40%. The post-conversion period mean MPR was 0.899, with a standard deviation of 0.142 and range between 0.614-1.093. The post-conversion adherence rate was 80%. A paired t-test found a p-value of 0.129, Wilcoxon signed-rank test gave a p-value of 0.047, and the McNemar’s test provided a p-value of 0.219. For the McNemar’s test: 30% subjects were adherent pre- and post-conversion, 10% of subjects were non-adherent pre- and post-conversion, 50% of subjects were non-adherent pre-conversion and became adherent post-conversion, and 10% of subjects were adherent pre-conversion and non-adherent post-conversion.

Conclusion: It was expected that conversions to a 90-day supply and conversations with the patient would result in increased adherence signifying that pharmacists have an opportunity to reduce hospitalizations, mortality, and healthcare costs. The percent adherence pre-conversion was 40% and post-conversion was 80%, however these results were not statistically significant. Although not statistically significant, the results are clinically significant since 50% of the subject pool showed an improvement in adherence due to the 90-day conversion intervention. A follow-up study should be conducted including a larger subject pool and a time period spanning more than 2 years to determine statistical significance.

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Title: Fixed versus weight-based vancomycin loading doses and their effect on area under the curve over minimum inhibitory concentration ratio

Purpose: Recent studies suggest targeting a serum trough concentration of 10 – 20 mg/dL may not be adequate to maximize vancomycin’s bactericidal potential. The vancomycin area under the concentration curve to minimum inhibitory concentration ratio has been associated with predicting clinical and bacteriologic outcomes, while serum trough concentrations have not. Although guidelines recommend utilizing a 20 – 30 mg/kg loading dose, some patients alternatively receive a fixed, 1,000 mg dose. The purpose of this study was to determine if use of weight-based loading doses are more likely to achieve an area under the curve to minimum concentration ratio of 400 or greater.

Methods: This retrospective chart review was conducted at a large academic medical center from November 30, 2014 through March 7, 2017. Inclusion criteria consisted of the following: (1) 18 years of age or older; (2) actual body weight of 55 kg or greater; (3) identified methicillin-resistant Staphylococcus aureus infection; (4) vancomycin treatment duration of at least 72 hours; and (5) a minimum of one trough value collected within the first 72 hours of therapy. Exclusion criteria consisted of the following: (1) patients requiring renal replacement therapy; (2) patients with existing bacterial isolates other than methicillin-resistant Staphylococcus aureus; (3) absence of vancomycin dosing documentation by a pharmacist; and (4) patients previously included in the study. Age, actual and ideal body weight, methicillin-resistant Staphylococcus aureus minimum inhibitory concentration for vancomycin, 30-day inpatient mortality, alternative methicillin-resistant Staphylococcus aureus antibiotics administered, Sequential Organ Failure Assessment score components, comorbid conditions, and infection source were collected for each patient. The primary endpoint was the rate of achieving an area under the concentration curve to minimum inhibitory concentration ratio of 400 or greater between the weight-based and fixed loading dose groups. Secondary analyses included the difference in rates of treatment failure and magnitude of illness severity at 24 and 72 hours of vancomycin therapy for each dosing group.

Results: The rate of achieving an area under the concentration curve to minimum inhibitory concentration ratio of 400 or greater at 24 hours was significantly higher in the weight-based compared to the fixed group (91.7% vs. 40.0%, respectively, p=0.0009). However, no difference was observed between the weight-based (100%) and fixed (96.7%) groups at 72 hours (p=0.1417). No significant difference was found between groups for 30-day mortality, use of alternative antibiotics, or Sequential Organ Failure Assessment score at 24 or 72 hours. Classification and regression tree analysis revealed that weight-based loading doses and serum creatinine values less than 1.0 mg/dL were independent predictors for achieving an area under the concentration curve to minimum inhibitory concentration ratio of 400 or greater at 24 hours.

Conclusion: Vancomycin weight-based loading doses may increase the probability of achieving the target area under the curve to minimum inhibitory concentration ratio as compared to fixed-dose regimens [during the first 24 hours of therapy]. However, no differences in clinical outcomes were observed.

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Results: Twenty-two patients were identified as having stage IV (n=8) or recurrent (n=14) clear cell RCC. Of the patients included into the study, seven patients refused treatment. In patients receiving treatment, the most common agents utilized, regardless of place in therapy, were sunitinib (n=13; 86.7%), followed by sorafenib (n=7; 46.7%), and everolimus (n=6; 40.0%). Sunitinib (n=11; 73.3%) was the most common agent used in the first-line setting. Agents used in subsequent lines of therapy varied between VEGF TKIs and mammalian target of rapamycin (mTOR) inhibitors. Eleven patients had doses of their systemic therapy held or reduced. Adverse drug events (n=7; 36.6%) were the most common reasons for holding or adjusting doses of medications. Twelve patients had therapy discontinued with disease progression (n=11; 91.7%) as the most common cause. Disease progression was noted in 12 patients (80%) receiving treatment compared to 1 patient (14.3%) who was not treated. Death was noted in 12 patients (80%) receiving treatment and 6 patients (85.7%) who were not treated.

Conclusion: Sunitinib was the most commonly used agent in the management of recurrent or stage IV RCC in the Veteran population, with use most often seen in the first-line setting. There remains significant variability among patients following initial treatment with sunitinib in regards to use of subsequent therapy. Despite advancements in treatment for RCC, further research is needed to determine appropriate sequencing of therapy to improve Veteran outcomes.

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Title: Time to target vancomycin trough concentrations in obese patients based on renal function

Purpose: About a third of the US population is obese, but there is a lack of data regarding appropriate antimicrobial dosing for these patients. Vancomycin is one of the most widely used antibiotics in the healthcare setting. Safe and effective dosing of vancomycin in obese patients is challenging because vancomycin has a high volume of distribution which increases the risk of accumulation in this population. The objective of this retrospective study was to evaluate how effective the current pharmacist directed vancomycin-dosing protocol is in attaining timely therapeutic trough concentrations without compromising safety in obese patients with varying renal function.

Methods: This IRB approved retrospective, multicenter chart review was composed of obese adult patients started on intravenous vancomycin therapy dosed by pharmacy from March 1, 2016 to August 31, 2016 admitted at one of three acute care community hospitals within the network. Included patients had a target trough of 15-20 mcg/ml and at least one trough drawn appropriately at steady state. Excluded patients include pregnant, immunocompromised, BMI < 30, dialysis patients, or an estimated creatinine clearance less than 30 ml/min, or a change in vancomycin dose prior to obtaining the initial trough. Data collected from eligible records include patient demographics, serum creatinine, creatinine clearance, white blood cell count, max temperature, and indication. Loading dose, if given, was also collected along with initial maintenance dose, frequency, initial trough level, and whether it was therapeutic, subtherapeutic, or supratherapeutic. The appropriateness of levels drawn and vancomycin doses given were recorded. Lastly, the results of final cultures, the number of days to reach therapeutic range, and duration of therapy were also collected. The primary outcome was the number of days to achieve initial therapeutic troughs in obese patients based on renal function. Secondary outcomes included: frequencies of therapeutic, subtherapeutic, and supratherapeutic troughs, and average initial maintenance dose based on adjusted body weight.
weight. The above data was analyzed using descriptive and inferential statistics with a p-value <0.05 considered significant.

**Results:** A total of 175 patients were included in the final analysis after screening 2996 patients. Out of 175 patients, 46 (26%) had initial vancomycin troughs that were therapeutic, 113 (65%) were subtherapeutic, and 16 (9%) were supratherapeutic. It took an average of 3.5 days to reach a target trough of 15-20 mcg/ml for all patients. There were no significant differences in the time to reach target based on renal function in all three groups (CrCl 30-59 ml/min: 3.6 days; CrCl 60-89 ml/min: 3.5 days; CrCl> 90 ml/min: 3.5 days, p=0.9). A one-way ANOVA was performed to assess whether there were any statistically significant differences in the three groups (subtherapeutic, therapeutic, supratherapeutic) and the average number of days it required to attain target troughs. This resulted in a mean of 2 days for the therapeutic group and 5.5 days in the subtherapeutic group. The subtherapeutic group took significantly longer to achieve a therapeutic trough (mean of 3.5 additional days, 95% CI 2.86-4.12, p=0.001). There were insufficient patients in the supratherapeutic group for meaningful analysis. There were no significant differences in CrCl, age, or BMI in all three groups to account for the variation. The average age was 60 (Range 23-95, SD 15), BMI 38 (Range 30-95, SD 9.2), and CrCl 84 ml/min (Range 30-200, SD 33.3). The average initial maintenance dose administered based on adjusted body weight was 15.5 mg/kg (Range 7-27 mg/kg, SD 3.9).

**Conclusion:** The current vancomycin dosing protocol has been ineffective at dosing obese patients with a BMI≥ 30. It took an average of 3.5 days to reach therapeutic troughs and only 26% of patients were therapeutic on the first vancomycin lab draw. Pharmacists have been systematically under-dosing this patient population at our institutions. Pharmacist education and a reevaluation of the current dosing protocol is warranted.

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**Title:** Evaluation of pharmacist directed vancomycin dosing and monitoring protocol in acutely ill patients with a suspected methicillin resistant Staphylococcus aureus infection

**Purpose:** Vancomycin is a commonly used antibiotic in the United States for treatment of infections involving methicillin-resistant Staphylococcus aureus. Dosing recommendations are provided by Infectious Disease Society of America Guidelines; however, dosing continues to vary despite these recommendations. Without the use of a standardized dosing protocol, patients may receive varying doses depending on who is overseeing their therapy. Recently, a pharmacist directed vancomycin dosing protocol was implemented at Banner Estrella Medical Center to standardize this process. The purpose of this retrospective analysis is to evaluate the implemented protocol to compare the frequency of initial therapeutic vancomycin trough concentrations.

**Methods:** This is a retrospective chart review comprised of patients who were treated with intravenous vancomycin and received doses based on the Banner Estrella Medical Center Vancomycin Dosing Protocol between June 21st, 2016 and April 1st, 2017. Via the new pharmacy and therapeutics approved dosing protocol, a pharmacist performed a comprehensive assessment of the patient being initiated on vancomycin and recommended a vancomycin dose from the protocol based on patient specific factors (i.e., renal function, age, weight, prior vancomycin use). This retrospective study included all patients at least 18 years of age who received IV vancomycin during the study period, and had at least one trough drawn during their therapy. All ethnicities and patients on hemodialysis were included in the study. Patients receiving peritoneal dialysis, or continuous renal replacement therapy were excluded. Information regarding significant comorbid conditions (i.e., heart failure, hypertension, diabetes mellitus, obesity, and kidney function), risk factors for acute kidney injury (concomitant use of nephrotoxic agents, vancomycin doses >4 grams/day, weight >100kg, and intensive care unit stay), and indication for use was also collected. Frequency of initial therapeutic vancomycin trough concentrations was separated into two categories: ‘goal trough 10 to 15 mcg/mL’ or ‘goal trough 15 to 20 mcg/mL’ to ensure adequate interpretation of serum concentrations. Secondly, this information was also compared between obese versus non-obese patients.

**Results:** During the 10-month study period, 248 patients were evaluated for therapeutic vancomycin trough concentrations. Out of the 248 patients, 75 (30.2%) had initial therapeutic troughs (prespecified based on indication; goal 10-15 mcg/mL, or 15-20 mcg/mL). Of the 75 patients with therapeutic troughs, 36 (48.0%) had a trough of 10-15 mcg/mL, and 32 (42.6%) had a trough of 15-20 mcg/mL. The remaining 7 patients (9.4%) had a separate goal (15-25 mcg/mL) for hemodialysis. Of the non-therapeutic troughs, 101 (40.7%) were subtherapeutic (<10 mcg/mL), and 72 (29.0%) were supratherapeutic (>20 mcg/mL). Initial therapeutic troughs varied between obese (30/122, 24.6%) and non-obese patients (45/126, 35.7%), however, this was not statistically significant (p=0.072). If initial therapeutic trough is grouped into a goal trough of 10-20 mcg/mL, 156 (62.9%) patients were therapeutic, with 73 (59.8%) being obese, and 83 (65.9%) non-obese (p=0.359). There were 26 (10.5%) new acute kidney injury diagnosis with 24 (92.3%) occurrences associated with dual antibiotic therapy (vancomycin and piperacillin/tazobactam), and 2 (7.7%) cases secondary to vancomycin monotherapy.

**Conclusion:** Implementation of a pharmacist directed vancomycin dosing and management protocol resulted in roughly one-third of patients to be therapeutic upon initial
vancomycin trough. In addition, if troughs are grouped into an overarching goal of 10-20 mcg/mL, roughly 60% of patients were therapeutic upon initial trough evaluation. Although there were 26 new acute kidney injury diagnosis, antibiotic use was rarely the sole culprit. Additional causes include contrast, diuretics, hypotension, and vasopressor use. Most troughs were subtherapeutic (<10 mcg/mL), therefore, consideration of loading doses should be explored in the future.

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Presentation Category: Acute Care
IRB Status: Pending Approval

Title: Does the use of intravenous acetaminophen reduce both opioid consumption and opioid related adverse drug events (ORADEs) in geriatric hip fracture patients?

Purpose: Acetaminophen has a long history as an effective analgesic; however, the benefit of intravenous (IV) administration is not yet clear. The study evaluated geriatric hip fracture patients and the effect scheduled IV acetaminophen had on patient opiate related adverse drug events (ORADEs), total opioid use, and pain relief.

Methods: A retrospective cohort study was conducted evaluating patients admitted to the hospital who were ≥60 years old and treated for isolated hip fracture from 8/2012 to 9/2016. Patients were excluded due to chronic opioid use, use of regional analgesia, and admission to ICU. Patients were separated into two groups: those who received IV acetaminophen for at least 5 doses started within 2 days of admission, and those who received no IV acetaminophen. The primary outcome was the incidence of ORADEs, consisting of delirium, gastrointestinal (GI) dysfunction (ileus, constipation, administration of anti-nausea/vomiting (NV) medications), and respiratory depression (administration of naloxone or respiratory rate of ≤ 6). All opioid medications were converted to IV morphine equivalents and recorded as daily totals, for the first 4 days of hospitalization. Pain was evaluated by nursing charted patient visual analogue pain scale (VAS) scores and reported as daily averages.

Results: There were 332 patients evaluated (APAP, n=142; control, n=190). All baseline demographics were well balanced between groups, with the exception of liver disease, which was more common in the control group (0.0% vs 3.2%, p=0.04). A lower incidence of ORADEs were observed in the IV acetaminophen group (84.5% vs 93.2%, p=0.011). This was primarily due to a lower incidence of GI dysfunction (82% vs 90%, p=0.029) and respiratory depression (3.5% vs 8.9%, p=0.049). There was no difference in the incidence of delirium (21.8% vs 19.5%, p=0.598). Total morphine equivalent consumption was similar between groups (43mg vs 41mg, p=0.720). There was no difference in pain relief with the exception of day 3 whereby VAS scores were lower in the IV acetaminophen group (3.55±2.62 vs 4.25±2.47, p=0.016).

Conclusion: IV acetaminophen was not associated with lower opioid consumption and minimal benefit in pain relief in geriatric patients following hip fracture but did reduce the incidence of ORADE. This was primarily seen with the ADE’s respiratory depression and GI dysfunction.

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Presentation Category: Ambulatory Care
IRB Status: Approved

Title: Evaluating the implementation of a vaccine information training session for pharmacists and pharmacy technicians intended to increase the administration rates of non-Influenza vaccines

Purpose: To conduct a vaccine education course directed at pharmacists and technicians to address the health benefits of non-flu vaccines and techniques to overcome common barriers to vaccination.

Primary outcome: Investigate the rate of non-influenza vaccines administered before and after the intervention.

Secondary outcome: Evaluate the knowledge of non-influenza vaccines and the comfort level of processing the vaccines amongst pharmacy staff before and after the intervention.

Methods: A total of six supermarket pharmacies of varying prescription volumes were randomly selected to participate in the educational session. Prescription volume was used to classify a pharmacy as low tier, medium tier, or high tier. Two pharmacies were randomly selected from each tier. Pharmacy staff attended a two-hour training session that discussed the role of vaccination, patient identification, vaccine billing, and techniques to overcome common patient barriers. The specific non-influenza vaccines addressed during the training session included tetanus-diphtheria-accelular pertussis (Tdap), pneumococcal conjugate vaccine (PCV13), pneumococcal polysaccharide vaccine (PPSV23), and herpes zoster. The number of non-influenza vaccines were measured after the intervention and compared to identical time periods from the two preceding years.

A validated and anonymous paper survey specific to pharmacists and technicians was distributed before and after the intervention that measured the participants’ knowledge of non-influenza vaccines and comfort level of processing the vaccines.

Results: During the study period, the low volume pharmacies administered 22 vaccines in 2015, 30 vaccines in 2016, and 70 vaccines in 2017. The medium volume pharmacies administered 23 vaccines 2015, 29 vaccines in 2016, and 34 vaccines in 2017. The high volume pharmacies administered
Validation of anti-factor Xa response in obese patients with a body mass index ≥ 60 kg/m² receiving enoxaparin 60 mg subcutaneously twice daily.

Purpose: At Banner Desert Medical Center a venous thromboembolism prophylactic dosing protocol for morbidly obese patients was implemented in 2015. Patients with a body mass index (BMI) of ≥ 60 kg/m² receive enoxaparin 60 mg subcutaneously twice daily. Anti-factor Xa (AFXa) levels were drawn and assessed by clinical staff. The purpose of this project was to retrospectively evaluate AFXa levels and characterize the current dosing protocol in adults with a BMI > 60 kg/m².

Methods: Using Cerner, data was collected on patients identified through a discern alert for patients 18 years of age, admitted to Banner Desert Medical Center between August 1, 2015 and August 1, 2016, on enoxaparin, weight > 140 kg, and creatinine clearance (CrCl) > 30 ml/min. Patients on enoxaparin 60 mg subcutaneously twice daily with a BMI ≥ 60 kg/m², who were non-pregnant, had received at least 3 doses of enoxaparin, and had an AFXa level drawn 3-6 hours post dose were included in this retrospective chart review.

Patients with impaired renal function at baseline or at time of draw, thrombocytenopenia, age ≥ 90 years old, or active bleeding were excluded. Demographic data collected included: age, gender, actual body weight at admission, ideal body weight, and BMI. Additional data collected included: serum creatinine and CrCl at baseline and time of AFXa level draw, DVT risk score, AFXa levels, timing of AFXa levels, and processing time of levels. Collection of outcomes data included: major and minor bleeding and suspected or confirmed thrombotic events. Descriptive statistics were used to report continuous variable as means and standard deviations and categorical variables as percentages. Spearman’s rho test was used to detect correlations between variables. Linear regression was used to determine predictors of AFXa levels. For all tests, p ≤ 0.05 was considered significant.

Conclusion: The overall number of non-influenza vaccines administered increased across all three tiers involved in the intervention. The low and high volume pharmacies administered more vaccines compared to the medium volume tier. Educating the pharmacy staff members about the importance of vaccinations and techniques to address patient barriers may be an important step in increasing the immunization rate in the community. Although identical time periods were compared, the staffing components may have changed over the years. Also, not every staff member from the selected pharmacies was able to attend the vaccine education session. Due to the small number of pharmacies included in the intervention, statistical analysis could not be conducted regarding vaccination administration rates; further research is required to determine statistical significance.

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IRB Status: Approved

Title: Retrospective analysis of adherence to aromatase-inhibitor therapy and correlates to early discontinuation of therapy in American Indian and Alaska Native women with breast cancer

Purpose: Although the incidence of breast cancer is lowest among American Indian and Alaska Native women compared to all other ethnic groups, the mortality rate in this ethnic group is highest per incident observed. Currently, there is limited data regarding adherence rates to aromatase-inhibitor therapy among American Indian and Alaska Native women with breast cancer.

Methods: In this retrospective study, we evaluated the adherence to aromatase-inhibitor therapy among American Indian and Alaska Native women with breast cancer. Adherence was defined as the percentage of prescribed medications taken as prescribed. The study population included all American Indian and Alaska Native women with breast cancer who started aromatase-inhibitor therapy at a specific hospital from January 1, 2015 to December 31, 2017. Patients were excluded if they had less than 3 months of adherence data or were lost to follow-up. The primary outcomes were the percentage of patients who discontinued aromatase-inhibitor therapy within the first year of treatment, and the correlation between adherence and discontinuation. Descriptive statistics were used to summarize the data, and logistic regression was used to determine predictors of discontinuation.
inhibitor therapy among American Indian and Alaska Native women. The objective of this study is to determine how many breast cancer patients who initiated aromatase-inhibitor therapy discontinued early and to evaluate adherence in patients who persisted with therapy. A secondary objective will be to identify possible risk factors which may correlate to early discontinuation of therapy.

**Methods:** This study was approved by the Institutional Review Board. This will be a retrospective chart review from 1/1/2006 to 1/1/2016 using electronic medical records. All post-menopausal women that were newly prescribed aromatase-inhibitors in the specified time frame and receiving care in the Phoenix Indian Medical Center (PIMC) oncology clinic will be reviewed. There will be no direct patient contact and no individual consents obtained. The data set for this study will be created with the assistance of a PIMC data specialist. All data will be stored in a password protected Excel spreadsheet with minimal patient identifiers. Data will be collected from electronic health records of the patients that meet the criteria for the chart review. Data will include demographic data, adverse drug reactions (ADR’s), descriptions of ADR’s, specific aromatase-inhibitor used, total time on aromatase-inhibitor therapy, time to discontinuation of therapy and additional therapy or steps taken to aid with side effects.

**Results:** A total of 142 patients were identified from the specified years who met criteria to be prescribed an aromatase-inhibitor. Of these 142 patients, 106 were prescribed and picked up at least 1 prescription for an aromatase-inhibitor. Seven patients were prescribed letrozole, 11 patients received exemestane, and 83 patients received anastrozole. A total of 30 patients were never prescribed an aromatase inhibitor, due to contraindications, loss to follow up, or declining therapy. The most common adverse drug reactions were joint pain or stiffness and hot flashes. Joint pain was associated with the highest rate of aromatase-inhibitor discontinuation. Further results are pending and to be determined.

**Conclusion:** To be determined, pending final results.

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IRB Status: Approved

**Title:** Opioid overuse pilot program: Impact of provider education on chronic opioid prescribing practices in the Aetna Better Health of West Virginia Medicaid population.

**Purpose:** To evaluate the impact of telephonic prescriber education on opioid prescribing patterns for the treatment of chronic pain among the Aetna Better Health of West Virginia Medicaid population.

**Methods:** A prospective observational study was conducted using pharmacy claims data on the Aetna Better Health of West Virginia Medicaid population. A utilization report was run in RxNavigator from a period of October 1st, 2016, through December 31st, 2016. This report used paid pharmacy claims to identify members on chronic opioids (90 days or more) with a daily Morphine Milligram Equivalent (MME) of ≥50. Members with active, aggressive cancer were excluded. Another utilization report was run to identify which chronic opioid users filled a concomitant benzodiazepine prescription during the same time period. A flexible script was created for telephonic outreach with opioid prescribers. The script explained the risks of a MME ≥ 50 and provided strategies to reduce opioid misuse, addiction, and overdose. Another flexible script was created for opioid prescribers with members on concurrent benzodiazepines. This script was delivered during the same phone call as the initial opioid outreach. Prescriber outreach was primarily conducted from February to April 2017. To evaluate outcomes, paid pharmacy claims will be analyzed to assess for post-intervention changes in total daily MME dosage, utilization of chronic opioids, and concurrent utilization of opioids and benzodiazepines. Claims will be analyzed from the time period of January 1, 2017, to May 30, 2017.

**Results:** Utilization reports identified 298 members as being chronic opioid users with daily MMEs of ≥50 during the time period from 10/1/2016 to 12/31/2016. This excludes members with a diagnosis of active, aggressive cancer. 251 unique prescribers were identified as providing these opioid prescriptions to the members. Out of the 298 chronic opioid users, 64 members filled prescriptions for a benzodiazepine during the same period. Provider demographics collected from utilization reports indicate that the majority (78.5%) of chronic opioid prescribers for these 298 members were of the male gender. The most common specialties among opioid prescribers were family practice (16%), internal medicine (10%), orthopedic surgery (10%), and emergency medicine (8%). The original timeline of this research project was pushed back and extended due to intervention collaboration with other health plans in the state of WV. Post-intervention pharmacy claims will be analyzed for the time period of January 1, 2017, through May 30, 2017. Final results are pending at this time.

**Conclusion:** A significant limitation occurred after this research project received IRB approval. After the start of the project, the state of West Virginia initiated a collaborative intervention effort among health plans to combat opioid misuse and comply with the CDC guideline recommendations. Patients with daily MMEs of ≥50 for a consecutive 90 days were identified using reverse look. These patients were then recommended for PA edit and were restricted from filling additional opioid prescriptions unless they obtained PA approval. To comply with state efforts, the PA edit went live in the ABH of WV plan on 3/1/2017. As a result, any reductions in daily MME dosage and utilization of chronic opioids after March 1st cannot be attributed solely to the
prescriber outreach efforts of this research intervention. Final data results are still pending at this time. Conclusions will be updated once final results are obtained and analyzed.

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Title:  Evaluating use of a deprescribing protocol and blister packaging for elder Native Americans at increased risk of non-adherence and poor outcomes due to polypharmacy.

Purpose:  Care goals change as patients age. For elderly patients, complex medication regimens are difficult to remain adherent to and may no longer be appropriate. Deprescribing protocols may be enacted when the pharmacist, provider, and patient agree that a medication may be systematically removed from a drug regimen based on specific safety and efficacy factors. Adherence is also an issue for all patients on chronic medications, with about 50% adherence among elders. In order to simplify understanding of medication regimens and create a visual reminder, adherence blister packaging may help increase medication adherence among elderly patients.

Methods:  This project aims to establish the use of a deprescribing protocol for elderly patients and provide adherence blister packaged medications to those that may benefit most. A pharmacist will perform a medication review for any patient over 65 years old admitted to the inpatient unit or at the referral of an outpatient primary care clinic provider. The care team of the provider, pharmacist, patient, and caregivers will agree upon a plan for safely removing inappropriate medications from the regimen. The pharmacist will follow up with the patient during the deprescribing protocol and monitor for adverse events. Patients will be offered medication refills in an adherence reminder blister package if they meet the following criteria: over 65 years old, five or more chronic solid dosage form medications, and lack of support through paid assistance or consistent family care. Patients on stable chronic medications and their caregivers will receive education on the use of the adherence blister package. To evaluate adherence, patients will return their used blister packages each month in exchange for their refills in order to calculate missed doses. Patients will also be followed for the duration of the study for hospital admissions and health outcomes based on chronic conditions, such as changes from baseline in A1c or blood pressure, through chart reviews.

Results:  Through collaboration with the primary care provider team, the deprescribing evaluations were narrowed to focus on the following medications and classes: aspirin, bisphosphonates, HMG-coA reductase inhibitors (statins), proton pump inhibitors, and vitamins and supplements. At the time of this submission, 131 patients have been evaluated for the application of a deprescribing protocol upon admission to the inpatient unit. A consultation for outpatient referral will be established in the future. Through these evaluations, 61 recommendations have been made by a pharmacist to primary care providers for deprescribing for 35 patients. These recommendations were communicated to the primary care providers through a standardized note template. For the 35 patients that received deprescribing recommendations, there was an average of 1.74 recommendations made per patient. It is unclear how many recommendations have been approved. Standardizing communication of the acceptance of recommendations and plans for deprescribing protocols will be established in the future. Of the patients evaluated for deprescribing, 29 patients met inclusion criteria for adherence packaging. Filling adherence packaging will be incorporated into the outpatient pharmacy workflow in the future.

Conclusion:  (100 words) A deprescribing protocol should result in a decreased pill burden for patients. Adherence packaging should result in better management of chronic conditions through better medication adherence. Implementing a deprescribing protocol within the primary care setting requires collaboration and clear communication between the pharmacist, primary care provider, patient, and caregivers.

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IRB Status:  Approved

Title:  Weight Based Variability of Response to Stress-Dose Steroids in Patients with Septic Shock

Purpose:  Since methods of diagnosing adrenal insufficiency in this state are unclear, many clinicians resort to prescribing intravenous (IV) hydrocortisone. Given set dosing, obese patients may be inadequately dosed. The intention of this study was to evaluate variability in patient response to corticosteroids in septic shock by assessing duration of vasopressor therapy following hydrocortisone administration among categories of patient weight. Methods of diagnosing adrenal insufficiency in this state are unclear, many clinicians resort to prescribing intravenous (IV) hydrocortisone. Given set dosing, obese patients may be inadequately dosed. The intention of this study was to evaluate variability in patient response to corticosteroids in septic shock by assessing duration of vasopressor therapy following hydrocortisone administration among categories of patient weight.

Methods:  This study was conducted as a pilot study through retrospective chart review. Using the EPIC database, adult patients in the Medical Intensive Care Unit (ICU) who had an
order for IV hydrocortisone between the dates of 11/2013 and 12/2016 were identified. Data was collected in a retrospective manner until each study category was filled. Patients were excluded from the study if hydrocortisone was ordered for any reason other than septic shock, vasopressor therapy was not initiated, hydrocortisone was ordered but not administered, or if the BMI category had been filled. Variables collected include: demographic data, comorbid conditions, Sequential Organ Failure Assessment (SOFA) scores, source of infection, duration of mechanical ventilation, duration of vasopressor therapy, dose of hydrocortisone, inpatient mortality, time spent in the Emergency Department (ED), and length of ICU and hospital stay. Data was collected with REDCap and was analyzed with STATA 13. Descriptive statistics were used for continuous variables and reported as medians with interquartile ranges. Fisher’s exact test was used for categorical variables. For all tests, a p-value of ≤ 0.05 was considered statistically significant.

**Results:** One hundred and twenty patients were included in the analysis with forty patients included in each category of Body Mass Index (BMI): BMI ≤29.9, BMI 30-39.9, and BMI ≥40. The median duration of vasopressor therapy was 52, 79, and 112 hours respectively (p=0.206). The median duration of mechanical ventilation was 65, 105, and 135 hours respectively (p=0.106). The median length of hospital stay was 8.5, 11, and 11.5 days (p=0.573) and ICU length of stay was 4, 6, and 6.5 days respectively (p=0.098). Baseline SOFA score, baseline cortisol levels, mortality, and incidence of mechanical ventilation did not differ between groups.

**Conclusion:** There was a trend towards increased duration of vasopressor therapy, duration of mechanical ventilation, and length of ICU and hospital stay; however, this study was underpowered to detect a statistically significant difference in each outcome. Larger studies are needed to further assess optimal doses of hydrocortisone in septic shock for various categories of patient weight.

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IRB Status: Approved

**Title:** Effects of an Antimicrobial Dosing Guideline for Inpatient Neonates

**Purpose:** Studies have shown that neonates are at an increased risk for medications errors and subsequent adverse drug effects due to individualized weight-based dosing of antibiotics. In addition, age-specific parameters such as volume of distribution and renal maturation need to be evaluated when dosing antibiotics in this patient population. The purpose of this project was to evaluate the trends in antibiotic dosing prior to and after the introduction of a standardized antimicrobial dosing guideline at Maricopa Medical Center (MMC).

**Methods:** This was a single center, retrospective chart review of antibiotic orders in the time periods of April 1, 2012 to March 31, 2014 and August 1, 2014 to July 31, 2016 (the timeframes representing pre- and post-implementation of the Arizona Children’s Center Neonatal Antimicrobial Dosing Guideline). Select antibiotic orders (ampicillin, cefepime, cefotaxime, gentamicin, piperacillin/tazobactam, and vancomycin) during hospital admission from patients under 29 days of age were included. Orders were excluded if they were one-time antibiotic doses and if they were modified based on patient age, weight, or drug levels during the treatment course. The primary endpoint was the rate of antibiotic dosing and frequency errors before and after the implementation of the dosing guideline. Secondary endpoints included: stratified error rates based on patient age, antibiotic type, and medical unit where the error occurred; number of dosing errors reported in the user-reported medication error reporting system (MIDAS); and errors during order entry or verification. Sample size was calculated using a presumed pre-intervention error rate of 35% and a post-intervention error rate of 15%. As such, 82 antibiotic doses were evaluated in the pre- and post-intervention groups to achieve 80% statistical power and a significance level of 5%. A chi-squared test was used for the primary endpoint. A Student’s t-test with a 95% confidence interval was utilized to evaluate secondary endpoints.

**Results:** A total of 164 antibiotic orders were included in the analysis. A reduction in antibiotic dosing error rate was observed after implementation of the dosing guideline (20.7% vs. 2.4%, p < 0.05). There was also a decrease in incorrect antibiotic dosing interval (20.7% vs. 6.1%, p < 0.05). Combined, there was an increase in orders having both the correct dose and frequency after guideline implementation (70.7% vs. 93.9%, p < 0.05). These results were consistent across all medical units. The NICU saw an error rate reduction (21.3% vs. 1.5%, p < 0.05). The error rate for all other medical units also declined (19% vs. 7.1%, p = 0.32). The rate of pharmacist intervention on antibiotic orders increased after guideline implementation (1.2% vs. 9.8%, p < 0.05). However, the number of user-reported dosing errors via the MMC internal reporting system was similar between the pre-and post-intervention groups (13 vs. 14).

**Conclusion:** The implementation of an antibiotic dosing guideline at MMC significantly reduced the rate of antibiotic dosing and frequency error rates in neonatal patients. Further analysis revealed that the reduction in error rates were consistent across all medical units and resulted in an increase in pharmacist interventions. The findings of the study suggest that guideline implementation may increase provider awareness of appropriate dosing for frequently used antibiotics in neonatal patients, leading to a reduction in medication errors.

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Title: Collaborative Practice Agreement At A Pharmacist-Run Anticoagulation Clinic

Purpose: To describe the process of creating a collaborative practice agreement and identify key components of an agreement targeting anticoagulation.

Methods: To help establish some background information about provider status and collaborative practice agreements, various online resources from the Centers for Disease Control and Prevention and the American Society of Health-System Pharmacists’ repertoire were consulted.

Yuma Regional Medical Center’s (YRMC) main anticoagulation clinic had already established a protocol that was utilized by all clinical pharmacists. The protocol includes specifics on the clinical component of warfarin management as well as the logistics side of how to run the clinic. The protocol details how to obtain physician referrals, questions all patients must be asked during visits, how to make INR-specific dosage adjustments, appropriate INR monitoring frequency and more. The clinical recommendations in the protocol were obtained from the American College of Chest Physicians’ (ACCP) evidenced-based guidelines for antithrombotic therapy and prevention of thrombosis. Updates were made to this protocol according to the ninth and latest edition of the ACCP guidelines and then all content was added to the collaborative practice agreement. Desired additional pharmacy services, such as warfarin and enoxaparin prescribing, were included in the agreement as well.

This agreement requires the review and signature of head physicians of the Family Medicine Center at Tuscany Plaza in Yuma, Arizona. Upon approval, the physician who oversees this clinic will refer all patients requiring warfarin management to YRMC’s anticoagulation clinic.

Results: Not applicable

Conclusion: Not applicable

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Title: Outcomes of palivizumab prophylaxis for respiratory syncytial virus in high risk infants in a managed care organization

Purpose: Palivizumab is the only pharmacologic agent approved for the prophylactic treatment of respiratory syncytial virus in high risk infants. There is limited information on the outcomes of patients who have only received a partial course of palivizumab prophylaxis and patients who qualify for use but do not receive any medication. This evaluation was designed to define the organizational palivizumab population and usage by determining the total costs and efficacy of palivizumab prophylaxis for reducing RSV related illness among high risk infants and to provide information on utilization and appropriateness of vial size with weight based dosing.

Methods: A retrospective descriptive enterprise wide study was conducted. Data was collected through retrospective medical claims and prior authorization claims. Medical claims reports were used to identify infants that have been hospitalized or had an outpatient visit associated with RSV infections. Infants that are not considered high risk were excluded from the RSV hospitalization data. Inpatient and ER visits were identified by their respective ICD-9/10 codes.

Members were categorized into four groups: total utilizers of palivizumab, members who received the recommended course of palivizumab and were hospitalized for RSV, members who received less than the recommended course of palivizumab and were hospitalized with RSV, and high risk infants hospitalized with RSV and received no prophylactic doses of palivizumab. Total costs for palivizumab and RSV hospitalizations and the rate of ER visits and ICU/NICU visits was calculated. Prior authorization requests were reviewed to determine the clinical indication frequency, consistency with clinical guidelines, completion of approved course of therapy, and appropriate choice of vial size for member weight. The time frame for all reports will be from October 2015 – March 2016 to capture the most recent RSV season. A sample size of 155 was used for the prior authorization review to ensure a 95% confidence level with a margin of error of 5%.

Results: One thousand and ninety four members received at least one palivizumab injection during the 2015-2016 RSV season. Seventy-eight members that received RSV prophylaxis were also hospitalized or had an outpatient visit associated with RSV. Fifty members were diagnosed with RSV despite receiving a full course of palivizumab determined by the date of their first injection and 28 members did not receive a full course of medication. Three-thousand five hundred and four members had a high risk diagnosis and had RSV claims and did not receive any prophylactic medications.

The total organizational costs for RSV infection in high risk infants was $7.1 million dollars for the 2015-2016 RSV season. An estimated total of $9.9 million dollars was spent on RSV prophylaxis with palivizumab usage based on the organizational total average drug cost. Thirty-nine percent of approvals that had weight information available were dispensed an inappropriate strength. Ninety-six percent of prior authorizations were approved in consistency with criteria specified in clinical guideline. The most common indication for prior authorization request was chronic lung disease with forty-nine percent of requests. Thirty-nine percent of high risk infants had ER visits compared to two percent of patients treated with palivizumab. Six percent of
high risk infants had ICU/NICU visits compared to two percent of patients treated with palivizumab.

**Conclusion:** The current analysis suggests that palivizumab is not cost-effective but is associated with better health outcomes including a reduction in emergency room and ICU/NICU visits. There is a large amount of high risk infants that would qualify for palivizumab prophylaxis and future interventions should focus on identification of high risk members during the RSV season for individual health plans due to the wide variation in seasonality and operationalization of palivizumab for each state. There are opportunities to reduce cost and improve efficiency through the development of palivizumab centers.

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**Title:** Improving transitions of care for HSCT recipients after discharge

**Purpose:** To date, no studies have been published that have evaluated the impact of pharmacist-led post-discharge telephone calls on outcomes in a patient population consisting strictly of hematopoietic stem cell transplant recipients. As such, this pilot study was designed to evaluate the impact of introducing a pharmacist-driven post-discharge intervention on transitions of care for a hematopoietic stem cell transplant (HSCT) recipient population. It was also designed to identify the frequency and types of medication-related and transitions of care problems that might affect HSCT recipients after discharge. Being a pilot study, this project was designed as a prospective, single-arm intervention evaluation.

**Methods:** All adults scheduled to receive an allogeneic or autologous hematopoietic stem cell transplant (HSCT) are screened for enrollment eligibility. Eligible individuals are recruited and consented during their final outpatient appointment prior to transplantation. Once an individual has consented to participate, they proceed through their admission and transplantation as scheduled. If transplantation is successful and the patient is discharged, researchers attempt the interventional telephone call within 24 hours of discharge. Using a structured call script, researchers evaluate participant adherence and understanding of discharge therapies, with particular emphasis on anti-rejection and infection prophylaxis medications. Medication-related problems identified during the telephone call are documented in the participant’s electronic medical record, and assistance is provided towards resolution of the problems. After completion of the telephone call, a post-intervention survey will be administered to participants at their first post-transplant care appointment. Additional surveys will also be administered to members of the healthcare team at the cancer center. Both surveys utilize a 4-item Likert scale to assess participant and provider perceptions regarding the impact and/or value of the new intervention. Descriptive analysis is being used to summarize survey responses and any medication-related problems identified during the intervention. The target sample size is 100 participants, based on the estimated 100-110 HSCTs that are performed by Banner-UMCT and the UACC on an annual basis.

**Results:** Data collection and analysis is ongoing at this time. No post-intervention surveys have yet been collected, and healthcare providers at the outpatient cancer center will not be surveyed until the target sample size has been achieved and participant data collection is complete. However, preliminary results are available and described here. Thus far, 10 individuals have been approached, and 8 have consented to participate. Of the 8 consented, 5 post-discharge telephone calls have been attempted, and 4 have been completed. The 5th participant could not be reached within the specified window of time (24 hours). The other 3 participants are undergoing or have yet to undergo transplantation at this time. Of the 5 completed telephone calls, 60% of the participants were male, and 100% underwent autologous HSCT. The median duration of the telephone calls was 32.5 minutes, and a median of 3 medication discrepancies related to non-transplant therapies have been identified. No discrepancies or problems regarding immunosuppressive or antimicrobial prophylaxis therapies have been identified. Patients have reported a median of 1.5 adverse effects, and the median number of recommendations and interventions made to patients is 0.5 and 1, respectively. Key interventions made include reminding a patient of scheduled appointments that may have otherwise been missed, and assisting with home health infusion enrollment for ongoing intravenous antibiotic treatment of a bacteremia.

**Conclusion:** Preliminary data suggest that ambulatory care pharmacists may have a positive impact on patient care after HSCT transplantation. Although medication-related problems have not yet been identified with regards to the projected high-risk therapies (immunosuppression and antimicrobial prophylaxis), other problems relating to chronic disease therapies, and potential gaps in follow-up care have been realized. More conclusive results will hopefully become available with ongoing patient recruitment and data collection to the target sample size.

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Title: Quality improvement project to standardize the documentation of pharmacist-initiated Medication Therapy Management (MTM) recommendations and improve provider engagement

Purpose: The purpose of this quality improvement project was to create a standardized electronic form for documenting pharmacist-initiated MTM recommendations and to improve provider engagement, recommendation approval rates, data collection, and user satisfaction and productivity.

Methods: This single-centered project was intended to be a research study following the Plan-Do-Study-Act (PDSA) model proposed by the Institute for Healthcare Improvement. Compared to the existing free-text MTM notes, the standardized MTM form was designed to improve productivity of pharmacists and providers, and to provide trackable data on acceptance rates of recommendations and rationales for disapproval. When the MTM form was being designed by the clinical pharmacist and the electronic health record (EHR) specialist, it was originally not a high priority within the organization. As the project progressed and the EHR team’s capacity to prioritize the form implementation increased, the form was moved to the testing environment for review and simulated data collection. Reports from simulated data collection showed unactionable results due to various confounders. Even though the data collected demonstrated approval rates, disapproval rates, and disapproval reasons, the relationship between the diagnoses, medications, medication-related problems (MRPs) and corresponding disapproval reasons remained unclear. It was identified that the confounders resulted from lack of interdisciplinary communication, especially with the statistical analyst at the initial phase of the form design. Moreover, since the creation of the form, the EHR system functionality had improved significantly. As a result, an interdepartmental team was assembled to facilitate a new form design process. Members of the team included clinical pharmacists, provider liaison, EHR specialist, and statistical analyst. Taking into consideration the enhancements of the EHR system, the team deemed it more appropriate to approach the project from a continuous quality improvement (CQI) perspective, thus changing the study design. Weekly thereafter, the team evaluated and revised the form to ensure it would produce actionable data for all stakeholders. Upon implementation of the form, subgroup analysis could be performed to collect statistics on the provider engagement and acceptance rates for each MRP. Additionally, the patterns in acceptance and declination rates, as well as prescribing trends, will be easily trackable at the organizational level. This will allow for more efficient pharmacy interventions to improve the quality of patient care at the population level.

Results: This form is on track for submission to the EHR vendor for creation and then to be piloted with EHR super-users and revised based on their feedback, before being implemented. The final design of the MTM form will be user-friendly and will produce meaningful data for clinical practice and CQI analysis. The standardized format will also have the potential to increase satisfaction and productivity for both pharmacists and providers. Providers’ efficiency will be further increased by the form’s capacity to transfer their responses to MRPs directly to their office visit notes.

Conclusion: In response to our dynamic organizational needs and the expanded capacity of the EHR system, the original PDSA study was changed to a CQI project. The MTM form designing process proved the importance of involving all stakeholders to identify the needs of collaborating departments early on, while continually reassessing the capabilities and functionality of the institutional EHR. The effectiveness of the form will be assessed in future studies via pre- and post-implementation analyses.

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Title: Study of Procalcitonin for Acute COPD Exacerbations

Purpose: Current guidelines recommend the use of antibacterial agents in all patients with chronic obstructive pulmonary disease (COPD) exacerbations that are severe enough to require hospital admission. However, literature indicates that many of these exacerbations may be non-bacterial in origin. Currently, few studies have evaluated the utility of the biomarker procalcitonin in differentiating between bacterial and non-bacterial causes of COPD exacerbations. The purpose of this study is to evaluate a procalcitonin-guided treatment protocol in veteran subjects admitted with acute exacerbation of COPD.

Methods: This prospective, randomized, controlled study has been approved by the hospital’s Institutional Review Board. The electronic medical record was used to identify subjects who were admitted with acute COPD exacerbation. Subjects who consented to participate in the study had a procalcitonin level measured by the laboratory using a point-of-care testing method. Subjects were then randomized to one group receiving the standard of care based on current guidelines (including antibiotics, systemic corticosteroids, and inhaled bronchodilators); the second group received care based on procalcitonin level. Subjects with procalcitonin levels less than 0.1 ng/mL were given systemic corticosteroids and bronchodilators only. Subjects with procalcitonin levels greater than or equal to 0.1 ng/mL received standard care based on current guidelines, including antibiotics. Outcome measures include utilization of the healthcare system for worsening or persistent COPD symptoms at 10 and 30 days.
after enrollment, antibiotic-related adverse events, and overall utilization of antimicrobials.

**Results:** This study in progress is continuing to actively enroll participants. The results discussed here are preliminary. Ten subjects have been enrolled, with an average age of 71 years. Nine of the ten subjects were male, and one was female, with nine Caucasian subjects and one Native American. Average FEV1 was 48% of predicted. Four subjects have been randomized into the control group, and six subjects have been randomized into the procalcitonin-guided therapy (intervention) group. Out of the ten subjects, 80% had a negative (less than 0.1 ng/mL) procalcitonin level on admission, and 20% had a positive (greater than or equal to 0.1 ng/mL) level on admission. Additional results to be presented at the meeting.

**Conclusion:** To be presented at the conclusion of full data analysis.

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**Title:** Perioperative bridging in high risk atrial fibrillation subjects on concomitant warfarin therapy

**Purpose:** The 2012 CHEST guideline recommends bridging atrial fibrillation patients receiving temporary warfarin interruption if the patient is at high risk of stroke. Recent studies, including the BRIDGE study, does not contradict this recommendation but did find that bridging atrial fibrillation patients at low risk for stroke may increase the risk of major bleeding while not having a significant improvement in the rate of all-cause mortality, myocardial infarction, deep vein thrombosis, and pulmonary embolism. The purpose of this study is to assess the risks and benefits of perioperative bridging in atrial fibrillation patients, on warfarin therapy, with a history of stroke.

**Methods:** This is a retrospective study of 155 subjects at the Southern Arizona Veterans Administration Healthcare System. To be included in the study, subjects had to have atrial fibrillation, history of stroke or transient ischemic attack, had a surgical procedure between October 1999 and August 2016, was on warfarin prior to surgical procedure, and had a calculated and CHA2D2-VASc score greater than three. Subjects who had procedures not requiring temporary warfarin interruption were excluded from the study. Each procedure was counted as a separate event and a total of 240 procedures were included in the analysis. Information analyzed included any minor or major bleeding events and any clotting events within 3 months of procedure as defined by the protocol. Procedures were also separated into high bleed risk versus low bleed risk categories based on the protocol. Statistical analysis was completed using the chi square test with P value less than 0.05 noted as statistically significant.

**Results:** Two out of 155 subjects were female (1.3%). The average CHA2D2-VASc score was 5.8. There were 240 procedures in total; 142 procedures were considered high risk while 98 procedures were considered low risk. Out the 240 procedures, 138 procedures involved perioperative bridging and 102 procedures did not. 13% of these procedures resulted in a bleeding event and 2% resulted in a clotting event.

A total of 32 bleeding events were noted. The difference in bleeding events between bridged versus not bridged was 13.7% and 13.0% (P = 0.88) respectively. When bleeding events were broken down by minor versus major bleeding events, there were 18 minor bleeds and 14 major bleeds. Of the procedures that resulted in minor bleeds, 10 procedures were bridged and 8 procedures were not bridged (P = 0.86). Of the procedures that resulted in major bleeds, 8 procedures were bridged and 6 were not bridged (P = 0.98).

A total of 4 clotting events were noted with an average perioperative INR of 1.3. The difference in clotting events between bridged versus not bridged was 2.17% and 1.0% (P = 0.48) respectively.

**Conclusion:** There was no significant difference in the measured endpoints but this may be reflect of type II error. The occurrence of thrombus, major bleeding, and minor bleeding were all more common in patients who received perioperative bridging, which is in accordance with the findings of the ORBIT-AF study. This study is unable to support the 2012 CHEST guideline recommendation of intra-operative bridging in high risk atrial fibrillation patients. Further studies are warranted.

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**Title:** Needs Assessment for the Implementation of a Standardized Transitions of Care Process at an Interdisciplinary Academic Family Medicine Practice located along the Texas-Mexico Border

**Purpose:** The Department of Family and Community Medicine at the Texas Tech University of Health Sciences Center-El Paso (TTUHSC) serves a diverse population along the US-Mexico border. Currently, TTUHSC lacks a standardized transitions of care (TOC) process for patients discharged from inpatient family medicine to outpatient clinic follow-up. Furthermore, it is unknown whether the current TOC process meets criteria for Transitional Care Management (TCM) billing requirements set forth by Medicare & Medicaid Services (CMS). Aim I of this project was to assess the current
workflow process for the discharge transition and subsequent follow-up outpatient, Aim II was to describe transitions of care outcomes, and Aim III was to analyze the cost of missing and achieving care targets to determine the need for a standardized TOC process.

Methods: Aim I of this project created a current TOC workflow model by reviewing available TTUHSC policies and procedures and interviewing key personnel regarding the discharge and follow-up process. To identify gaps in the current standard of care compared to best practices, a retrospective chart review was performed for patients discharged from the inpatient hospital setting to the community setting from March 1, 2016 to May 30, 2016. The review included patients who were (1) discharged to home, (2) Medicare beneficiaries, (3) established at TTUHSC outpatient clinic, or (4) without a primary provider and approved for follow-up at TTUHSC outpatient clinic. Aim II analyzed the patient cohort for 30-day re-admission rates and classification for TCM billing codes if qualified. Aim III assessed the cost associated with missing care targets and potential revenue according to TCM billing payments allocations. The University of Texas at El Paso International Review Board with a letter of support from TTUHSC approved this study as a quality improvement project.

Results: For Aim I, no formal policies or procedures were identified regarding the transition of care from discharge to follow-up at the outpatient TTUHSC clinic. Upon interview with key staff, a current work-flow model was developed. This work flow involves communication with the clinic scheduling department to set up follow-up appointments through the electronic medical record (EMR). Upon comparison to best practices, areas identified to strengthen the TOC process include the involvement of an interdisciplinary team, a mechanism to ensure consistent patient contact by clinic for all patients, and the integration of medication reconciliation prior to the follow-up appointment. The retrospective review to analyze patients discharged from hospital to community produced a cohort of 37 patients that met the established inclusion criteria. Of these 37 patient charts, 62% of all discharge summaries were available in the clinic EMR and 61% of discharge summaries in the clinic EMR were sent to the clinic scheduler. In total 59% of all patients discharged during the 3-month duration had a follow-up appointment, and the clinic initiated contact with these patients to schedule the post-discharge appointment for 22% of patients. Aim II identified 11% of patients were re-admitted within 30 days of discharge and 14% seen at TTUHSC outpatient clinic met criteria for TCM billing. The estimated additional revenue assessed in AIM III from the 14% of patients that met TCM billings targets was $538.35; conversely, the estimated cost of missing care targets was $3,805.8 within the 3-month study period and projected $15,233 yearly.

Conclusion: In the literature, a standardized, team based TCM service has been shown to decrease readmission rates for high and moderate risk patient population. The outcomes of this project identified processes are in place at the TTUHSC family medicine service to facilitate a standardized TOC process which could meet both TCM & best practices. This quality improvement project will help administrators better understand the impact of a standardized TOC process on patient outcomes.

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Purpose: In studies comparing CDI treatment regimens, receiving SOT is a typical exclusion criterion and there has not been any comparative studies in SOT patients. However, some clinicians are hesitant to treat CDI in SOT patients as non-SOT patients and prefer prescribing combination therapy of intravenous metronidazole and oral vancomycin for uncomplicated cases without any supporting evidence. Therefore, the aim of this study is to compare CDI recurrence rates between combination therapy of metronidazole and vancomycin versus monotherapy with either metronidazole or vancomycin in SOT patients with a first episode of uncomplicated CDI.

Methods: Single centered, retrospective, cohort study for patients who were admitted to Banner university medical center, Tucson between November 1, 2013 and October 30, 2016.

Results: This study results are not finalized yet. By the time the conference data will be collected and analyzed.

Conclusion: Although this study results have not been determined yet, but it may provide further insight into a possible treatment algorithm for CDI in transplant patients. This may assist in creating strategies to optimize therapy. This could provide benefit of reducing medication costs and decrease length of hospital stay.

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Title: Ceftaroline vs standard therapy for the treatment of MRSA pneumonia

Purpose: The Infectious Diseases Society of America/American Thoracic Society guidelines for hospital-acquired pneumonia, ventilator-associated pneumonia, and community-acquired pneumonia recommend vancomycin or linezolid for empiric treatment of methicillin-resistant Staphylococcus aureus (MRSA) pneumonia. However, increasing reports of vancomycin-resistant, vancomycin-intermediate, and linezolid resistant strains of Staphylococcus aureus can limit the utility of these antimicrobials. Ceftaroline fosamil is a novel agent for the treatment of MRSA that can potentially overcome current resistance mechanisms. The purpose of this study was to compare the efficacy of ceftaroline, linezolid, and vancomycin for MRSA pneumonia in patients who received less than 72 hours of other antibiotics with MRSA activity.

Methods: This retrospective 1:1:1 case-control study included patients with respiratory culture-positive MRSA pneumonia with clinical signs and symptoms likely indicative of pneumonia, who received less than 72 hours of other susceptible antibiotics with MRSA activity. Patients on ceftaroline, linezolid, and vancomycin were matched 1:1:1 based on mechanical ventilation status, age, and ICU admission. The primary outcome was clinical cure which was defined as no additional antibiotic therapy with MRSA activity within 7 days of treatment discontinuation and resolution of baseline pneumonia criteria.

Results: Six groups were successfully matched and included in the study. The primary outcome of clinical cure was achieved in four patients in the ceftaroline group, two patients in the linezolid group, and four patients in vancomycin group (p=0.59). There were no statistically significant differences seen for any secondary outcomes.

Conclusion: Ceftaroline showed activity against MRSA pneumonia, although no significant differences were seen for clinical cure, or secondary outcomes.

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Title: Trends In Identification Of Medication-Related Problems And Resolution By Medicare Insurance Type

Purpose: To evaluate the occurrence of medication-related problems (MRPs) by type (adherence, guidelines, cost, and safety) and the acceptance rates of interventions by type, between Medicare Advantage Prescription Drug plans (MAPDs) and Prescription Drug Plans (PDPs) and to identify trends in the data between the two contract years (2014 and 2015).

Methods: This retrospective evaluation utilized 2014 and 2015 outcome summary reports generated by a national Medication Therapy Management (MTM) provider for all individual contracted plans. Data collected for each contract included: plan type; total number of eligible patients; total number of MRPs identified; number of therapy interventions; and number of problems resolved. Interventions were categorized by type: safety, cost, guideline gap, or adherence gap. The primary outcome, prevalence of MRPs identified, was computed from the total number of MRPs identified divided by the total number of qualified patients. The secondary outcome, acceptance and resolution rate of interventions, was computed from the number of
interventions accepted divided by the number of MRPs identified with measurable data. Prevalence and intervention resolution rate data, according to therapy intervention type, were compared between MAPDs and PDPs. A Chi Squared Test was used for this analysis. Qualitative analysis also was conducted to compare the 2014 and 2015 data to identify trends between the two contract years. Statistically significant differences in frequency were assessed at an alpha level less than 0.05.

**Results:** The 2014 data included 167,094 members from 68 MAPD plans and 638,813 members from 28 PDP plans with 162,176 MRPs total. The 2015 dataset contained 152,235 from 77 MAPD plans and 571,013 members from 275 PDP plans with 596,308 MRPs. In 2014 and 2015, MAPDs had more adherence problems than PDPs (p less than 0.0001; p less than 0.0001); however, MAPDs accepted less adherence recommendations (p less than 0.0001; p less than 0.0001). MAPDs also had more guideline gaps in both years (p less than 0.0001; p less than 0.0001); yet MADPs accepted less guideline gap interventions in 2014 (p less than 0.0001) but accepted more in 2015 (p less than 0.0001). In both years, MAPDs had less medication-related safety problems than PDPs (p less than 0.0001; p less than 0.0001) and accepted more safety interventions (p less than 0.0001; p less than 0.0001). During 2014, MAPDs used more high-cost medications (p less than 0.0001) and accepted more cost-saving interventions (p less than 0.0001). In 2015, MAPDs used less high-cost medications (p less than 0.0001) and accepted less cost-saving interventions (p equals 0.3533).

**Conclusion:** This retrospective evaluation showed some statistically significant differences in the number of medication-related problems identified and resolved between MAPDs and PDPs. These initial findings are encouraging, yet further evaluation is needed to identify whether other factors (e.g., member characteristics, environmental factors) influenced the observed differences between health plans. Finally, additional research is warranted to determine the generalizability of these results and whether these trends hold across longer-term investigations.

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**Title:** Lacosamide for early post traumatic seizure prophylaxis in traumatic brain injury

**Purpose:** To compare the efficacy and safety of lacosamide versus phenytoin for seizure prophylaxis in patients following traumatic brain injury.

**Methods:** All traumatic brain injury patients who received seizure prophylaxis with either phenytoin or lacosamide from August 2012 to September 2016 were retrospectively identified. Patients were included if they presented within 24 hours of injury, had seizure prophylaxis initiated within 24 hours of admission, were ≥18 years old, and had a CT scan that revealed cortical contusion, subarachnoid hemorrhage, subdural hemorrhage, epidural hemorrhage, intraparenchymal hemorrhage, or intraventricular hemorrhage. Patients were excluded if they were taking antiepileptic medications prior to admission, had received multiple seizure prophylaxis medications, had a seizure before prophylaxis was initiated, had expected or confirmed brain death within 48 hours of admission, or were transferred to another hospital within 24 hours. Efficacy was assessed by comparing the incidence of seizures that occurred within the first 7 days of injury along with the incidence of adverse effects requiring drug discontinuation. A planned sub-group analysis was performed for patients with severe TBI defined by head AIS ≥ 3 upon admission.

**Results:** Preliminary results included 100 patients who received phenytoin and 262 patients who received lacosamide. Age (50.62±21.94 vs 59.68±22.11 years, P = 0.001) and admission GCS (11.48±4.29 vs 12.61±3.83, P = 0.022) were lower in the phenytoin group, while the need for mechanical ventilation was higher (50% vs 37%, P = 0.025); all other baseline characteristics were similar. Early post traumatic seizures were observed in 1% of the phenytoin group and 1.1% of the lacosamide group (P = 1.00). Adverse drug events requiring drug discontinuation were significantly higher in the phenytoin group (6% vs 0.8%, P = 0.007). Subgroup analysis for patients with severe TBI revealed no difference in early post traumatic seizures between phenytoin and lacosamide (1% vs 1.2%, P = 1.00) and a higher incidence of adverse drug events with phenytoin (6.3% vs 0.8%, P = 0.003).

**Conclusion:** There is no difference between lacosamide and phenytoin in the prevention of early post traumatic seizures in patients following traumatic brain injury. Lacosamide has a more tolerable side effect profile which may lead to less treatment discontinuation.

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**Title:** Short and long term effects of clinical pharmacy management on type 2 diabetes treatment outcomes in an ambulatory care setting

**Purpose:** There are numerous studies outlining the positive effect pharmacists have on the management of patients with type 2 diabetes mellitus (T2DM), but limited long term data.
The primary objective of this study is to identify the median time it takes for patients with T2DM in Pharmacy Patient Aligned Care Team (PACT) clinics to reach A1C goals. The secondary objectives of this study are to measure the time at A1C goal after patients are discharged from Pharmacy PACT clinics and to determine the proportion of patients who are at their A1C goals 1-year post discharge from their Pharmacy PACT clinics.

Methods: This is a retrospective, observational study conducted at the Phoenix VA Healthcare System (PVAHCS). The study period is February 1, 2014 through September 30, 2016. The assessed group included patients who had at least 2 Pharmacy PACT Therapy Management notes and who have uncontrolled type 2 DM defined as A1C > 8% at the index date. The following data was collected: A1C value and date at three defined time periods (index date, date of discharge from the clinic, and 1 year from discharge date), date of birth, gender, ethnicity/race, number of clinic visits, number of diabetes medications at the start and at the end of study period, date of first and last Pharmacy PACT Therapy Management note, and method by which patients were referred to Pharmacy PACT clinic (e.g. referral from provider, primary care almanac). Data was extracted from the Computerized Patient Record System (CPRS) and descriptive statistics were used to assess gathered information.

Results: The results of this study are still pending and will be presented at the conclusion of this study.

Conclusion: The conclusion will be presented at the conclusion of this study.

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Title: Efficacy and safety of aminocaproic acid compared to aminocaproic acid and prothrombin complex concentrate in cardiac surgery patients

Purpose: Management of perioperative bleeding complications following cardiac surgery remains a challenge and uncontrolled perioperative bleeding is often associated with increased postoperative complications, morbidity, and mortality. The package insert for aminocaproic acid contains a warning regarding the co-administration of aminocaproic acid and prothrombin complex concentrate and the increased risk of thrombotic events. Despite this warning, there are currently few studies looking at this combination of medications. The intention of this study is to describe the benefits and risks of the addition of prothrombin complex concentrate to aminocaproic acid therapy in adults undergoing cardiac surgery.

Methods: This study was conducted as a retrospective chart review using the EPIC database. Adult patients who underwent cardiac surgery from 2/2015 and 10/2016 were identified and data was collected in a retrospective manner until each study group was filled at fifty patients. Patients were excluded from the study if they did not receive aminocaproic acid or prothrombin complex concentrate in the operating room, received prothrombin complex concentrate as a reversal agent, or did not undergo cardiac surgery. Variables collected included: demographic data, comorbid conditions, type of cardiac surgery, duration of cardiopulmonary bypass, preoperative laboratory values, preoperative anticoagulation, aminocaproic acid dose administered, type of prothrombin complex concentrate given and dose, chest tube output, transfusion requirements, hospital and intensive care unit length of stay, postoperative thrombotic events, and in-hospital death. Data was collected with REDCap and was analyzed with STATA 13. For continuous data, descriptive statistics were used and reported with medians and interquartile ranges. Fisher’s exact test was used for categorical variables. For all tests, a p-value of ≤ 0.05 was considered statistically significant.

Results: One hundred and one patients were included in the analysis with fifty patients included in the aminocaproic acid group and fifty-one patients included in the aminocaproic acid and prothrombin complex concentrate group. The median baseline serum creatinine was 1.0 mg/dL and 1.1 mg/dL respectively (p=0.045). The median baseline INR was 1.1 and 1.4 respectively (p=0.002). The median aminocaproic acid dose given in each group was 22.39 grams and 40.01 grams respectively (p=0.002). The median chest tube output from 0-12 hours was 580 mL and 760 mL respectively (p=0.011). The median chest tube output from 0-removal of the tube was 1480 mL and 2639 mL respectively (p=0.007). Chest tube output between 0-24 and 0-48 hours, hospital length of stay, and postoperative thrombotic events did not differ between the groups.

Conclusion: Despite the combination of aminocaproic acid and prothrombin complex concentrate the patients in that group were more likely to have increased chest tube output, receive higher doses of aminocaproic acid, and receive higher amounts of blood products during the procedure. No postoperative thrombotic events were reported in either group. Additional studies are needed to assess this trend and further characterize potential risk factors for perioperative bleeding.

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IRB Status: Approved
Title: Medication regimen complexity and hospital readmissions in a rural healthcare system

Purpose: Medication non-adherence can result in poorer outcomes for patients, including preventable hospital readmissions, increased utilization of emergency department services, and ultimately increased cost to the healthcare system. This increased utilization of hospital and emergency services can be especially difficult in resource-constrained rural settings. The Medication Regimen Complexity (MRC) score has been proposed as a tool to predict a patient’s potential for an adverse drug event and hospital readmission. The objective of this study was to determine whether MRC can be used to predict readmissions or utilization of emergency services among patients in a rural healthcare delivery system.

Methods: This study utilized a retrospective cohort design and was approved by the Presbyterian Healthcare Services Institutional Review Board. All adult patients (age 18 years or older) who were admitted with a diagnosis of either chronic obstructive pulmonary disease (COPD) or heart failure (HF) over a 6-month period (October 1, 2015 – March 31, 2016) to any of the five regional medical centers in the Presbyterian Healthcare System were identified. Pregnant women, patients who expired during their hospitalization, and patients who left against medical advice were excluded. A random sample of included patients was selected and a discharge MRC score was calculated using the MRC Data Capture Tool developed by the University of Colorado. In addition to the MRC score, additional data was collected on potential confounders, including patient age, sex, primary language, admission diagnosis, admitting hospital, insurance provider, discharge location, and medication count at discharge. Data was also collected for the two primary outcome variables, hospital readmission or utilization of emergency services within 90 days of discharge. Using a stepwise approach, a univariate analysis was done first to study the relationship between each independent variable and each of the outcome variables. Next, a multivariate analysis was performed to determine whether any significant relationships existed between the patient’s discharge MRC score and unplanned readmissions or utilization of emergency services within 90 days. For all tests, p≤0.05 was considered significant.

Results: One hundred and ninety-nine patients were included in the final analysis: 131 (65.8%) with COPD and 68 (34.2%) with HF. A majority of patients (98%) had English listed as their primary language, the sample had slightly more females (53%) than males (47%) and the average age was 71 years. The majority of patients had Medicare as their primary payer (64%) and most patients were discharged to home with self-care (68%) followed by home with home health care (12%). The average number of medications at discharge was 13 and the average MRC score at discharge was 35. Of the patients included in the sample, 28% went on to be readmitted and 32% went on to utilize emergency services within 90 days from discharge. Although there was no association with readmission and the MRC score, there was an association with utilization of emergency services and both the MRC score (p=0.01) and medication count (p=0.00). Using multivariate analysis, a best-fit model found that the number of medications was a better predictor of utilization of emergency services than the MRC score. According to a logistic regression model, patients who had 21 or more medications on their discharge medication list had a 50% chance of having an ED visit within 90 days.

Conclusion: This study found no evidence to support the use of the medication regimen complexity (MRC) score to predict 90-day hospital readmissions among patients hospitalized for COPD or heart failure. It did provide some evidence to suggest that using the MRC score could help to predict utilization of emergency services within 90 days, however using the actual number of medications may be a better predictor.

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Title: Rates of antibiotic de-escalation in hospitalized patients with febrile neutropenia and positive cultures

Purpose: In patients with febrile neutropenia requiring hospital admission, current guidelines from the Infectious Diseases Society of America recommend empiric monotherapy with an intravenous anti-pseudomonal beta-lactam with modifications to the regimen based on clinical and microbiologic data. The purpose of this study was to evaluate the rate of de-escalation of empiric antibiotics in patients with febrile neutropenia and positive culture results.

Methods: This was a retrospective chart review conducted at the University Medical Center of Southern Nevada between March 1, 2013 to September 30, 2016. Data was collected from electronic chart records and included patients with documented febrile neutropenia and positive cultures who were initiated on an empiric IV anti-pseudomonal beta-lactam within 24 hours after fever onset. The primary outcome was to assess the rate of de-escalation within 48 hours of finalized positive cultures with sensitivities. Secondary outcomes included de-escalation rates within 48 to 96 hours after finalized cultures as well as comparisons between the de-escalated versus non-de-escalated groups including length of antibiotic therapy, length of stay, survival at discharge, positive Clostridium difficile, discontinuation of anti-MRSA agents, and isolated pathogens.

Results: Thirty two patients were included in the study after meeting inclusion criteria. The primary outcome of de-escalation within 48 hours was achieved in 46.9% of the patients. The secondary outcome of de-escalation within 48-
Validation of a pediatric vancomycin dosing protocol for patients 12 to 18 years old

Purpose: In this community hospital, a pharmacist driven vancomycin empiric dosing protocol that accounts for patient's age and treatment indication was implemented to improve the rate of attaining therapeutic trough levels. The purpose of this evaluation was to assess the number of adolescent patients between ages 12 to 18 years in whom therapeutic trough levels were achieved using this weight based dosing protocol. This validation study also evaluated the dose required to reach target trough levels of 10 to 15 mg/L and 15 to 20 mg/L in this patient population.

Methods: In this retrospective study, patients between the ages 12 to 18 years who received vancomycin utilizing a pediatric protocol were evaluated for the number of therapeutic trough levels achieved. This protocol included empiric dosing strategies based on patient's weight, treatment indication, and target trough level range. Subjects were retrospectively identified through electronic medical records. Patients were included if aged 12 to 18 years, prescribed vancomycin for greater than or equal to 48 hours, empirically utilized the protocol, and had a documented steady-state trough concentration. Patients were excluded if they received less than 3 doses, vancomycin was initiated at another facility, trough concentrations were drawn inappropriately, or if they received hemodialysis or extracorporeal membrane oxygenation (ECMO) during vancomycin therapy. Data collection included: age, gender, weight, if a patient was on hemodialysis or ECMO, if trough was drawn appropriately, renal function, empiric dose and interval given, treatment indication, and target trough level range. The following outcomes were analyzed: trough levels, whether trough level obtained was therapeutic according to target range, and development of acute kidney injury based on Pediatric Risk, Injury, Failure, Loss, and End Stage Renal Disease (pRIFLE) criteria. Descriptive statistics were used to report continuous variables as means and categorical variables as percentages. A Chi-squared test was used for categorical variables. For all tests, \( p \leq 0.05 \) was considered significant.

Results: Forty-two patients were included in the analysis: 69 percent were male, average age was 14.5 years, 52.4 percent were targeting trough level of 10 to 15 mg/L and 47.6 percent were targeting trough levels of 15 to 20 mg/L. Average weight of males was 63.6 kg and females was 61.9 kg. Mean empiric dose received was 15.7 mg/kg/dose. In the group targeting 10 to 15 mg/L, mean trough level obtained was 10.8 mg/L and 45.5 percent of patients achieved therapeutic trough. In the group aiming for level of 15 to 20 mg/L, mean trough level was 13 mg/L and 40 percent of patients had therapeutic trough \( (p=0.76) \). There was a significant association with subtherapeutic trough levels and male gender, which only 31 percent of males achieved therapeutic trough level compared to 69.2 percent for females \( (p=0.02) \). Every 6 hour dosing frequency was more likely to result with therapeutic trough level compared to every 8 hour dosing frequency (58.3 percent versus 36.7 percent, \( p=0.02 \)). There was one patient in the 10 to 15 mg/L targeting group who developed acute kidney injury based on the pRIFLE criteria due to a combination of vancomycin and ibuprofen.

Conclusion: A large proportion of adolescent patients between the ages 12 to 18 years whose vancomycin was dosed using this dosing protocol had trough levels that were below the therapeutic range. Specifically, every 8 hour dosing frequency tended to result in low trough concentrations, whereas every 6 hour frequency was more likely to have therapeutic trough level with empiric dosing. Also, more male patients had subtherapeutic trough levels than female patients did. Revision is warranted considering dosing frequency and gender to ensure therapeutic vancomycin trough is achieved in a timely manner.

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Title: Evaluation of opioid discontinuation from the intensive care unit to discharge

Purpose: The incidence of opioid abuse has dramatically increased during the past two decades. One of the major influence in this problem is a significant increase in the total
number of opioid prescriptions issued over recent years. Critically ill patients with respiratory failure commonly receive continuous infusions of intravenous (IV) opioids to decrease patient discomfort while on mechanical ventilation. The assumption that all patients have pain can contribute to excessive use of opioids and continued use of opioids after extubation. Given the potential for creating new opioid dependence among opioid naïve patients after critical illness, this study aims to quantify the number of new prescriptions that remain throughout the transitions of care to discharge for patients after respiratory failure who have not had major surgical or procedural interventions.

**Methods:** This was a retrospective chart review study of adult opioid naïve patients (aged > 18 years) with respiratory failure who required mechanical ventilator support and were prescribed opioids while in the adult Medical Intensive Care Unit (MICU) at Banner-University Medical Center Tucson between November 2, 2013 and January 31, 2017. Patients were excluded if they had history of polysubstance abuse or chronic pain prior to admission or received surgical intervention during the index hospitalization. The primary endpoint was the incidence of new opioid prescriptions at discharge. Baseline characteristics will be compared using t-test, chi-squared, or Fisher’s exact test as appropriate. The level of significance is 0.05 with a two-tailed test.

**Results:** Data collection and analysis are currently in process. The results will be presented at the Southwestern States Residency Conference 2017.

**Conclusion:** The conclusion will be presented at the Southwestern States Residency Conference 2017.

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**Title:** Therapy sequencing and its impact on clinical outcomes in castrate resistant prostate cancer

**Purpose:** Treatment of castrate resistant prostate cancer (CRPC) has evolved over recent years with the introduction of several new therapeutic oral agents, including enzalutamide and abiraterone. This study was aimed to examine the clinical outcomes of different sequences of castrate resistant prostate cancer treatments and to determine whether there is an optimal sequence in which to give the first line agents.

**Methods:** The study was submitted to the Institutional Review Board for review and was approved. The study was conducted as a retrospective chart review of patient records spanning from January 1, 2011 to July 1, 2016, achieved using the VA’s Computerized Patient Record System. Veterans aged 18 to 89 years old, with an ICD-9 or 10 code documented for prostate cancer diagnosis, disease that was documented to be castrate resistant, and who had received at least one dose of either enzalutamide, abiraterone or docetaxel were included in this study. The primary clinical outcome of the study was the duration of response to each treatment received. The secondary clinical outcome was the number of subjects who experienced a greater than or equal to fifty percent decline of prostate specific antigen (PSA) from baseline as a result of treatment. Additional data to be collected includes patient age, gleason score, serum prostate specific antigen and testosterone level at baseline, nadir, and time of treatment discontinuation, reason for treatment discontinuation, and duration of response. Statistical analysis consisted of one-way ANOVA for the primary outcome and Fisher’s exact test for the secondary outcome.

**Results:** One hundred patient charts were screened with 52 meeting the inclusion criteria. In the first line setting abiraterone was received most often (32 of 52 subjects, 62%), followed by docetaxel (13 of 52, 25%) and enzalutamide (7 of 52, 13%). Twenty-eight subjects went on to receive second line treatment and of that population 11 subjects went on to receive third line treatment. Average duration of responses in the first line setting with abiraterone, docetaxel and enzalutamide were 8.5, 9.1 and 6.5 months respectively (p=0.69). In the second line setting with abiraterone, docetaxel and enzalutamide, the average duration of responses were 5.3, 9.2 and 5 months respectively (p=0.14). In the third line setting, average duration of response with docetaxel and enzalutamide were 4.4 and 7.5 months respectively (p=0.33). PSA decline greater than 50% in the abiraterone, docetaxel and enzalutamide treatment groups occurred in 15 (47%), 9 (69%) and 3 (42%) subjects with first line treatment and 5 (45%), 6 (67%) and 1 (13%) subjects with second line treatment, respectively. In the third line setting, the enzalutamide and docetaxel treatment groups had 33% and 40%, respectively, of subjects experience a PSA decline greater than 50 percent. There was a marginally significant difference in the second line setting between enzalutamide and docetaxel (OR = 0.0714, 95% CI: 0.0058-0.8809, p<.05) – In terms of PSA decline greater than 50 percent.

**Conclusion:** Abiraterone, docetaxel and enzalutamide for CRPC achieved similar durations of response in all lines of treatment. The rate of subjects who had a greater than or equal to 50 percent decline in PSA as a result of treatment were also similar between treatments. However, there may be a difference in this regard when comparing enzalutamide and docetaxel in the second line setting. A larger trial with better matched cohorts is needed to confirm any potential differences in clinical outcomes between treatment options.

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Title: Evaluation of procalcitonin utilization and subsequent antimicrobial de-escalation in critically ill patients.

Purpose: Procalcitonin levels are being used more commonly to evaluate the presence of bacterial infections in patients with sepsis or lower respiratory tract infections. It remains unclear if the results of procalcitonin testing are being used to modify antimicrobial therapy within the study’s health system. The primary objective of this study is to determine whether procalcitonin results are leading to the de-escalation of antimicrobials in critically ill patients. The secondary objective is to evaluate how often the health system procalcitonin level driven protocol is being utilized appropriately.

Methods: This retrospective cohort study was performed from October 1, 2016 to December 15, 2016. Electronic medical records of two community medical centers were screened for adult patients admitted to the intensive care units of HonorHealth Osborn Medical Center or HonorHealth Shea Medical Center and had at least one procalcitonin level drawn in the unit. Patients were excluded if they were less than 18 years old, pregnant, had chronic kidney disease stages IV or V, or were on dialysis. The health system’s procalcitonin driven protocol was compared to each patient’s care to assess if the intensive care teams are utilizing this protocol appropriately. Patients were divided into two groups: appropriate or inappropriate use group. Records were screened until 125 patients were identified. Data collected for the appropriate use group included: age, gender, infectious disease diagnoses, creatinine clearance, number of procalcitonin levels, antimicrobials and positive culture results before and after procalcitonin results, length of antimicrobial treatment, and length of stay in the intensive care unit. Data for the inappropriate group includes: number of procalcitonin levels, presumed disease state for obtaining procalcitonin levels, and whether procalcitonin was used to initiate antibiotics. The sample size was not designed to reach statistical power. Descriptive statistics were used to analyze the data the primary objectives. Understanding how the health system is using the procalcitonin protocol and if antimicrobials are being de-escalated as a result, can identify ways to improve antimicrobial stewardship at the medical centers.

Results: Of the 125 patients evaluated, intensive care medical teams appropriately used procalcitonin levels, in the context of the approved protocol, 48% (n=60) of the time. Within this appropriate use group, 37 patients (61%) had the potential to be de-escalated in which 12 (32%) of them were. In the 25 patients (68%) not de-escalated, some barriers included patients still having clinical signs of infection (fever, leukocytosis, tachycardia, imaging etc.) or patients improving on the antimicrobials. These patients were also critically ill and therefore it is possible that they did not want to stop antibiotics due to the severity of their illness. For most patients, however, it was unclear why they were not de-escalated. Of interest, 5 of the 12 patients (41%) who were de-escalated, attribution of the procalcitonin level to direct de-escalation was explicitly expressed in the physician’s progress note. Twenty-three patients (38%) could not have de-escalation of their antimicrobials due to positive cultures, high procalcitonin levels, or death. Overall, 12 of 125 patients (10%) had the procalcitonin protocol used appropriately and also had antimicrobial de-escalation during their care which is a very low rate.

Conclusion: The intensive care medical teams appear to be underutilizing procalcitonin levels to assist with antimicrobial de-escalation. It also seems that they are not appropriately employing the health system’s procalcitonin protocol into their practice. Due to the nature of this retrospective chart review, many limitations have been identified which could have affected the results. More studies are warranted to truly determine the utilization of procalcitonin in the intensive care unit. Opportunities exist to exercise continuous quality improvement to make the procalcitonin protocol more user-friendly and to increase utilization.

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Title: Direct and Indirect Remunerations and Pharmacists’ Understanding of the Concept: A Survey on the Pharmacists’ Base Knowledge

Purpose: The purpose of this study is to assess the knowledge and beliefs of pharmacists in the southwest division of Albertsons Companies in regard to direct and indirect remunerations (DIRs) and related activities within workflow that can help to avoid or reduce DIR-related retroactive fees. The current study intends to fulfill the following research questions: 1) how prevalent is the understanding of DIRs and related activities among pharmacists, 2) what are the beliefs and interests of pharmacists in fulfilling activities in workflow related to DIRs, and 3) what additional training and education do pharmacists want on the topic of DIRs?

Methods: This project is a cross-sectional, census of all Albertsons Companies pharmacists in the southwest division conducted through an anonymous Qualtrics® survey. The survey contains 61 items based on a Likert-scale. The questions are focused on four areas: 1) pharmacists’ knowledge of DIRs, 2) interest and beliefs about certain activities that may minimize DIR fees, 3) pharmacists’ education and training needs about DIRs, and 4) demographic questions. A link to the anonymous survey was distributed by the Director of Pharmacy Operations via corporate emails to division pharmacists. Four email reminder were sent one week apart starting one week after the initial survey email. The survey was left open for 6-weeks. Nominal and ordinal/scale data was collected through the survey with one
free response question at the end of the survey to gather additional information related to the education and training needs of each survey participant. Data analysis was conducted using a modified Dilman method. Non-parametric statistics are used to aggregated and analyze scaled responses.

Results: Approximately 49% of respondents have heard of the term “direct and indirect remunerations” and 66% of those responders understood the financial impact DIRs have on community pharmacy practice by decreasing profit margins. For each activity, a majority of pharmacists reported inadequate time to complete DIR-related activities in workflow. A majority of pharmacists had great interest in completing such tasks, though they would like additional training in regards to certain tasks, specifically related to high risk medication use in the elderly and addressing gaps in therapy for patients. The area of complete medication review also required additional training because pharmacists reported a lack of comfort with completing this particular task.

Conclusion: Pharmacists benefit by gaining greater insight into rational behind activities in workflow related to preventing DIR fees. Albertsons leadership now has greater awareness on the learning and training needs of pharmacists to create additional education and training opportunities.

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Title: Effectiveness and Safety of Hepatitis C Treatment with Direct-Acting Antivirals (DAAs) In a Veteran Population

Purpose: The objective of this study is to determine the effectiveness and safety of hepatitis C treatment with Direct-Acting Antivirals (DAAs) in a Veteran population.

Methods: The primary objective of this study is to determine the effectiveness of HCV DAA therapy defined as the percent of Veterans with HCV infection who achieved sustained viral response (SVR). DAA regimens used at the PVAHCS during the study time period included all FDA-approved DAA drug regimens. Secondary objectives included comparison of 12-week SVR between Veterans who were treated with ledipasvir (LDV)/sofosbuvir (SOF) for 8 weeks versus those treated for 12 weeks, comparison of 12-week SVR between Veterans who took H2 blockers and/or proton pump inhibitors, and the number of Veterans that relapsed after SVR. Incidence of anemia, neutropenia, thrombocytopenia, use of medical treatment for anemia or neutropenia, discontinuation of therapy, and reasons for discontinuation were used to characterize the safety of DAA therapy. Adherence to DAA therapy was assessed by calculating median gap between refills. Additionally, the SVR outcomes in this study were compared with those found in landmark trials to determine if there was a difference.

Veterans who were 18 years of age or older, diagnosed with HCV infection, started on HCV DAA medication treatment at the Phoenix VA on or after 10/1/2014 were evaluated for inclusion. Veterans were excluded from the study if they transferred HCV care to a provider outside of the Phoenix VA and the medication was filled outside of the Phoenix VA, transferred HCV care from a non-VA provider to the Phoenix VA, or SVR date was after 12/1/2016. Data was extracted from the Computerized Patient Record System (CPRS).

Results: There were 497 patients screened for inclusion. Of the 497 patients, 366 met inclusion criteria. Baseline characteristics were: males (95%), mean age (61), born between 1945 and 1965 (92%), genotype 1 (82%) genotype 2 (13%), genotype 3 (4%), mean baseline viral load (3,823,793 IU/mL), non-cirrhotic (65%), and LDV/SOF treatment (77%). Of the Veterans who obtained a HCV viral load 12 weeks after treatment, 89% (n=325) achieved SVR overall. Treatment effectiveness, subgroup analysis, and secondary outcomes to follow.

Conclusion: The success rates of the FDA-approved DAA regimens utilized in the study were 89%. Future directions for this study would be to expand inclusion criteria to Veterans currently taking DAA therapy vs starting therapy, provide power to the study, and expand patient population to multiple VA sites. The results of the study are applicable to the PVAHCS institution given the regimens are currently being utilized at with SVRL2 being the goal of treatment.

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Title: Pharmacy cost savings analysis of implementing a human immunodeficiency virus pilot program for tenofovir+emtricitabine when used for pre-exposure prophylaxis and post-exposure prophylaxis

Purpose: Pre-exposure (PrEP) and Post-exposure (PEP) prophylaxis are human immunodeficiency virus (HIV) prevention strategies which reduce the risk of acquiring HIV by non-infected, but high-risk individuals. Currently, Truvada (tenofovir + emtricitabine) is the only FDA approved medication for the indication of PrEP/PEP, which when taken daily can decrease the risk of acquiring HIV by 90%. This prophylaxis rate declines significantly if Truvada is not taken consistently. Within a large managed care organization, the absence of restriction on most HIV medications has led to exponential financial spending within this drug class. In order to reduce resistance, promote adherence and control costs, a
policy limiting HIV drug distribution was implemented. The primary objectives of this project are to determine the cost savings of implementing a Truvada PrEP/PEP prior authorization guideline and a HIV pilot (diagnosis requirement and drug utilization review edits) for 12 weeks pre and post implementation within two Medicaid plans.

**Methods:** The current financial spend based on claims data for Truvada and other formulary HIV medications was assembled for a unit cost baseline reference. A prior authorization guideline for PrEP/PEP diagnoses was created along with a requirement that all requests for HIV medications possess an HIV diagnosis for approval. In addition, three drug utilization review edits concerning ingredient duplication, drug-drug interaction, and unboosted protease inhibitors were implemented. The guideline was initially executed in the two Medicaid plans, however due to patient care barriers was limited to full implementation in only one plan. A prior authorization summary report for approval and denial rates along with claims data was collected for a 12 week period post implementation for each plan. The financial spend for the 12 week time frame pre and post implementation was compared to determine cost savings in terms of average wholesale price.

**Results:** The full implementation of an HIV pilot consisting of a PrEP/PEP guideline, diagnosis requirement and drug utilization review edits resulted in an overall cost savings of $23,612.84 for total antiretroviral spend in terms of average wholesale price during a 12 week comparison. Truvada financial data showed an increase in spend by $17,179.08 due to an increase in number of claims. For the plan which only implemented three drug utilization review edits, there was an increase of $98,464.39. Prior authorization summary reports for the 12 week time period revealed 4 PrEP approvals, 2 PEP approvals, and 1 PEP denial based on off-label use.

**Conclusion:** Cost savings was seen in total antiretroviral spend for one Medicaid plan through implementation of an HIV pilot consisting of a PrEP/PEP guideline, diagnosis requirement, and drug utilization review edits. The impact of the PrEP/PEP guideline was not significant in this plan as financial spend on Truvada did not see a decrease after criteria implementation. In the plan which only implemented three drug utilization review edits, there was no financial benefit seen for total antiretroviral spend. While this project did not have the desired financial impact, patient safety was improved through decreased barriers to care and increased appropriate drug utilization.

**Title:** Standardized versus customized: a retrospective chart review comparing different formulations of total parenteral nutrition therapy in the neonatal intensive care unit

**Purpose:** Total parenteral nutrition (TPN) therapy in the neonatal population is used for multiple different reasons including prematurity, sepsis, necrotizing enterocolitis (NEC), and as a source of nutrition before or after surgery. This retrospective review is designed to assess outcomes associated with standardized and customized TPN therapy in a level II neonatal intensive care unit (NICU). The primary outcome of this evaluation is to determine the efficacy and safety of standardized and customized TPN therapy in the neonatal population by reviewing normal and abnormal laboratory values. Additional outcomes include error potential and cost analysis associated with each type of TPN therapy.

**Methods:** Neonatal patients who received standardized or customized TPN therapy between November 1, 2015, and November 1, 2016, were identified using an electronic health record. Data was collected through retrospective chart review. The administration of standardized or customized TPN therapy for at least three continuous days during hospital admission was required for inclusion in the study. Patients were excluded if TPN therapy was administered for less than three continuous days or if there was a diagnosis of neonatal sepsis, NEC, or gastrointestinal perforation. Data points collected include glucose and electrolyte values, acid base status, diuretic use, ventilation requirements, TPN associated event reports, and the total number of TPN orders written during the study period. For consistency, only venous blood gas values were collected during the chart review. Data analysis includes a comparison of counts, percentages, and means with standard deviations associated with normal and abnormal lab values between the two groups. The proportion of normal and abnormal lab values is used to normalize the difference in quantity of lab values between the two study groups. Independent sample t-tests are used to compare the demographic variables between customized and standardized TPN therapy groups. Pearson chi-square tests are used to compare categorical variables.

**Results:** A total of 114 subjects met inclusion criteria during the study period, of which 84 received customized TPN therapy and 30 received standardized TPN therapy. Baseline characteristics differ greatly between the two groups, therefore matching using the NCSS software and Cohen’s D was completed which reduced the sample size to 60 patients, 30 in each group. After matching, differences in baseline characteristics decreased based on a reduction in Cohen’s D effect sizes. Of the data points collected, there are no mean differences noted between the two groups. From November 1, 2015 to November 1, 2016 a total of 4,502 TPN orders were written. Of those, 2,981 (66%) were customized and 1,521 (34%) were standardized. Workflow analysis provides an estimate of five minutes to prepare a standardized TPN and twenty minutes to prepare a customized TPN. Using these estimates, compounding standardized TPNs saved
involve a process of continuous improvement to be able to
these centers must be systematic, highly robust and
increasingly stretched system, the charge and billing process
therapies. In order to ensure reimbursement in an
convenient alternative to inpatient care for infusion
claims are contested through initiation of a labor intensive
appeals process. After appeal, a portion of the denied claims
would be expected to be around 3,708 based on manual data
review. The lost profit due to these write-offs is estimated to
be around $92,000. As of 1 May 2017, implementation of the
standardized patient intake process is nearing completion.
Efforts are also underway to better understand the number of
claims in “denial” status, and the reason for the denial. Since
there is variability in the time it takes to determine level of
success of submitted claims, the effectiveness of the
standardized workflow will be assessed in the months
following workflow adoption and development of robust data
analytics tools.
Conclusion: Standardized workflow implementation will be
expected to decrease both the number of claims denied by
payers, as well as claim denials that are written off as non-
collectable.

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Title: Clinical Outcomes Of Archived HIV-1 DNA Sequencing
To Guide HIV Therapy Changes

Purpose: Patients who are on antiretrovirals (ARVs) and are
well controlled can still require changes in medications due to
factors such as side effects or pill burden. Genotyping is
available to determine if major ARV resistance mutations are
present, but this testing is not always feasible when HIV is
well controlled. Archived DNA genotyping has allowed for
genotyping of archived viral DNA even when HIV RNA levels
are low or undetectable. Small studies have compared
archived DNA genotyping to patients’ historical resistance to
see if the results correlate, but there is very little information
on clinical outcomes when using this test to change
medications. Further study is needed to confirm that the
results of the archived DNA testing can be relied upon to accurately predict which medications will be effective.

**Methods:** We conducted a retrospective review of the medical records associated with all patients diagnosed with HIV-1 who had their antiretroviral therapy modified based on the results of archived DNA genotyping within the specified study dates. The primary outcome of this study compared the overall percent of patients who were undetectable (HIV RNA <50 copies/mL) prior to switching regimen versus the overall percent of patients who were undetectable after switching. This was done by comparing the baseline HIV RNA to the first RNA after the switch followed by the most recent RNA on the same regimen. Secondary outcomes included the comparison of regimen components before and after switching and the percent of patients who needed to switch therapy again after the initial switch. A comparison was also made to detect the correlation between historical genotypes and archived DNA genotype with regards to identifying major drug resistance mutations, and whether the archive led to a significant improvement in pill burden on patients.

**Results:** In the two-year period from 2014 to 2016, 38 patients met the inclusion criteria. The majority of the patients included in this study were men (89%), Caucasian (66%), had a history of AIDS (45%) and had an HIV/AIDS diagnosis for >10 years (74%). Overall, 82% of patients were undetectable at baseline; 89% became undetectable at first follow-up (p=0.5) and 92% became undetectable at most recent follow-up (p=0.22). No patients who were initially undetectable became detectable after the switch. However, 2 patients remained detectable after the switch, one of which had documented non-adherence. Pill burden significantly decreased after the regimens were switched, the average number of pills per day decreased from 3.84 to 1.97 (p<0.001), and the average number of administrations per day decreased from 1.47 to 1.05 (p<0.001). Regimen components that included protease inhibitors (PI) and integrase strand transfer inhibitors (INSTI) at baseline significantly changed, with a decrease from 66% to 21% in PI-based regimens (p<0.001) and an increase from 53% to 89% (p=0.001) in INSTI-based regimens after the switch was made. Finally, archived DNA genotyping detected most mutations reported on historical genotypes, and often detected additional mutations. However, there were three situations in which the archive missed mutations or inaccurately reported susceptibility.

**Conclusion:** Use of archived DNA genotyping to guide ARV therapy adjustment maintained similar rates of viral suppression while allowing for regimens with more long term safety and less pill burden.

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**Title:** Assessing the safety of dual alpha-blockers in posttraumatic stress disorder (PTSD)

**Purpose:** Prazosin is a centrally active alpha1-blocker that works to counteract the excessive brain noradrenergic activity reported in posttraumatic stress disorder (PTSD). Another disease state that is a concern for this aging veteran population is benign prostatic hyperplasia (BPH), for which the primary treatment is an alpha1-blocker, such as doxazosin, terazosin, alfuzosin, or tamsulosin. Studies have not been conducted to determine the safety of prescribing prazosin with a second alpha1-blocker when treating veterans with PTSD and BPH. The primary outcome will be the safety of prescribing prazosin concurrently with another alpha1-blocker. Safety is defined as having an adverse effect (falls, hypotension/syncope, dizziness, headache, other) within one year of starting the second medication. For the secondary outcome, tolerability will be assessed. Tolerability will be defined as continuation of both medications with no disruption of therapy for one year, as determined by having an active prescription on file.

**Methods:** The electronic medical record identified male veterans diagnosed with PTSD and BPH at the Southern Arizona VA Health Care System (SAVAHCS) who were prescribed prazosin and another alpha1-blocker concurrently at any time between August 1, 2010 to August 1, 2015. Data was collected through retrospective chart review. Patients included were male Veteran, 18 years or older but less than 90, and prescribed prazosin with a second alpha-1 blocker during the timeframe listed above. Patients were excluded if they did not have a PTSD diagnosis via ICD-9 or ICD-10 codes here, transgender, were not follow-up at SAVAHCS after inclusion, or were prescribed combination alpha1-blockers before August 1, 2010. The following data was collected: age at the time of initiation of overlap of therapy, indication for each alpha1-blocker, if the patient had hypertension, number of antihypertensive medications, and reason for discontinuation if applicable. Provider documentation were reviewed to determine reasons for discontinuation. Sample size was determined by inclusion timeframe, was not designed to target statistical power. Descriptive statistics were used to report the safety and tolerability of dual alpha1-blockers.

**Results:** One hundred and eighty-seven patients were included in the analysis: Ninety-two patients were on concomitant alpha-blockers for at least twelve months. Out of the ninety-five patients who were on the concomitant therapy for less than twelve months, eleven patients were discontinued due to an adverse effect (seven dizziness/lightheadedness, three hypotension, and one fall). Others were discontinued due to logistic reasons such as patient did not refill or the prescription expired.

**Conclusion:** Concomitant use of prazosin with a second alpha-blocker in veterans with PTSD and BPH are safe and tolerable. As doses for alpha-blockers were not assessed
during this study, patients should be monitor closely during dose titration to prevent adverse reactions.

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Title: Evaluation of the effectiveness and safety of pharmacological intervention versus no pharmacological intervention for the treatment of delirium in hospitalized veterans

Purpose: Delirium is a prevalent complication that occurs in up to 80% of hospitalized patients and can result in negative outcomes including increased mortality. Both pharmacological and nonpharmacological interventions have been used to reduce severity and duration of delirium. Historically, antipsychotics have been used for delirium treatment in hospitalized patients, and recent evidence has shown that melatonin may be an effective agent as well. There is inconclusive evidence among studies evaluating these agents, and therefore, no general consensus in guiding therapy. Further research is needed to determine the effectiveness of medication use compared with no medication use among hospitalized patients with delirium.

Methods: A retrospective review of 228 charts was conducted to evaluate the use of antipsychotics (quetiapine, olanzapine, risperidone, aripiprazole, haloperidol) and/or melatonin for the treatment of delirium in hospitalized veterans aged 18 years or older from October 1, 1998-August 1, 2016. Patients were included if they had a diagnosis of delirium via ICD9 of 293.0 and 293.1 or ICD10 of F05 codes. Patients were excluded if they had an outpatient prescription for haloperidol, aripiprazole, olanzapine, quetiapine, risperidone or melatonin in the 90 days prior to hospital admission. Length of hospital stay and length of intensive care unit (ICU) stay (if applicable) were used to evaluate the effectiveness of pharmacological treatment in these veterans. Risk factors for the development of delirium were evaluated including concomitant medications, history of alcohol abuse, hypertension, or dementia, and severe illness. Other outcomes evaluated included the use of restraints, use of a sitter, death, and discharge location. Adverse effects associated with antipsychotic use were collected including torsades de pointes, sudden cardiac death, hypotension, neuroleptic malignant syndrome, extrapyramidal symptoms, and extreme sedation. Statistical analysis was completed using descriptive statistics to determine the median and interquartile range for continuous variables including duration of delirium and duration of ICU and hospital length of stay. Relative frequencies were used to analyze categorical variables including delirium risk factors and receipt of each pharmacological intervention.

Results: Twenty patients were included in the no treatment group and 25 in the treatment group. The most common admission diagnoses included delirium, infection, and surgery. The majority of patients admitted due to delirium were on an anticholinergic, sedative hypnotic, antidepressant, and/or anticonvulsant. Patients that developed delirium in the hospital were receiving an opioid (58%), anticholinergic (36%), sedative hypnotic (36%), or tramadol (7%). Concomitant conditions observed at diagnosis included history of alcohol abuse (29%), history of hypertension (80%), dementia (31%), and severe illness (38%). Twenty-one (84%) patients received an atypical antipsychotic, 10 (40%) received a typical antipsychotic, and one patient received melatonin. Olanzapine was used the most frequently, followed by haloperidol, quetiapine, risperidone, aripiprazole, and then melatonin. More patients in the treatment group required the use of a sitter (4 vs. 0), use of restraints (8 vs. 0), and resulted in death (7 vs. 1). Patients in the treatment group were more likely to be discharged to rehab or hospice and less likely to be discharged home. Median hospital length of stay was longer in the treatment group than no treatment group (14 days vs. 8 days), and more patients in the treatment group required an intensive care unit stay. No incidences of adverse effects were found in either group.

Conclusion: Delirium risk factors observed were concordant with those reported in the literature including receipt of opioids, anticholinergics, and sedative hypnotics; history of hypertension, dementia, and alcohol abuse; and severe illness. The pharmacological treatment group showed a trend toward a higher incidence of ICU stay and a longer hospital length of stay; it did not show a difference in the incidence of adverse effects. This study does not support the use of pharmacological therapy versus nonpharmacological therapy for the treatment of delirium in hospitalized veterans. Further prospective studies are warranted.

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IRB Status: Approved

Title: Impact of clinical decision support in helping pharmacists to identify vancomycin-induced acute kidney injury; a pre/post implementation study

Purpose: The purpose of this study was to evaluate the impact of an electronic clinical decision support (CDS) tool on pharmacists’ ability to recognize and treat vancomycin-induced acute kidney injury (AKI). Impact was measured as time-to-intervention, defined as the time it takes for pharmacists to identify vancomycin-induced AKI and intervene. The primary outcome was calculated by taking the time of onset of AKI until the time that an intervention on
vancomycin occurred. The time-to-intervention was compared between two groups of patients: before (pre-implementation group) and after (post-implementation group) the alert was implemented. The secondary outcome was the percentage of patients who received greater than 2 doses of vancomycin after acute kidney injury, but before pharmacist intervention.

Methods: This project was a multi-centered, pre/post implementation chart review. The pre-implementation group consisted of patients at least 18 years of age who received vancomycin from August 1st through November 30th, 2016. The post-implementation group consisted of patients at least 18 years of age who received vancomycin from December 1st, 2016 through February 28th, 2017. Subjects were included in the study if they were on vancomycin and experienced AKI, defined as increased serum creatinine of at least 0.5 mg/dL or 50% from baseline. Patients who were on dialysis or who had an intervention made by a physician were excluded from the study. Three possible interventions were documented: vancomycin was discontinued, the dose of vancomycin was decreased, or a vancomycin level was ordered. The time, in hours, between when AKI occurred to when the intervention occurred was recorded. The number of vancomycin doses received after AKI, but before pharmacist intervention was also recorded. Descriptive statistics were used with continuous variables reported as means and standard deviations and categorical variables reported as percentages. Continuous variables were analyzed using independent t-tests and Fisher exact tests were used for analyzing categorical data. A two-tailed p < 0.05 was considered significant. For the primary outcome, 49 subjects in each group were needed to provide 90% power to detect a reduction of four hours.

Results: Two hundred patients were included in the analysis: 97 from the pre-implementation group (Group 1) and 103 from the post-implementation group (Group 2). Mean age was 61 years in group 1 and 66 years in group 2 (p = 0.022). Serum creatinine increase from baseline was 0.66 mg/dL in group 1 and 0.66 mg/dL in group 2 (p = 0.953). Percent increase in serum creatinine from baseline was 84.8% in group 1 and 74.7% in group 2 (p = 0.108). For the primary outcome, mean time-to-intervention was 13.19 hours (SD 12.36) in group 1 and 7.31 hours (SD 5.17) in group 2 (p < 0.001). For the secondary outcome, the percentage of patients who received greater than 2 doses of vancomycin from the time of AKI to intervention was 19.6% in group 1 and 6.8% in group 2 (p = 0.011).

Conclusion: Implementation of an electronic CDS tool that identified patients on vancomycin with AKI decreased pharmacists’ time-to-intervention by almost 6 hours. Clinically, this equated to 12 fewer patients (12.8%) receiving more than 2 doses of vancomycin after AKI occurred and before a pharmacist intervened.

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Title: Comparison of standard versus reduced-dose pegfilgrastim on clinical outcomes and chemotherapy dose intensity in pancreatic cancer patients receiving combination chemotherapy in an outpatient infusion clinic.

Purpose: Pegfilgrastim use has been shown to reduce the incidence of febrile neutropenia when given at recommended dosage (6 mg) following myelosuppressive chemotherapy. Despite lack of supportive data, many prescribers have adopted the practice of utilizing reduced dosages (3-4 mg) of pegfilgrastim, often citing bone pain as reason for dose reduction. We sought to explore the impact of reduced-dose pegfilgrastim on chemotherapy dose intensity in patients with advanced pancreatic cancer treated with the triplet combination of nab-paclitaxel, cisplatin and gemcitabine (NabPlaGem) at our facility.

Methods: A retrospective analysis was conducted on all patients who received NabPlaGem chemotherapy in combination with pegfilgrastim during the period of 1/1/16 through 9/30/16. Patients who received at least two cycles were considered evaluable. Chemotherapy was administered on Days 1 and 8 of a 21-day cycle with pegfilgrastim administered on Day 9. Chemotherapy doses were considered full-intensity if no dose reduction was made from original protocol dosing (125 mg/m2 nab-paclitaxel, 25 mg/m2 cisplatin, gemcitabine 1000 mg/m2), no doses were omitted, and no doses were delayed from original treatment plan. The primary outcome was a comparison of the overall chemotherapy dose intensity achieved between groups. Secondary outcomes included the incidence of febrile neutropenia, neutropenia, and reported bone pain. The electronic medical record (EMR) was used as the source of data, which included medication administration records (MARs) of treatment plans, doses given and any modifications made to original order. Data was recorded by two independent investigators to minimize possibility of data error, and all patient identifiers were excluded from collection process in order to maintain confidentiality. Additional data collected included patient demographics such as age, gender, and prior lines of treatment. Descriptive statistics were used to report continuous variable as means and standard deviations and nominal variables as percentages. A Fisher's Exact test was used for nominal variables. For all tests, p ≤0.05 was considered significant.

Results: A total of 50 chemotherapy cycles were administered, with 22 cycles (44%) using a reduced dosage of pegfilgrastim and 28 cycles at full dosage (56%). Dose delay or omission was observed in 7% cycles (2/28) in the full dose group, vs. 14% (2/14) in the reduced-dose group. Full (100%) chemotherapy dose-intensity was achieved in 64% (n=18) of cycles using full-dose pegfilgrastim vs. 36% (n=8) in reduced-dose group, reflecting statistical significance (P = 0.046).
Incidence of neutropenia was 100% in the reduced-dose group and 33.3% in the standard dose group (P=0.046). There were no significant differences between groups for the incidence of febrile neutropenia and reported bone pain (P=0.55 and P=0.65, respectively).

**Conclusion:** Based on this data, a reduced dosage of pegfilgrastim is not recommended when used in combination with myelosuppressive chemotherapy in patients with advanced pancreatic cancer. Supportive measures to minimize bone pain and increase tolerance of full dosage is encouraged rather than dose reduction.

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**Title:** An Impact Analysis on Expanding Hepatitis C Virus (HCV) Liver Fibrosis Staging Criteria for Medicaid Plans

**Purpose:** Direct-acting antivirals (DAAs) have revolutionized Hepatitis C virus (HCV) treatment, backed by high cure rates and improved tolerability compared to prior treatment regimens. However, the high costs of the DAAs have led to restrictive Medicaid criteria in order to minimize HCV drug spend. Patients with more advanced liver disease (defined as patients with F3-F4 liver fibrosis staging) are prioritized for treatment due to increased risks of hepatic complications, including end-stage liver disease and hepatocellular carcinoma. However, due to recent federal rulings and the Centers for Medicare and Medicaid Services (CMS) recommendation, Medicaid plans in some states are required to provide coverage to patients with less severe fibrosis staging. Additionally, the American Association for the Study of Liver Diseases (AASLD) guidelines recommends treatment for all patients with chronic HCV infection, with the exception of patients with short life expectancies. This model will provide the impact analysis for Medicaid plans that have become less restrictive by expanding HCV treatment coverage to include patients with liver staging from F2-F4. The impact of expanding HCV treatment coverage to include patients regardless of their abstinence from alcohol and illicit drugs will also be analyzed.

**Methods:** Prior authorization requests and pharmacy claims and cost data from pertinent plans were used as the basis for determining anticipated costs as more state Medicaid plans adopt the less restrictive criteria. Plans studied for liver fibrosis staging criteria include Aetna Better Health of New Jersey, Aetna Better Health of Virginia, Aetna Better Health of Pennsylvania and Mercy Care Plan. Plans studied for abstinence criteria include Aetna Better Health of Illinois, Aetna Better Health of Kentucky, and Aetna Better Health of Louisiana. Subjects for this study were Medicaid members in states with plans that have recent policy updates expanding the fibrosis staging criteria. The impact analysis evaluated the percentage of denials due to fibrosis staging criteria prior to state policy updates and determined the percentage of members who were then approved after the policy updates. The percentages of new members who received HCV treatment after the staging requirement expansion was analyzed to determine the number of newly approved claims after the staging requirement expansion. The percentages were extrapolated to all plans to estimate the increased utilization and costs anticipated as more plans adopt similar criteria.

**Results:** The fibrosis staging criteria expansion in the analyzed plans led to 131 newly approved claims, resulting in $9,546,756 in incremental costs. 14.4% of claims previously denied due to fibrosis staging, were later approved after the fibrosis staging criteria expansion. 4.9% of newly approved claims were patients with F2 fibrosis staging. When extrapolated to all Medicaid plans over one year, this criteria expansion would yield 889 newly approved claims and $64,786,764 in incremental costs. The abstinence criteria expansion in the analyzed plans would lead to 268 newly approved claims, resulting in $19,530,768 in incremental costs. When extrapolated to all Medicaid plans over one year, this criteria expansion would yield 1,323 newly approved claims and $96,414,948 in incremental costs.

**Conclusion:** Due to the high cost of HCV medications, the expansion of state-mandated HCV treatment coverage criteria can lead to significant increases in specialty drug spend for Medicaid MCOs. This impact analysis underestimates the true effect on costs as the criteria for most plans recently went into effect, allowing a limited time period for analysis. Also, the restrictive criteria put in place have created a population of untreated patients who have had to wait for disease progression in order to receive treatment. The significant increases in HCV drug spend will have the most impact in the near future, but may decrease as more patients are cured of the chronic infection.

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**Title:** Evaluation of the appropriateness of empiric piperacillin/tazobactam for diabetic foot infection and implication for antimicrobial stewardship

**Purpose:** Diabetic foot infections (DFI) are often polymicrobial, with aerobic gram-positive cocci (GPC) being the most common causative pathogen. Aerobic gram-negative bacilli (such as Pseudomonas aeruginosa) and anaerobic species may be co-pathogens. The Infectious Disease Society of America (IDSA) recommends empiric...
treatment targeting aerobic GPC for mild to moderate DFI infections and broad-spectrum antibiotic therapy for severe DFI infections. The guidelines state that empiric therapy directed at P. aeruginosa is unnecessary except for patients with risk factors for infection with this organism (e.g. high local prevalence). The purpose of this study is to determine the frequency of empiric piperacillin/tazobactam prescribing for DFI and its appropriateness by evaluating the prevalence of P. aeruginosa and other gram-negative isolates from DFI in adult patients admitted to several hospitals in a multihospital system.  

Methods: Patients who were diagnosed with a DFI between October 1, 2013 and October 31, 2016 based on ICD-9 and ICD-10 codes were identified using the Epic database. Patients included in data analysis were 18 years of age or older, type II diabetics, and were treated for a DFI with antibiotics. Patients were excluded if they were pregnant, did not receive antibiotics or did not have a positive swab, tissue, or bone culture. The following data was collected through retrospective chart analysis: systemic inflammatory response syndrome (SIRs) criteria prior to culture, culture type, isolated pathogen/sensitivities, bone biopsy pathogen/sensitivities, piperacillin/tazobactam prescribing frequency, and frequency of antibiotic de-escalation in all cases of DFI. Descriptive statistics were used to report continuous variable as means and standard deviations and categorical variables as percentages. A Chi-squared test was used for categorical variables. For all tests, \( p \leq 0.05 \) was considered significant.  

Results: Two hundred patient encounters were included in the analysis. Pseudomonas aeruginosa was isolated in 7% of cases, with 73% of those being polymicrobial infections. Piperacillin/tazobactam was administered in 27% of cases prior to culture in Pseudomonas aeruginosa cases and in 37% of all other cases. The most commonly isolated pathogen from deep tissue cultures was Methicillin-Sensitive Staphylococcus aureus (MSSA) (13%), and the most commonly isolated pathogen from superficial swab cultures was Streptococcus agalactiae (18%). The most common two-pathogen combinations that were isolated were Streptococcus agalactiae/MSSA, Streptococcus agalactiae/mixed anaerobic flora, and Enterococcus faecalis/Echerichia coli. Swab cultures were positively correlated with bone biopsy cultures 92% of the time (n=14), and tissue cultures were positively correlated with bone biopsy cultures 100% of the time (n=2). After being treated with broad-spectrum antibiotics, antimicrobial therapy was appropriately de-escalated in 67% of cases.  

Conclusion: Pseudomonas aeruginosa is not a common etiology of DFI. The results of our study align with the IDSA’s recommendation that empiric therapy directed at Pseudomonas aeruginosa is usually not warranted. Ampicillin/sulbactam and vancomycin may be appropriate empiric therapy in the majority of patients with superficial, non-severe DFI, but patient specific characteristics should be taken into account such as extent of DFI, past episodes, previous treatment, and comorbidities. Based on the results of this study, educational efforts will be made by the antimicrobial stewardship team to increase provider’s awareness of the current treatment pathway and de-escalation strategies for DFI as well as addition of clinical decision support involving treatment selection at order entry.  

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Title: Multidisciplinary Heart Failure Clinic in a small, rural hospital  

Purpose: Heart failure (HF) is a complex clinical syndrome which accounts for significant morbidity, mortality and negatively impacts quality of life. Prevalence of HF among Native Americans ages 60-79 is approximately 1.8 times higher than the general United States population. The objective of this project is to improve patient care by providing greater accessibility and continuity of care through HF disease management services. Studies show HF management programs effectively increase use of recommended medications, reduce hospitalizations and improve patient quality of life. In this multidisciplinary clinic, services will focus on medication management, patient education for self-management and coordination of care.  

Methods: Patients who have previous or new HF diagnosis from September 2014 through September 2016 were identified through the electronic health record. Chart reviews were performed to determine the percent of patients on target medication therapy, mortality rate and number of HF-related emergency department (ED) visits and hospitalizations before implementation of the clinic. The multidisciplinary HF clinic team includes the PGY1 pharmacy resident, a pharmacist, an internal medicine physician and a cardiologist. Patients were referred by their primary care providers or cardiologist to the HF clinic for disease management. Upon admission to the clinic, patients completed an initial HF functional assessment and quality of life (QOL) questionnaire which will be repeated after 6 months in the clinic. Primary outcomes measured include percent of patients receiving recommended medications and percent of patients at target doses of medications per current guidelines. Secondary outcomes include all-cause mortality rate, rate of HF-related emergency department (ED) visits or hospitalizations, percent of patients with documented echocardiogram (ECHO) in the past two years, change in patient functional status in heart failure by New York Heart Association Class and change in QOL assessment.  

Results: At Whiteriver Indian Hospital, 91 patients were identified with heart failure (48% reduced ejection fraction or HFrEF, 31% preserved ejection fraction or HFpEF and 21% unclassified). Seventy-seven percent were on guideline-recommended medications, with 16% at target doses. Sixty-
nine percent of patients had at least one HF-related ED visit in
the past two years and 66% had a recent ECHO.
Since the HF Clinic began, there have been 24 visits with 12
patients. Of these 12 patients, 83% have HFrEF. Prior to the
clinic, 80% were on guideline-recommended medications
with 20% at target doses. Currently 100% are on guideline-
recommended medications with 40% at target doses (as
tolerated). Seventy-five percent of patients seen in the clinic
had at least one HF-related ED visit or hospitalization.
Currently, there has been 1 HF-related ED visit after
implementation of the HF Clinic. Previous to first clinic visit,
66% of patients had received a recent ECHO compared to
75% currently. The remaining 25% of the patients have
ECHOs either scheduled or ordered.
Conclusion: Thus far, percentages of patients on
recommended medications and at target doses are higher for
clinic patients compared to their pre-clinic baseline data.
Many remain in the medication titration process, however,
the clinic has provided an effective link to communicate and
develop follow-up. Secondary outcomes will require more
time for assessment, although are trending toward lower ED
visits and higher recent ECHOs (66% v. 75%). Through
continued efforts, medications will be optimized and QOL will
be re-assessed after six months. With additional referrals
and further participation, we predict continued improvements in
both primary and secondary outcomes.

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IRB Status: Approved

Title: Evaluation of allopurinol regimens on the effect of uric
acid levels to prevent acute gout flares

Purpose: Gout is a debilitating form of arthritis that is caused
by crystallization of uric acid in the joints. The American
College of Rheumatology guidelines recommend a reduction
of serum uric acid (UA) to less than 6mg/dL to prevent
relapse of gouty flares. The purpose of this retrospective
study is to evaluate the treatment of gout within the Phoenix
VA Health Care System in order to determine if patients have
been receiving optimal therapy.

Methods: Data was retrieved from a computerized patient
record system which identified patients who had a clinical
diagnosis of gout being started on allopurinol between
January 1, 2012 and December 31, 2012. The following data
was collected: age, gender, race, allopurinol initiation dose,
titrated allopurinol dose, serum uric acid levels, and number
of recurring flares after starting urate lowering therapy.
Subjects were not reviewed if they were being treated with
allopurinol for the prevention or treatment of tumor lysis
syndrome, managed by non-VA providers, or prescribed
xanthine oxidase inhibitors other than allopurinol. The
primary endpoint of this study will be to compare the number
of gouty flares that occur when serum uric acid levels are
above or below 6 mg/dL.

Results: Forty-six patient charts were reviewed for this study
and twenty-two were included for analysis based on inclusion
and exclusion criteria. The age of patients ranged from 45 to
83 years old at the time of allopurinol initiation, with the
average being 66 years old. Additionally, of the twenty-two
patients included, only one patient was female, 63.6% were
white, 13.7% were black, and 22.7% had unknown race listed.
Base line serum uric acid levels ranged from 5.5 to 12.7
mg/dL, with an average baseline serum uric acid level of 8.7
mg/dL. Final results regarding gout flares are forthcoming
and will be presented.

Conclusion: To be presented at the conclusion of the study.

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IRB Status: Approved

Title: Effect of prescriber and member education on statin
use in diabetic patients: a part D STAR measure pilot
program

Purpose: The Centers for Medicare and Medicaid Services
has proposed a new measure called Statin Use in Persons
with Diabetes Measure (SUPD) that measures the use of
statin in diabetic patients. Current American Heart
Association/American College of Cardiology guidelines
recommend patients who are 40 to 75 years old with
diabetes should be put on a statin in order to prevent an
atherosclerotic cardiac disease. This new measure targets
diabetic patients 40 to 75 years old who are taking greater
than or equal to two diabetes medications. Primary end
point: Increase in number of statin claims in diabetic patients
who are 40 to 75 years old and are on two or more diabetes
medications without a statin. Secondary end point: increase
in Statin Use in Patients with Diabetes (SUPD) Part D STAR
measure

Methods: One thousand nineteen members with two or
more diabetes medications who were between the age of 40
and 75 years old were identified based on patient safety
report provided by Centers for Medicare and Medicaid
Services (CMS), SUPD-Bene_Denominator generated in
August 2016. Members who filled a statin between July 31,
2016 and November 15, 2016 were excluded (245). Pharmacy
claims were utilized to identify the prescribers treating
diabetic patients without statins. Members whose
prescriber’s fax numbers were not available were excluded
(68). The identified members were divided into 6 groups to
assess the effectiveness of different provider and member
interventions. Members were divided based on provider
Results: Group A included members whose prescribers received fax only, group B included members whose prescribers received fax plus provider call, group C included members whose prescribers received fax plus prescriber in-service, Group D included members whose prescribers received fax and members received member letter, Group E included members whose prescribers received fax plus prescriber call and members received member letter, Group F: members whose prescribers received fax plus prescriber in-service and members received member letter. Faxes were sent on December 1, 2016; calls are made mid to end of December. Prescriber in-services were provided in February and member letters were mailed out in January. Member claims were assessed at the end of February to measure the effectiveness of each intervention and they will be assessed in May to allow more time for providers. All the different intervention groups were compared to group A to assess the effectiveness of each intervention. Groups D, E, and F were compared to groups A, B and C respectively to assess the effectiveness of member letters.

Results: There were 82 members put on a statin between 12/1/16 and 2/23/17, leading to an 11.7% increase in statin fills. Group E showed a significant increase in fills compared to group A (p=0.003), in addition group E fill was significantly increased compared to group B (p=0.005). The rest of the groups did not show a significant increase in comparison to group A (p>0.05).

Conclusion: Although not statistically significant, most groups showed an increase in the number of statin fills in comparison to group A. Group E (provider fax plus provider call plus member letter) showed a significant increase in comparison to group A (provider fax only). Group E also showed a statistically significant increase in statin claims compared to group B (provider fax plus provider call), indicating that including member letters as an intervention can lead to an impact in statin use. Claims data will be analyzed again in May to ensure adequate time for providers intervened to evaluate statin use in members.

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Title: Initial fluid resuscitation volumes on outcomes in patients with severe sepsis or septic shock

Purpose: The Surviving Sepsis Guidelines recommend an initial minimum fluid challenge of 30 milliliters per kilogram (mL/kg) crystalloid bolus in patients experiencing severe sepsis or septic shock. Existing evidence for this recommendation is controversial, and clinicians have begun to question the one size fits all applicability of a 30 mL/kg fluid challenge. This study aims to determine if volumes of fluid boluses less than 30 mL/kg in patients with severe sepsis or septic shock leads to differences in patient outcomes.

Methods: This is a single-center, retrospective chart review at a tertiary care academic medical center comparing the effects of various volumes of fluid boluses in severe sepsis and septic shock on intensive care unit (ICU) length of stay. A total of 40 patients with severe sepsis or septic shock were allocated 1 to 1 into groups based on the amount of fluids they received in mL/kg within the first 6 hours of admission. Groups consisted of fluid bolus totals of less than 30 mL/kg, and greater than or equal to 30 mL/kg. Patients were matched based on: age plus minus 5 years, broad spectrum antibiotic initiation time (less than 3 hours or greater than or equal to 3 hours of admission), and three tiers of modified SOFA score (0 to 7, 8 to 11, greater than 11). The primary outcome was differences in ICU length of stay, and secondary outcomes were in-hospital mortality, hospital length of stay, and mortality at 28 days or at discharge.

Results: No significant difference in ICU length of stay was observed in patients with severe sepsis or septic shock who received less than 30 mL/kg (mean 4.3 ICU days) versus greater than or equal to 30 mL/kg bolus (mean 5.9 ICU days) within the first 6 hours of admit (p=0.10). For secondary outcomes, we found a significant difference for in-hospital mortality and mortality at 28 days (p=0.0471) with five deaths in the less than 30 mL/kg group and no deaths in the greater than or equal to 30 mL/kg group. A significant difference was also observed between less than 30 mL/kg (mean 10.9 days) and greater than or equal to 30 mL/kg (mean 20.6 days) for hospital length of stay (p=0.0224). However, when adjusting for mortality, the difference did not remain significant (mean 11.9 days vs. 20.6 days respectively, p=0.09).

Conclusion: Using a universal 30 mL/kg bolus may not have one size fits all applicability for all patients with severe sepsis and septic shock, but a 30 mL/kg bolus may still be favored for most patients. Our study observed no significant difference in ICU length of stay between the two groups. However, we observed significantly more in-hospital mortality in the less than 30 mL/kg group. Although patients in the less than 30 mL/kg group experienced significantly shorter hospital length of stay, this did not remain significant when adjusted for mortality. Larger studies are needed to evaluate true outcomes.

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IRB Status: Approved

Title: Initial fluid resuscitation volumes on outcomes in patients with severe sepsis or septic shock
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Methods: This is a single-center, retrospective chart review at a tertiary care academic medical center comparing the effects of various volumes of fluid boluses in severe sepsis and septic shock on intensive care unit (ICU) length of stay. A total of 40 patients with severe sepsis or septic shock were allocated 1 to 1 into groups based on the amount of fluids they received in mL/kg within the first 6 hours of admission. Groups consisted of fluid bolus totals of less than 30 mL/kg, and greater than or equal to 30 mL/kg. Patients were matched based on: age plus minus 5 years, broad spectrum antibiotic initiation time (less than 3 hours or greater than or equal to 3 hours of admission), and three tiers of modified SOFA score (0 to 7, 8 to 11, greater than 11). The primary outcome was differences in ICU length of stay, and secondary outcomes were in-hospital mortality, hospital length of stay, and mortality at 28 days or at discharge.

Results: No significant difference in ICU length of stay was observed in patients with severe sepsis or septic shock who received less than 30 mL/kg (mean 4.3 ICU days) versus greater than or equal to 30 mL/kg bolus (mean 5.9 ICU days) within the first 6 hours of admission (p=0.10). For secondary outcomes, we found a significant difference for in-hospital mortality and mortality at 28 days (p=0.0471) with five deaths in the less than 30 mL/kg group and no deaths in the greater than or equal to 30 mL/kg group. A significant difference was also observed between less than 30 mL/kg (mean 10.9 days) and greater than or equal to 30 mL/kg (mean 20.6 days) for hospital length of stay (p=0.0224). However, when adjusting for mortality, the difference did not remain significant (mean 11.9 days vs. 20.6 days respectively, p=0.09).

Conclusion: Using a universal 30 mL/kg bolus may not have one size fits all applicability for all patients with severe sepsis and septic shock, but a 30 mL/kg bolus may still be favored for most patients. Our study observed no significant difference in ICU length of stay between the two groups. However, we observed significantly more in-hospital mortality in the less than 30 mL/kg group. Although patients in the less than 30 mL/kg group experienced significantly shorter hospital length of stay, this did not remain significant when adjusted for mortality. Larger studies are needed to evaluate true outcomes.

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Title: Characterization of methylnaltrexone utilization and laxation in the acute care setting

Purpose: The primary objective was to evaluate appropriate methylnaltrexone (MNTX) usage by assessing utilization indicators such as documented nothing by mouth (NPO) status, lack of laxation, opioid use and laxative use with dosage escalation prior to MNTX administration. Appropriate dosing regimen based upon renal function and indication (opioid-induced constipation [OIC] with chronic non-cancer pain, OIC with advanced illness, postoperative ileus) was also evaluated. The secondary objective was to assess time to laxation after initial MNTX administration.

Methods: An electronic medical record system was utilized to identify patients 18 through 89 years of age with orders for MNTX between January 1, 2016 and June 30, 2016. Patients taking MNTX, linaclotide, or lubiprostone prior to admission were excluded. Retrospective review of the patients’ medical records was utilized to collect the following data: age, gender, initial weight, creatinine clearance (CrCl), NPO status, time of last laxation prior to MNTX initiation, opioid usage prior to MNTX (defined as greater than or equal to two doses of scheduled or as needed narcotics in the preceding 24 hours prior to MNTX administration), and encounter type (inpatient, observation, or emergency department). Additional data included the following were collected: stimulant and/or osmotic laxative use and dosage escalation in the 48 hours preceding MNTX administration and time to laxation following first MNTX administration. The following information was collected about each MNTX dose: day and time of administration, dose, dosing schedule, and prescriber specialty. After data collection and analysis, descriptive statistics were used to characterize patients and utilization indicators. Additional statistical tests were performed to determine if any correlation existed between utilization indicators and time to laxation.

Results: There were 107 patients evaluated with the majority of patients being male (67.3 percent). Indications for MNTX were identified as follows: 23 patients with OIC with advanced illness (21.5 percent); 42 patients with OIC with chronic non-cancer pain (39.3 percent); 14 patients with postoperative ileus (13.1 percent); and 28 patients with unknown indication (26.2 percent). Ninety patients utilized opioids prior to MNTX administration (84.1 percent). Stimulant laxatives were utilized in 31 patients (29 percent) and dose escalated in 5 patients (4.7 percent). Osmotic laxatives were utilized in 72 patients (67.2 percent) and dose escalated in 8 patients (8.4 percent). The mean duration of laxative use prior to MNTX administration was 1.27 days. Of the 75 patients with a definitive indication and calculated CrCl, 32 patients (42.7 percent) were dosed incorrectly. Based on encounter type, 77 patients with inpatient status (72 percent), 9 patients with observation status (8.4 percent), and 21 patients in the emergency department (19.6 percent).
Three patients had documented NPO status on day of MNTX administration. MNTX was most frequently prescribed by hospitalists (58.9 percent) and emergency department physicians (24.3 percent). There was no statistical difference in time to laxation after MNTX if dosed appropriately versus inappropriately.

**Conclusion:** The majority of MNTX use at Banner Desert Medical Center was used in patients who did not have other bowel care agents prior to administration of MNTX. Opportunities are available for process improvement when patients are prescribed MNTX. Specialties that primarily prescribed MNTX were identified for education of appropriate dosing regimens. Criteria for MNTX usage should be further developed and implemented.

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**Title:** Evaluation of trigger alerts associated with laboratory abnormalities on preventing adverse drug events in the intensive care unit and general ward

**Purpose:** The risk of adverse drug events is higher in the intensive care unit (ICU) and associated with worse outcomes than general ward patients. Comprehensive adverse drug event surveillance programs have focused on identification rather than prevention. However, one detection method utilizing trigger alerts has shown promise as a viable preventative strategy. Trigger alerts are real-time notifications resulting from logic-based rules involving abnormal laboratory values. The purpose of this study was to evaluate the performance of trigger alerts involving laboratory abnormalities on identifying adverse drug events as well as drug-related hazardous conditions (DRHCs) in ICU and non-ICU patients.

**Methods:** This study was a retrospective, cohort study of an automated trigger alert surveillance system in adult patients at a large academic medical center. Trigger alerts generated over a 1-year period (January 1, 2015 – December 31, 2015) for all hospitalized patients were identified from a centralized database. Patient inclusion criteria consisted of the following criteria: (1) at least 18 years of age, and (2) at least 1 trigger alert associated with abnormal laboratory values was generated. Patients were excluded if the electronic medical record was not accessible, or duplicate trigger alerts resulting from the same medication during the same hospital admission. The primary endpoint was to compare the rate of adverse drug events occurring despite pharmacist intervention in response to a trigger alert between ICU and general ward patients. Secondary analyses included severity of harm associated with DRHCs and the positive predictive value for all 20 unique trigger alerts in identifying both drug related hazardous conditions as well as adverse drug events.

**Results:** The rate of adverse drug events occurring despite pharmacist intervention resulting from a trigger alert in the ICU and non-ICU was 5.2% and 5.72% (p=NS), respectively. The majority of drug related hazardous conditions were mild (55%) and moderate (22.5%). The overall positive predictive value of trigger alerts for identifying a DRHCs was 0.29, while those in the non-ICU (0.31) performed better than the ICU (0.25). Trigger alerts identified more severe and life-threatening DRHCs in the ICU compared to non-ICU settings.

**Conclusion:** The performance of trigger alerts in identifying drug related hazardous conditions was lower in the ICU compared to non-ICU settings. Significant variability in the frequency, severity, and positive predictive value for each individual trigger was observed between the ICU and non-ICU settings.

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**Title:** Readmission rates after discharge on warfarin at a rural community hospital

**Purpose:** Warfarin is an anticoagulation medication used in a variety of blood and clotting disorders. Warfarin’s interactions with medications, foods and disease states make it difficult to dose in the acute setting. Dosing requires routine monitoring and evaluation, and it can be difficult to keep patient’s regimen within the therapeutic range. Even when patients are on a stable regimen at discharge, other medications might be changed for home administration. This sudden change to the medication regimen may lead to acute changes in INR causing patients to quickly return to the hospital for warfarin related complications.

**Methods:** This project is was a retrospective patient chart review from a 1-year period of July 1, 2015 to June 30, 2016. Patients included in the study were patients who were discharged from the hospital on warfarin and visited the emergency room or were readmitted to the hospital in the next 14 days with a bleed, supratherapeutic international normalized ration (INR) or thromboembolic event. Patient charts were examined to determine the inpatient diagnosis of the original admission, the discharge warfarin dose, other discharge medications, the profession of the practitioner who managed the patient’s warfarin during the patient’s stay as an inpatient, and changes made to warfarin dose at discharge. Demographic data such as age, gender, race, and comorbidities were also collected. The data was analyzed to see if there were possible opportunities for interventions that could have prevented the readmission or emergency room visit.
**Results:** During the study period, 509 patients were discharged from the study hospital while on warfarin. Of those patients, 81 had a readmission or emergency room visit during the subsequent 14 days. A total of 28 of those patients had a bleed, supratherapeutic INR or thromboembolic event and were included in the study. Patients included in the study returned to the hospital in an average of 7.75 days. The average length of stay for the second visit was 4.68 days. Of the 28 patients included in the study, 22 patients (79%) had their warfarin regimen increased at discharge, had a mediation that interacts with warfarin added at discharge, or both. Ten patients (36%) had their warfarin regimen increased at discharge. Seventeen patients (61%) had a medication that interacts with warfarin added at discharge. A total of 9 patients (32%) returned to the hospital with an active bleed.

**Conclusion:** For patients who are discharged on warfarin, a pharmacist evaluation of the discharge medication regimen may help improve patient outcomes by decreasing the number of bleeds, supratherapeutic INRs or thromboembolic events experienced over the subsequent 14 days.

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**Title:** Analysis of the clinical and economic impact of a pharmacist-led, behavioral health provider education program in a managed care setting

**Purpose:** This study measured the prescription cost-savings and clinical impact of an expanded Clinical Pharmacy Advisor role within the Mercy Maricopa Integrated Care (MMIC) plan. Additionally, provider satisfaction feedback was analyzed to identify the most valued clinical services and target areas for future quality improvement.

**Methods:** Providers in the intervention group (Partners In Recovery clinic, n=27) received intensified clinical services (a dedicated pharmacist to provide answers to drug information questions, participate in monthly clinic meetings, in-service presentations, and provide additional reporting), whereas those in the control group (Southwest Network, n=29) received standard Clinical Pharmacy Advisor services. The type, frequency and date of all interventions made in the intervention group were tracked during the four month period following IRB approval (October 2016-January 2017). A literature review was then completed to assign established cost-savings to these interventions. Provider reporting and claims data were assessed to determine prescription cost savings. A baseline provider survey was distributed to all providers. Following the 4 month intervention period, a follow-up survey was distributed to measure satisfaction with newly implemented clinical programs.

**Results:** During the intervention period (October 2016-January 2017) the following clinical interventions were made: 99 provider report cards, 639 identified drug-drug interactions, 24 providers attended in-service presentation, 41 patients on concomitant benzodiazepines and opioids were identified, and two drug information questions were answered. Subsequently, a year-over-year comparison of pharmacy costs was conducted. Changes in pharmacy cost were assessed based on October 2015-January 2016 and October 2016-January 2017 claims data. The average increase in monthly net prescription cost in the intervention group was $399,552.82 compared to $913,193.32 in the control group (p=0.0386). The average increase in cost per prescription in the intervention group was $24.32 in the intervention group versus $31.67 in the control group (p=0.0974). The average increase in cost per utilization per month (PUPM) was $93.00 in the intervention group and $114.25 in the control group (p=0.7874). Preliminary provider satisfaction surveys had a limited response (n=4, 14.8%).

**Conclusion:** Preliminary analysis of the Clinical Pharmacy Advisor role suggests that it has a positive clinical impact that decreases costs while increasing quality of care for the members we serve. In additional, a decreasing trend in controlled substance prescribing was identified. However, while increases in prescription cost were lower in the intervention group, the difference was not statistically significant compared to the control group. The low response rate to the provider satisfaction survey suggests that expanded efforts for feedback should be made. Nonetheless, the survey highlights key areas for improvement as well as educational outreach opportunities that may be targeted as part of continuous quality improvement efforts.

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**Title:** Safety and effectiveness of very low LDL in a veteran population

**Purpose:** Currently, there is limited guidance regarding statin use in subjects with very low low-density lipoprotein (LDL) levels (less than 40 mg/dl). The 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults advises clinicians to consider decreasing a statin dose if two consecutive values of LDL are less than 40 mg/dl but do not provide further recommendations regarding initiation of statin therapy in these subjects. This retrospective chart review aimed to determine the safety and effectiveness of statin use in veterans with an LDL less than 40 mg/dl. Cardiovascular outcomes in veterans with no documented statin use will be...
compared to subjects on a statin prior to the first LDL less than 40 mg/dL.

Methods: Veterans with at least four LDL levels less than 40 mg/dL at the Southern Arizona VA Health Care System between January 1, 2000 and September 1, 2011 were evaluated. The primary outcome was a composite of cardiovascular (CV) related death, myocardial infarction (MI), and cerebrovascular accidents (CVA). The primary outcome was compared between statin and non-statin users with chi-square analysis. Secondary outcomes included time to first event (CV related death, MI or CVA), death from any cause, incidence of rhabdomyolysis, and adverse drug reactions to statins.

Results: A total of one hundred and sixteen patients were included in the analysis. Half of these patients (58 veterans) had no documented statin use. Statin users had a mean age of 67 years vs. 56 years for veterans with no documented statin use. Veterans on a statin prior to the first LDL less than 40 mg/dL had a higher incidence (p = 0.047) of CV related death. There was no significant difference in the composite outcome of CV related death, MI, and CVA. Five statin users (9%) had an adverse drug reaction, two of which were myalgia and one of which was rhabdomyolysis.

Conclusion: Statin users with a very low LDL had a higher incidence of CV related death compared to non-statin users. It is suspected that this increase in CV related death was not due to statin use itself, but due to the co-morbidities and risk factors of the patient population evaluated. This may also indicate that naturally low LDL has a protective effect on cardiovascular outcomes. In conclusion, statin users with very low LDL remain at high risk for adverse cardiovascular outcomes and do not appear to be at an increased risk for adverse drug reactions.

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Title: Retrospective, qualitative review of the enhanced care process of the HEART pathway tool in a geriatric population

Purpose: The HEART Pathway is a risk stratification tool combining the HEART (history, echocardiogram, age, risk factors, and initial troponin level) score with serial troponin tests. The American Heart Association HEART Pathway Randomized Trial substantiated the real-time applicability and sensitivity of the HEART Pathway in detecting the risk for a major adverse cardiac event in patients presenting to the emergency department with chest pain. The original HEART pathway trial was done in subjects with an average age of 54 years. The purpose of this retrospective review is to describe the utility of the Heart Pathway tool in geriatric subjects.

Methods: This was a retrospective, observational chart review in which the emergency department data of subjects 65 years or older presenting with chest pain during the month of July 2016 was evaluated. In addition to demographic data (i.e. age, sex, race, and ethnicity) the following risk factors for acute coronary syndrome were collected from the electronic medical record: current smoking status, hypertension, hyperlipidemia, diabetes mellitus, family history of coronary artery disease, body mass index greater than 30 kg/m2, and any previous coronary artery, cerebrovascular and/or peripheral vascular disease. Physician HEART scores were extracted from electronic medical records. For those subjects without a recorded HEART score, one was retrospectively applied based on the HEART Pathway parameters. The HEART score was then used to stratify subjects into either a high risk category (HEART score ≥ 4 or any positive troponins) or a low risk category (HEART score <4 and negative troponins at 0 and 3 hours). This risk category was then compared to the disposition of either early discharge, observation status, or admission to an inpatient unit following emergency department evaluation. Additionally, the occurrence of a major adverse cardiovascular event, defined as a composite of all-cause mortality, myocardial infarction, or coronary artery revascularization within 30 days, or an admission for bleeding within 30 days’ post index emergency department visit were assessed.

Results: Of the 121 patients presenting to the emergency department for chest pain during the month of July 2016, 114 met inclusion criteria. The average age of the study population was 78.6 years. Females represented 51% (n = 59) of the study population. Majority of patients (n = 111) were white. The average HEART score was 5.6. Majority of patients (n = 109, 95.6%) were classified as “high risk” (HEART score ≥4) according to HEART Pathway parameters. Of those 109 subjects who were considered as “high risk”, 24% (n = 26) were admitted to an inpatient unit, 60% (n = 66) were admitted as observation, 10% (n=11) were discharged, and 6% (n=6) left against medical advice. Of the five “low risk” (HEART score <4) subjects, two were discharged, two were admitted as observation, and one was admitted to an inpatient unit. Of those subjects held in observation or inpatient, the average length of stay was 1.58 days. Two subjects were re-admitted within 30 days following the index emergency department visit for a major adverse cardiovascular events (both had “high risk” index Heart scores and had inpatient stays). No subjects had readmissions for bleeding.

Conclusion: Given the intrinsic presence of age-related risk factors, the results of this study suggest that the HEART Pathway scoring tool may not be as effective at stratifying risk and further methods of risk stratification in the geriatric population may prove useful. Considering that this was only a descriptive study of the use of the HEART Pathway scoring tool, further exploration is needed in order to truly understand the value of this tool when applied to geriatric
patients presenting to the emergency department with chest pain.

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Title: Evaluation of appropriate apixaban and rivaroxaban dosing in atrial fibrillation

Purpose: Anticoagulation management strategies utilizing apixaban and rivaroxaban for atrial fibrillation has increased in recent years. However, dose adjustments for these agents are recommended based on patient’s renal function, actual body weight, and/or advanced age. There is a paucity of evidence available regarding the number of patients being placed on modified dosing strategies of apixaban or rivaroxaban inconsistent with package insert recommendations and the appropriateness of these decisions. The purpose of this study was to describe the rate of appropriate dosing strategies of apixaban and rivaroxaban in patients with atrial fibrillation.

Methods: This was a retrospective chart review of adult patients with atrial fibrillation who received at least one dose of apixaban or rivaroxaban among six acute care hospitals including a large academic, large community and small community hospitals within the same health-system (Banner Health) between October 1, 2015 and September 30, 2016. Patients were excluded if they had a documented history of venous thromboembolism or mechanical heart valve. Data collected included medication dosages as well as various laboratory values and comorbidities encompassed within risk stratification scores such as CHADS2, CHA2DS2-VASc, and HAS-BLED. The primary endpoint was the percentage of patients receiving apixaban or rivaroxaban for atrial fibrillation at appropriate versus inappropriate dosing. Secondary analyses included the rate of appropriate dosing between apixaban and rivaroxaban, and the prescribing patterns associated with the CHADS2, CHA2DS2-VASc, and HAS-BLED scoring between appropriate and inappropriate dosing.

Results: A total of 7442 unique encounters among 5787 patients met inclusion criteria. The majority of patients were administered apixaban (83%) over rivaroxaban (17%). The rate of appropriate doses administered for apixaban and rivaroxaban was 81% and 68%, respectively. The majority of inappropriate apixaban dosing (90%) was attributed to lower than recommended doses. Conversely, lack of dose reductions warranted for low renal function resulted in 55% of inappropriate rivaroxaban dosing.

Conclusion: Both apixiban and rivaroxaban may require adjustments for optimal dosing in certain populations.

Adherence to recommended doses varied between each agent with different proximal causes identified for areas of improvement.

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Title: Evaluation of subcutaneous calcitonin use in hypercalcemia before and after a computerized alert

Purpose: Subcutaneous calcitonin is one of the treatment options available for hypercalcemia. Tachyphylaxis with calcitonin has been demonstrated with use over 48 hours and as a result, patients that receive subcutaneous calcitonin for hypercalcemia derive little benefit after 48 hours have expired. A computerized alert was created in order to assist with subcutaneous calcitonin use based on this time frame. The primary objective of this retrospective review is to determine if there is a reduction of inappropriate use of subcutaneous calcitonin in patients with hypercalcemia after implementation of a computerized alert.

Methods: This is a retrospective chart analysis of patients that received subcutaneous calcitonin between July 2015 and December 2016. Inclusion criteria involved patients greater than 17 years of age and received subcutaneous calcitonin within our facility. Patients were excluded if they did not receive subcutaneous calcitonin. The following data was collected: patient’s gender, actual body weight, ideal body weight, total units of appropriate calcitonin used, total units of inappropriate calcitonin used, total number of calcitonin doses, serum creatinine at baseline, serum calcium at baseline, serum albumin at baseline, calcitonin dose at initiation, calcitonin dose changes, and estimated cost of therapy. The primary objective was evaluated with a chi-squared test and descriptive analysis will be used on cost considerations. A two-tailed p-value of ≤ 0.05 was considered statistically significant. Results: Forty-eight patients were included in this analysis. Thirty-one patients were included before the implementation of the computerized alert while 17 patients were included post implementation of the computerized alert. For the primary objective, 32.3% of patients received inappropriate calcitonin pre-implementation of the computerized alert while 29.4% of patients received inappropriate calcitonin post-implementation of the computerized alert (P = 0.838). On average, patients in the post implementation group received fewer units of inappropriate calcitonin, leading to lower overall costs.

Conclusion: There was no difference observed between the two groups in terms of reduction of patients receiving inappropriate subcutaneous calcitonin with implementation
of a computerized alert. Alternative methods reduce inappropriate subcutaneous calcitonin should be explored.

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Title: Creation of Exclusion List for Non-Rebateable NDCs and Process Improvement to Promote Pharmacy Encounter Acceptance

Purpose: To reduce the number of encounter rejects by restricting adjudication at POS for targeted NDCs.

Methods: (1) To develop and implement an exclusion process with the pharmacy benefits manager (PBM) to reduce the number of point-of-sale (POS) rejections for drugs and DME that are not encounterable. Once the process is implemented it will lead to more detailed pharmacy benefit monitoring, State compliance, and analysis of rejections. (2) Work with the PBM to identify and remove encounterable NDCs from the exclusion list, ultimately reducing the number of rejected encounters by the state and assessing monetary effect. With appropriate steerage, there is a projected $4.7 million savings.

Results: Working with PBM and health plan encounters teams to review submitted encounters for accuracy and appropriateness in accordance with the State contract. Prior to creation of the Exclusion File, 45% or $500,000, of the rejected encounters from January to August 2016 were related to “NDC not covered” encounter reject code.

Conclusion: Over the last quarter, there was an increase in pharmacy benefit utilization for DME products, and is now identified as a Top 10 Drug for the Health Plan. The results collected have provided justification to institute a similar program across all Health Plans to verify appropriate medication and DME coverage by State mandated contracts.

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Title: Comparison of the incidence and prevalence of delirium and coma in mechanically ventilated ICU patients receiving continuous infusion ketamine versus propofol

Purpose: The incidence of delirium in the ICU has been reported to be as high as 89%. One of the many factors that have been associated with delirium is the choice of sedative used while mechanically ventilated. Contemporary first line agent’s dexmedetomidine and propofol have been shown to be less deliriogenic than benzodiazepines. Currently there is a paucity of data regarding the incidence and prevalence of delirium and coma with ketamine. This retrospective review was designed to evaluate the number of days alive without delirium or coma in mechanically ventilated ICU patients on continuous infusion ketamine versus propofol.

Methods: This was a retrospective study conducted at a tertiary care, academic medical center. Mechanically ventilated adult ICU patients receiving continuous infusions of ketamine or propofol for a minimum of six hours between November 1, 2015 and April 7, 2017 were included. Patients were excluded if ketamine or propofol was used for any indication other than sedation while mechanically ventilated, or if they received a paralytic infusion concurrently for the duration of the sedative infusion. Data collected included CAM-ICU and RASS scores, ICU admission SOFA scores, length of hospital and ICU stay, number of days on mechanical ventilation and mortality. Additional outcomes evaluated included incidence and prevalence of delirium and coma, duration of mechanical ventilation, and length of stay.

Results: A total of 79 subjects met inclusion criteria during the study period, of which 39 received continuous infusion ketamine and 40 received propofol therapy. Baseline characteristics were overall similar, except patients in the ketamine group used significantly more vasopressors and inotropes. The median age in the overall cohort was 58 years, 54% were male and the majority were admitted to the medical ICU service. Ketamine was initiated a median of 2 days (IQR 1-6 days) after ICU admission. The median initial dose of ketamine was 5 mcg/kg/min (IQR 5-5 mcg/kg/min), which was titrated to a median maximum dose of 10 mcg/kg/min (IQR 7-15 mcg/kg/min). Sedation with ketamine resulted in no difference in days alive without delirium or coma (median days, 6 vs. 4; P = 0.351) or incidence of delirium (mean percentage of rates, 74% vs. 85%; P= 0.274) compared to sedation with propofol. There was no difference in ventilator free days (median days, 13 vs. 21; P= 0.229) or inhospital mortality (mean percentage of mortality, 28% vs. 13%; P=0.099) between patients on ketamine or propofol.

Conclusion: In mechanically ventilated ICU patients, there was no difference in the number of days alive without delirium and/or coma, the number of mechanical ventilator free days, or mortality with continuous infusion ketamine compared to propofol. Ketamine may serve as a viable alternative to current sedative agents in select patients requiring mechanical ventilation.

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Title: Comparison of safety between two computerized insulin management algorithms in a multi-hospital system

Purpose: Longstanding hyperglycemia is correlated with increased morbidity and mortality. Numerous studies have shown that tight glycemic control reduces these complications, but at times achieving this control is associated with increased adverse events. Hypoglycemia, an adverse event often related to tight glycemic control, is associated with increased mortality. Studies have shown that computerized insulin protocols are superior to manual or paper calculations. The objective of this study is to compare the safety of two computerized insulin management algorithms across a wide variety of populations in a multi-hospital system.

Methods: This study is a retrospective, chart review comparing two insulin management algorithms. The pre-cohort received insulin by a proprietary algorithm. The post-cohort received insulin through a program integrated into the electronic health record (EHR). Cohorts were compared during the same time frame one year apart. Cases for each cohort were identified through point-of-care blood glucose (BG) values. Events were included if the patient had active orders for insulin, a BG ≤ 70 mg/dL, age ≥ 18 years, and received treatment with dextrose 50% in water injection, glucose tablets, and/or glucagon injection. Events within procedural areas were excluded. Additional cost and utilization analyses of basal insulin and hypoglycemia treatment was completed. Utilization of all drugs was accessed from the EHR. Sample size was determined by inclusion time frame and was not designed to target statistical power. Descriptive statistics were used to report continuous variables as means and categorical variables as percentages. A Chi-square test was used for categorical variables. A Chi-square goodness-of-fit calculation was completed to account for variances in sample size. An independent measures t-test was calculated to detect differences between baseline demographics of the cohorts. For all tests, p ≤ 0.05 was considered significant.

Results: Baseline demographics were compared between groups. A significant difference in age was detected (67 vs 59, t=5.162, p < 0.001). No significant difference was detected in gender (χ² = 0.068407, p < 0.05). There were 411 hypoglycemic events of 64,541 (0.6%) in the pre-cohort, with 53 severe events or a BG ≤ 50 mg/dL (0.08%). In comparison, 666 hypoglycemic events occurred in the post-cohort of 55,728 (1.2%). Of which 78 were severe (0.14%). When comparing the incidence of hypoglycemia, the results were significant, χ²=102.502, p < 0.001. The incidence of severe hypoglycemia was significantly different, χ² = 8.654, p < 0.05. Due to the difference in sample size, a goodness-of-fit test was completed. The results were not significant, χ² = 0.088, p > 0.05. The amount of insulin glargine utilized was 113,914 units in the pre-cohort and 232,874 units in the post-cohort over a three month period. The cost of insulin glargine was $10,000 in the pre-cohort and $20,444 in the post-cohort. The cost for hypoglycemia treatment was $3,060 in the pre-cohort and $13,750 in the post-cohort. The cost difference was highly affected by an approximate 10-fold increase in glucagon use.

Conclusion: There was a statistically significant difference in the incidence and severity of hypoglycemia between the two insulin management algorithms. Utilization of insulin glargine increased by 118,960 units, an additional $10,443 in medication cost for the hospital. There was $10,690 more spent on the treatment of hypoglycemic events in the post-cohort. This does not include the cost for the purchase of the insulin management software, pharmacy and nursing labor, or the intangible costs of untreated hyperglycemia that is occurring (data displayed in discussion section).

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Presentation Category: Specialty Care
IRB Status: Exempt

Title: Case Series Report: Impact of high-dose cannabis use in patients with advanced pancreatic cancer receiving Phase I investigational chemotherapy nab-paclitaxel, cisplatin, gemcitabine, paricalcitol, and nivolumab

Purpose: For over 6,000 years herbal remedies, such as Cannabis, have been used to cure or ease ailments. Recent polls in the United States have shown that almost half (48%) of adults have used cannabis once in their lifetime and that perceptions toward its use are changing. Despite increased use and acceptance, only limited data exists regarding cannabis in pharmacology, pharmacokinetics, comparative efficacy, toxicities, drug interactions, and dosing. There are known interactions of cannabis with the metabolism and effects of select medications but many other effects are unknown, especially with investigational drugs.

Methods: This case report series looked retrospectively at patients enrolled in a Phase I clinical trial of multi-drug chemotherapy for advanced pancreatic cancer at the Virginia G. Piper Cancer Center in Scottsdale, Arizona at the HonorHealth Shea Medical Center campus. Patients were included in the study if they reported use of cannabis (inhaled, consumed, etc.) during pharmacy consultations. Data collected from the electronic health record (HER) includes basic demographics, self-reported cannabis usage, vitals, basic labs, nausea and pain scores, and outpatient prescription records. Due to the observational nature of the study, no advanced statistics were performed. Descriptive statistics were used to report continuous variables as means and categorical variables as percentages. Sample size was determined by study enrollment and was not designed to target statistical power.

Results: Of the 10 patients in the clinical trial at the time of the review, three were included (median age, 57; range, 45-
Cannabis was both consumed and inhaled at high doses of THC in these patients (median 256 mg; range 120-500 mg). The THC doses reported are equivalent to 24-100 capsules of Dronabinol®. These patients with high cannabis use required 2-4 new antiemetic and 1-3 additional analgesic prescriptions during cycle one. In addition, the patient’s had Grade 2-3 hyponatremia, per the National Institutes of Health Common Terminology Criteria for Adverse Events Version 4.0 criteria, on average 51% of the time (range 23-75%). Two patients were hospitalized during cycle one, during which one patient expired. One hospitalization was related to postural hypotension, likely related to fluid imbalances.

**Conclusion:** This is the first case series of possible adverse effects attributed to high-dose cannabis consumption in pancreatic cancer patients receiving multidrug chemotherapy. Further data collection will compare the identified toxicities in this series to a control group to determine if adverse effects are isolated to the cannabis group only. Based on these results physicians should closely monitor patients for adverse effects possibly related to cannabis. We believe that toxicities of cannabis are worth exploring, ideally in a randomized trial.

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IRB Status: Approved

**Title:** Twice daily lisinopril in chronic kidney disease (TDL in CKD Trial)

**Purpose:** Evidence-based treatment guidelines recommend angiotensin converting enzyme inhibitors (ACEI) in chronic kidney disease (CKD) to preserve renal function and delay the progression of end organ damage. Lisinopril is a commonly used ACEI at the Southern Arizona Veterans Affairs Health Care System (SAVAHCS). Lisinopril is traditionally dosed once daily despite its documented 12 hour half-life. Based on its pharmacokinetics, it may be reasonable to dose twice daily to achieve optimal results. There are currently no published studies analyzing the effects of twice daily lisinopril in preventing the progression of CKD. The lack of data has led SAVAHCS clinicians to speculate whether once daily or twice daily dosing is more efficacious in preserving renal function in our Veterans. This study primarily aimed to demonstrate twice daily lisinopril reduces the number of subjects whose serum creatinine doubles over a four year period.

**Methods:** In this retrospective cohort study, the charts of Veterans age 18-79 years with CKD Stage II-IV, documented baseline serum creatinine (Scr) value, and new prescription for lisinopril between January 2001 and January 2011 were selected for review. A total of 180 patient charts were screened, with 20 being included in the final study analysis. Subjects were divided into two groups: one group which received once daily lisinopril dosing (n = 10), and another group received twice daily dosing (n = 10). TheScr at baseline and four years later was recorded and analyzed to determine if doubling occurred. Other outcomes recorded, if available, included change in estimated glomerular filtration rate (eGFR), change in urine albumin-creatinine ratio (UACR), need for hemodialysis and reported adverse drug reactions (ADRs).

**Results:** The mean age of included subjects was 64 years. All were male with the majority (65%) being Caucasian. Hypertension, type II diabetes mellitus, and coronary artery disease were the most prominent medical conditions. The average serum potassium level at baseline was 4.6 mEq/L, and 70% of subjects were diagnosed as CKD Stage III per ICD-9 codes. There were no significant differences in the baseline characteristics of the subjects. No subjects in either group had doubling of serum creatinine and therefore no difference was found between the groups. In the once-daily lisinopril group, the mean serum creatinine was 1.56 mg/dL at baseline and 1.64 mg/dL four years later; mean eGFR was 50.41 mL/min/BSA at baseline and 47.9 mL/min/BSA four years later. A similar trend was observed in the twice-daily lisinopril group: mean serum creatinine was 1.65 mg/dL at baseline and 1.7 mg/dL four years later; mean eGFR was 51.02 mL/min/1.73 m2 at baseline and 48.1 mL/min/1.73 m2 four years later. The differences in Scr and eGFR were not statistically significant in either group. Documented UACR values were not available for all subjects and subsequently were not included in the final data analysis. One subject in the once daily lisinopril group required the initiation of hemodialysis during the course of the study. Two subjects in the twice daily lisinopril group had reported adverse drug reactions of hyperkalemia; no adverse drug reactions were reported in the once daily group (p=0.47).

**Conclusion:** There was no statistically significant difference in the doubling of serum creatinine in subjects taking twice daily versus once daily lisinopril. In this study subjects taking lisinopril twice daily were more likely to experience hyperkalemia, although this difference was not statistically significant.

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IRB Status: Approved

**Title:** Clinical characteristics of Clostridium difficile-associated diarrhea (CDAD) among a Veteran population

**Purpose:** Healthcare-associated C. difficile infection rates continue to increase across the United States despite more effective methods of identification and infection control strategies. Antibiotic use is one of the most widely accepted and modifiable risk factors associated with C. difficile
infection. This retrospective cohort study aimed to evaluate if a correlation exists between positive C. difficile PCR tests and antibiotic use, length of stay, location of admission, documented penicillin allergy, and other factors that may increase the burden of hospital acquired C. difficile associated diarrhea (CDAD) for the Veterans at SAVAHCS.

Methods: In a retrospective cohort study of 54 subjects at the Southern Arizona VA Healthcare System, Veterans ages 18-89 years with a positive C. difficile Toxin A/B PCR during admission between July 31, 2015 and July 31, 2016 were included for analysis. A total of 111 patients with 165 positive C. difficile results were screened, 57 patients were excluded as CDAD symptom onset and/or C. difficile result was prior to admission. Patients were divided into two groups: Group I received antibiotics during admission prior to positive C. difficile result (n=17), and Group II did not receive any antibiotics during admission prior to C. difficile result (n=37). Additional outcomes measured included recorded beta-lactam allergy, admission location, mean admission length, and death during evaluation period. Descriptive statistics were used to characterize antibiotic use and ward location, secondary outcomes such as presence of beta-lactam allergy, death during analysis period, and length of hospital stay were analyzed using the chi square test with P value less than 0.05 noted as statistically significant.

Results: The mean age of all included subjects was 70 years, two subjects were female (3.7%). Of the 54 patients with positive C. difficile PCR results, 17 patients received antibiotics during admission prior to PCR result and 37 did not. There were a total of five patients with recorded beta-lactam allergies, two in the antibiotic group and three in the no antibiotic group (p >0.05). Mean admission length was 9.5 days in the antibiotic group and 9 days in the no antibiotic group (p >0.05). Vancomycin (34%), ceftriaxone (21%), and piperacillin/tazobactam (14%) were the most commonly used antibiotics prior to the positive C. difficile PCR result. 71% of positive PCR results occurred on medicine wards 3E, 3N, and 25. There were two deaths in each of the groups during evaluation period.

Conclusion: Antibiotic use, recorded beta-lactam allergies, admission location, and admission length were not associated with increased rates of positive C. difficile PCR results in this small study population. While this data does not directly coincide with previous literature findings, it is imperative to maintain antimicrobial stewardship and infection control policies to minimize the incidence of C. difficile in accordance with current guidelines. Further studies may be beneficial to identify and target additional risk factors in this patient population.

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Title: Study of Procalcitonin for Acute COPD Exacerbations

Purpose: Current guidelines recommend the use of antibacterial agents in all patients with chronic obstructive pulmonary disease (COPD) exacerbations that are severe enough to require hospital admission. However, literature indicates that many of these exacerbations may be non-bacterial in origin. Currently, few studies have evaluated the utility of the biomarker procalcitonin in differentiating between bacterial and non-bacterial causes of COPD exacerbations. The purpose of this study is to evaluate a procalcitonin-guided treatment protocol in veteran subjects admitted with acute exacerbation of COPD.

Methods: This prospective, randomized, controlled study has been approved by the hospital’s Institutional Review Board. The electronic medical record was used to identify subjects who were admitted with acute COPD exacerbation. Subjects who consented to participate in the study had a procalcitonin level measured by the laboratory using a point-of-care testing method. Subjects were then randomized to one group receiving the standard of care based on current guidelines (including antibiotics, systemic corticosteroids, and inhaled bronchodilators); the second group received care based on procalcitonin level. Subjects with procalcitonin levels less than 0.1 ng/mL were given systemic corticosteroids and bronchodilators only. Subjects with procalcitonin levels greater than or equal to 0.1 ng/mL received standard care based on current guidelines, including antibiotics. Outcome measures include utilization of the healthcare system for worsening or persistent COPD symptoms at 10 and 30 days after enrollment, antibiotic-related adverse events, and overall utilization of antimicrobials.

Results: This study in progress is continuing to actively enroll participants. The results discussed here are preliminary. Ten subjects have been enrolled, with an average age of 71 years. Nine of the ten subjects were male, and one was female, with nine Caucasian subjects and one Native American. Average FEV1 was 48% of predicted. Four subjects have been randomized into the control group, and six subjects have been randomized into the procalcitonin-guided therapy (intervention) group. Out of the ten subjects, 80% had a negative (less than 0.1 ng/mL) procalcitonin level on admission, and 20% had a positive (greater than or equal to 0.1 ng/mL) level on admission. Additional results to be presented at the meeting.

Conclusion: To be presented at the conclusion of full data analysis.

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Presentation Category: Managed Care
Title: Effect of an educational provider outreach designed at promoting a formulation shift in Vancomycin utilization for a Medicaid plan.

Purpose: For the treatment of Clostridium difficile induced pseudomembranous colitis, oral Vancomycin is commercially available both as a branded capsule and as a compounding solution kit. A ten day treatment course for the Vancomycin 125mg capsules costs approximately $1250 versus $60 for the Vancomycin 25mg/ml compounded solution. Because of the significant high cost of the capsule, a managed care organization can derive economic benefit by making the compounded solution a preferred formulary drug. A clinical study that compared the use of capsule vs the solution formulation did not find any difference in the rates of clinical cure, time to clinical cure or incidence of infection related complications.

Starting September 1st 2016, the FIRST® Vancomycin compounded solution (25mg/ml and 50mg/ml) was added into the formulary for a select Medicaid plan for a large managed care network without requiring prior authorization (PA).

The primary objective of this study is to measure the effect of an educational provider outreach aimed at promoting the utilization of Vancomycin compounded solution over the capsule. The intervention also seeks to identify any potential barriers that may prevent the utility of the compounded solution vs the capsules, which will be applied to optimize possible future PA criteria for the capsules.

Methods: Using pharmacy claims data, 60 healthcare providers who prescribed Vancomycin capsules after September 1, 2016 were targeted for the educational outreach. The intervention involved: 1) a scripted telephone call from a clinical pharmacist addressing the new formulary status of the Vancomycin solution and collecting the barriers providers faced when attempting to utilize the solution and 2) a newsletter article focusing on raising awareness for the newer formulation now available. The outreach initiative will take place from October 17, 2016 till March 17, 2017. Following the completion of the intervention, baseline pharmacy claims for oral Vancomycin will be assessed and compared monthly over a period of 6 months for evidence of a shift in market share. Identified barriers will be collected and utilized for a possible future PA criteria for the capsules.

Results: Out of the 60 healthcare providers that were initially identified, 7 were not reachable due to invalid contact numbers. Prior to the implementation of the intervention, 60% of the total oral Vancomycin claims were represented by the capsule formulation while the compounded solution made up the remaining 40%. Post- intervention, there was a progressive shift in the market share for oral Vancomycin. For the month of March, 75% of the total paid claims were represented by the compounded solution with 25% being represented by the capsules. The overall claims rate of reduction for the capsule was 58% with an 87% increase in utilization of the compounded solution. Some of the barriers that prevent the utilization include: patient preference for capsules, automatic formulary selection in the in-patient setting and misconceptions regarding the type of compounding required for the solution.

Conclusion: This provider educational outreach program was able to successfully demonstrate a shift in market share. Similar programs can be effective when attempting to manipulate prescribing practices.

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Title: Effect Of Individualized Dietician Counseling On Cancer Patients

Purpose: Many patients with cancer may experience weight loss, fatigue, and a decrease in appetite throughout the course of their disease. Oral onc lytics are considered essential in a patient’s fight against advanced cancer, but these medications may negatively impact their nutritional status due to adverse effects. The purpose of this study was to provide cancer patients taking oral onc lytics with access to a diettician counsel session and evaluate the resulting effects on weight, food intake, adverse effects, and satisfaction/wellbeing over a period of four months.

Methods: This study was a multi-centered, prospective study in which the effectiveness of individualized nutrition counseling in cancer patients was assessed. Using the Avella database, adult patients taking oral onc lytics, ibrutinib, sorafenib, everolimus, regorafenib, or capicitabine, were identified between November 2016 and January 2017. Participants taking these oral onc lytics were at an increased risk for nutritional deficits due to adverse effects per package insert. Sample size was set to 15-30 participants and was not designed to target statistical power. Patients were enrolled if they were 18 years of age or older, undergoing oral onc lytic therapy, and had reported an adverse effect that has impacted their nutritional status. Participants were matched to certified oncology dieticians and received a single nutrition counsel. Patients were contacted by Avella staff prior to their counsel and again at two and four months post-counsel for assessment. Participants were asked a series of questions during each phone contact from two preapproved questionnaires. The first questionnaire was a reduced, “Scored Patient-generated Subjective Global Assessment (PG-SGA)” and included categories designed to assess the patient’s weight, food intake, and adverse effects. The second questionnaire reviewed patient satisfaction with the nutrition counseling and the perceived effects on their course of treatment.
Results: Eighteen participants were enrolled in this study and four successfully completed each questionnaire at baseline, two, and four months during the course of the study. Eleven participants dropped out after completing the baseline questionnaires and three completed the baseline and second month questionnaires. Patient demographics include a mean of 66.5 years of age, 61% male, and the majority were taking either ibritinib or sorafenib. Mean patient weight was 151.1 lbs with a BMI of 24.3 at baseline with an estimated 44.4% of participants considered to be within normal BMI range. All follow-up participants reported high satisfaction with their counseling and many implemented what they had learned into their dietary habits. Participants who completed the baseline and 2 month weights showed an increase of 5 lbs between check-ins (95% CI -3.04-13.04, P= 0.179) and were compared using a paired t-test. These participants also maintained or increased their food intake with 50% reporting an increase in eating to offset nutritional deficits. Reported adverse effects decreased from 16 side effects at baseline to 5 at four months in the participants who completed all surveys.

Conclusion: This study was created to see if there were any effects on cancer patient’s nutritional status when provided with an individualized dietitian counseling session. Unfortunately, due to a combination of disease progression and intolerable adverse effects, there was a significant decrease in study participation. However, it was seen that the patients had an improvement in weight, maintained their food intake, and most saw a reduction in adverse effects. All final participants also reported high satisfaction with their counseling and felt that they were more in control of their health. Although the participants’ changes in weight were considered statistically insignificant, their satisfaction with the study, food intake, and reduction in adverse effects were favorable and could be considered clinically significant. Further research with a larger patient population is needed to determine if an impact on nutrition status is statistically significant post dietitian counsel.

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IRB Status: Approved

Title: Examination Of Oncology Patient Admissions In A Community Hospital Setting In Northern Colorado

Purpose: To evaluate the admission and readmission rates and causes for oncology patients at Banner Health facilities in northern Colorado to determine if there are preventable factors for readmission.

Methods: A retrospective chart review was conducted on 437 randomly selected adult patients (ages 18-89 years) that were actively being treated for malignancy at Banner Health facilities in northern Colorado over a year period between 01/01/2015 and 01/01/2016. Patients were identified through an Explorer report (Pharmacy Dispense Query), which was run through Cerner to identify patients who received oncolytic chemotherapy (cisplatin, paclitaxel, rituximab, etc.) at Banner oncology clinics in northern Colorado during the specified time period. The patient charts were evaluated for causes of admissions, days between admissions, number of readmissions, and readmission preventability. Demographic data including age, sex, payer source, treatment type, and cancer type was also collected.

Results: A total of 396 patients were included in the study, with patients being excluded due to lack of therapy during the study window or noncancerous indication for therapy used. Of the patient population reviewed, 138 admissions (34.85%) and 39 readmissions (7.58%), defined as an admission to a subsection hospital within 30 days of a discharge from the same or another subsection hospital, occurred. From the observable readmissions, 26 were classified as not preventable and 13 were classified as preventable. When evaluating readmissions, age (p=0.785), sex (p=0.384), and cancer type (p=0.077) were not statistically significant indicators of readmission.

Conclusion: This study demonstrated that there was a relatively low amount of readmissions that occurred in cancer patients in this community hospital setting in northern Colorado. However, with some readmissions still classified as preventable, there is an opportunity for improvement.

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IRB Status: Approved

Title: Safety Of Rapid Infusion Of Rituximab In The Elderly

Purpose: Rituximab is a form of immunotherapy used to treat disease states both cancerous and non-cancerous. Infusion-related reactions are common, and rituximab is conventionally administered as a slowly titrated infusion resulting in prolonged infusion times and increased healthcare costs. Rapid infusion protocols with infusion times of 60 or 90 minutes have been shown to be safe and effective in various populations, but evidence supporting the use of rapid infusion rituximab in the elderly is limited. This study assessed the safety of rapid administration of post-first-dose infusions of rituximab in patients aged 65 and older as compared with standard infusion protocol.

Methods: This is a retrospective cohort study that includes 205 patients. Institutional Review Board approval was granted. Data from the medical records of three outpatient infusion centers between January 1, 2014 and September 15,
2016 were reviewed. All subjects are aged 65 years or older and received at least two doses of intravenous rituximab for any indication during the study period. The following parameters were excluded: a subject’s first lifetime infusion of rituximab, infusions without administration of premedications, and infusions during hospital admission. One post-first-dose infusion of rituximab was examined for each patient. The primary outcome was the incidence of infusion-related reactions among all examined rapid infusions and standard infusions. Secondary outcomes included the incidence of Grade 2 to 4 infusion-related reaction and Grade 3 to 4 infusion-related reaction. Infusion-related reactions were defined using the Common Terminology Criteria for Adverse Events version 4.0.3. Rapid infusion was defined as any rituximab infusion completed as intended in 120 minutes or less. Standard infusion was defined as any rituximab infusion completed in more than 120 minutes. Primary and secondary outcomes were analyzed using a Chi-squared test or Fisher’s exact test as necessary. An additional hypothesis-generating outcome analyzed the correlation of several patient-specific parameters with incidence of infusion-related reaction through the use of multiple linear regression.

**Results:** Of the 205 subjects analyzed, 99 subjects (48.3%) received rituximab via standard infusion and 106 subjects (51.7%) received rapid infusion. Infusion-related reaction occurred in 11.1% of patients receiving standard infusion and 8.49% of patients receiving rapid infusion (p-value 0.527). Grade 2 to 4 infusion-related reaction occurred in 8.1% of patients receiving standard infusion and 2.8% of patients receiving rapid infusion (p-value 0.125). Grade 3 to 4 infusion-related reaction occurred in 1.0% of patients receiving standard infusion and 2.8% of patients receiving rapid infusion (p-value 0.483). Primary and secondary outcomes were not statistically significant.

The following parameters were analyzed through multiple linear regression: age, sex, weight, body mass index, body surface area, rituximab dose, and administration of specific premedications among other parameters. Administration of a corticosteroid was found to have a statistically significant negative correlation with occurrence of infusion-related reaction (coefficient -0.174; p-value 0.0471). A post-hoc analysis was performed using a Chi-squared test. 106 patients (51.7%) received a corticosteroid as premedication and 99 patients (48.3%) did not receive a corticosteroid. Infusion-related reaction occurred in 11.3% of patients who did not receive a corticosteroid and 8.1% of patient who received a corticosteroid (p-value 0.435). This outcome was not statistically significant.

**Conclusion:** The incidence of infusion-related reaction, Grade 2 to 4 infusion-related reaction, and Grade 3 to 4 infusion-related reaction were not significantly different among elderly patients receiving rituximab via standard infusion compared to rapid infusion. No other patient-specific parameters were found to correlate with the incidence of infusion-related reaction in elderly patients. These results suggest that the introduction of a rapid infusion protocol for the administration of rituximab will be safe in elderly patients.

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IRB Status: Approved

**Title:** Morphine Use In Patients With ST-Elevation Myocardial Infarctions (STEMI) And Non-ST-Elevation Myocardial Infarctions (NSTEMI) Undergoing Percutaneous Coronary Interventions

**Purpose:** Morphine has been used as part of the initial management of patients with myocardial infarctions for many decades. However, recent studies suggest that morphine use may be associated with adverse outcomes in this patient population. In-vitro studies imply a potential drug-to-drug interaction between morphine and P2Y12 inhibitors (clopidogrel, ticagrelor, or prasugrel) that may render P2Y12 inhibitors less effective. The purpose of the study was to evaluate the outcomes of subjects diagnosed with myocardial infarction who were given morphine in addition to a P2Y12 inhibitor within 24 hours before undergoing percutaneous coronary intervention.

**Methods:** This is a retrospective one-year study focused on chart reviews of veterans age≥18 with ICD-9 and ICD-10 documented diagnoses of ST-elevation myocardial infarction (STEMI) or non-ST-elevation myocardial infarction (NSTEMI) who underwent percutaneous coronary interventions and received a P2Y12 inhibitor within 24 hours prior to the procedure. Subjects were divided into two cohorts based on whether or not they received morphine in addition to the P2Y12 inhibitor. They were followed for 30 days from the day of their procedure. Cardiology, medicine, and primary care progress notes were reviewed to determine if any of the following adverse outcomes occurred during the 30-day follow up period: death, post-admission myocardial infarction, cardiogenic shock, or new onset heart failure.

**Results:** Total of 68 patients (26%) received morphine within 24 hours of P2Y12 inhibitor and stent placement. The average total morphine dose was 4.94mg (95% CI: 3.94-5.94mg). Baseline characteristics were similar between the groups with exception of smoking history, use of IV nitroglycerin, and use of ticagrelor, which were significantly higher among patients who received morphine. There were no significant differences found between patients who received morphine and those who did not in regards to the risk of death OR 1.04 (95%C: 0.70-1.55), post-admission myocardial infarction OR 1.06 (95%C: 0.71-1.57), new onset HF OR 1.01 (95%C: 0.67-1.53), cardiogenic shock OR 1.06 (95%C: 0.70-1.53) as well as composite outcome of all of the above OR 1.11 (95%C: 0.72-1.72).
Conclusion: Use of morphine in patients presenting with STEMI and NSTEMI prior to P2Y12 inhibitor administration was not associated with higher risk of adverse outcomes. This study does not support the results of previous research on this topic. Given the study was likely underpowered, further randomized control trials are needed to investigate the appropriateness of morphine and P2Y12 inhibitor co-administration in patients with STEMI and NSTEMI.

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Title: Incident Of Significant Drug Interactions With Direct-Acting Antivirals (DAAs) Hepatitis C Drugs In A Medicaid Population

Purpose: With the introduction of direct-acting antivirals (DAAs), treatment for Hepatitis C Virus (HCV) infection has changed significantly in the past few years, with patients achieving a sustained virologic response around 95%. The DAAs are known to have many potential drug interactions (DI). Due to the poor outcomes of HCV and the high cost of DAAs, it is important to identify members taking DAAs concurrently with other drugs that can affect the efficacy of HCV therapy. The primary objective is to determine the incidence of significant drug interactions with DAAs in patients with HCV in a Medicaid population. The secondary objective is to implement an intervention to the selected health plans and evaluate its impact on the incidence of significant drug interactions with DAAs.

Methods: First, a HCV drug report was generated to target members taking DAAs from the time period of November 22, 2013 through August 31, 2016 to determine the number of DAAs DAA utilizers. Subsequently, detailed claims data was run with a focus on two interacting agents selected from four drug classes (anticonvulsants, anti-retrovirals, proton pump inhibitors, and HMG-CoA Reductase inhibitors). After populating eight drug-interaction reports, overlapping pharmacy claims were assessed to further identify affected members, respective health plans, and the year pharmacy claims were paid. An affected member is defined as a patient taking a DAAs and an interacting drug at the same time. Next, an overall incidence of affected members in a Medicaid population was calculated along with incidence of affected members within each health plan. An intervention with a focus on two drug classes was implemented to three selected health plans and evaluated based on its effect on the incidence of affected members. Another HCV drug report was run to assess the intervention’s impact.

Results: There were 2,084 DAA utilizers that were identified. Within the 2,084 utilizers, 342 members (16.6%) had pharmacy claims for DAAs and interacting drug agents filled within the specified time period, while 154 members (7.4%) were identified to have overlapping DI with the DAAs. The medications that had the highest percentage of affected members are high-dose omeprazole and pantoprazole. The estimated overall incidence in this Medicaid population (n=2,171,306) is 0.007%. The calculated incidence based on overall membership per health plan ranged from 0.0002% to 0.095%. Five health plans were identified as having a higher incidence of affected members compared to others. An intervention which consists of an in-service was implemented to three selected health plans that focused on the DAAs DI with 2 drug classes (Proton Pump Inhibitors and HMG-CoA Reductase Inhibitor). After the in-service, a post-drug report was run to identify incidence of affected members per health plan. Preliminary results show that there were seven affected members that were identified post-intervention. The calculated incidence in the three health plans ranged from 0.00046% to 0.005%. For pre-intervention data analysis, incidence in the same drug class per health plan was estimated to be around 0.003% to 0.085%.

Conclusion: An initial analysis in determining incidence of DDIs in a Medicaid population shows that although the incidence per health plan is low, there are drug interacting agents that are being continuously filled with DAAs. This could have potential impact on efficacy of treatment. An intervention has been implemented for three selected health plans. Preliminary results have shown that after the in-service was conducted there were a decrease in incidence per health plan within the selected drug class.

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Title: Safety of prolonged dexmedetomidine use in pediatric patients

Purpose: Dexmedetomidine is a centrally acting selective α2-agonist which produces both anesthetic and sedative effects. Although off-label, dexmedetomidine is used in pediatric populations. Limited information is available regarding use for sedation in pediatric patients. The purpose of this study is to determine whether patients who received dexmedetomidine continuous infusions 8 days or longer experienced any hemodynamic adverse events. The primary objective was to determine the incidence of hemodynamic adverse events during prolonged dexmedetomidine use and at discontinuation. The secondary objective was to evaluate the effects of clonidine usage on hemodynamic effects and withdrawal scores at time of dexmedetomidine discontinuation.
Methods: Data was collected on patients under 18 years of age who received continuous dexmedetomidine infusions for 8 days (192 hours) or longer between March 1st, 2013 and September 30th, 2016. Patients were identified using MedMined program and screened for any exclusion criteria prior to data collection. Patients were excluded if the dexmedetomidine was stopped for 12 hours or longer during continuous infusion or wean. Data collected included: demographics, dexmedetomidine regimen, incidence of hemodynamic adverse events, and use of clonidine at time of dexmedetomidine discontinuation. Hemodynamic adverse events were defined in accordance with the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents and Pediatric Advanced Life Support 2015 guidelines.

Results: Twenty seven patients were identified, of which 14 were enrolled. The average age was 5 years old. Patients ranged from 7 months to 17 years old. Average length of continuous dexmedetomidine use was 10 days and ranged from 8 to 19 days. Doses of dexmedetomidine were titrated up to an average 1.25 micrograms per kilogram per hour. The maximum rate of dexmedetomidine seen was 1.6 mcg/kg/hr. Eleven total hemodynamic events were seen during period of continuous infusion (9 episodes of hypotension and 2 episodes of bradycardia). Only one event during period of initiation and maintenance required rescue medication. Duration of initiation and maintenance period was not found to be correlated to prevalence of adverse events. Dexmedetomidine infusions were weaned over an average of 2 days plus and/or minus 1.7 days. Three hundred and sixty nine total hemodynamic events were seen over a total 1013 hours (154 episodes of hypertension, 161 episodes of tachycardia, and 54 episodes of both). Rescue medications were used during 5 instances of hemodynamic adverse events. Wean duration was not found to be correlated to prevalence of adverse effects. Clonidine was used during dexmedetomidine wean in 10 patients and started after an average 7.65 days of dexmedetomidine.

Conclusion: Prolonged continuous infusions of dexmedetomidine appear to be well tolerated with doses ranging up to 1.6 micrograms per kilogram per hour. A large number of hemodynamic adverse events were seen during dexmedetomidine wean, many of which may not have been clinically significant as interventions were not required. Duration of the continuous dexmedetomidine infusion was not found to be correlated to prevalence of adverse events.

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IRB Status: Approved

Title: Study of procalcitonin for acute COPD exacerbations

Purpose: Current guidelines recommend the use of antibacterial agents in all patients with chronic obstructive pulmonary disease (COPD) exacerbations that are severe enough to require hospital admission. However, literature indicates that many of these exacerbations may be non-bacterial in origin. Currently, few studies have evaluated the utility of the biomarker procalcitonin in differentiating between bacterial and non-bacterial causes of COPD exacerbations. The purpose of this study is to evaluate a procalcitonin-guided treatment protocol in veteran subjects admitted with acute exacerbation of COPD.

Methods: This prospective, randomized, controlled study has been approved by the hospital’s Institutional Review Board. The electronic medical record was used to identify subjects who were admitted with acute COPD exacerbation. Subjects who consented to participate in the study had a procalcitonin level measured by the laboratory using a point-of-care testing method. Subjects were then randomized to one group receiving the standard of care based on current guidelines (including antibiotics, systemic corticosteroids, and inhaled bronchodilators); the second group received care based on procalcitonin level. Subjects with procalcitonin levels less than 0.1 ng/mL were given systemic corticosteroids and bronchodilators only. Subjects with procalcitonin levels greater than or equal to 0.1 ng/mL received standard care based on current guidelines, including antibiotics. Outcome measures include utilization of the healthcare system for worsening or persistent COPD symptoms at 10 and 30 days after enrollment, antibiotic-related adverse events, and overall utilization of antimicrobials.

Results: This study in progress is continuing to actively enroll participants. The results discussed here are preliminary. Ten subjects have been enrolled, with an average age of 71 years. Nine of the ten subjects were male, and one was female, with nine Caucasian subjects and one Native American. Average FEV1 was 48% of predicted. Four subjects have been randomized into the control group, and six subjects have been randomized into the procalcitonin-guided therapy (intervention) group. Out of the ten subjects, 80% had a negative (less than 0.1 ng/mL) procalcitonin level on admission, and 20% had a positive (greater than or equal to 0.1 ng/mL) level on admission. Additional results to be presented at the meeting.

Conclusion: To be presented at the conclusion of full data analysis.

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Title: Managing Diabetes in a Happy and Healthy Way: Evaluation of a Diabetes Education Program in a Community Pharmacy

Purpose: The purpose of this study is to evaluate the efficacy of a pharmacist led diabetes education program for adult patients. The objectives include (1) gained diabetes disease state knowledge (2) better diabetes control as measured by self-reported fasting blood glucose levels, (3) improved nutrition and exercise habits, and (4) participant satisfaction with the education program.

Methods: Adults with type 2 diabetes mellitus who are currently receiving pharmacotherapy with oral or injectable antidiabetic medications will be included. The diabetes education program will include four 1 hour group visits over a 4 week period. The course will be offered up to 10 times in order to increase enrollment, with a maximum of 200 patients completing the course. The classes will be held in a group setting to encourage peer sharing and support. Each session will include team activities and discussion. To gather baseline knowledge and diabetes control, a survey will be given before the initial session. The survey questions will include basic demographics, nutrition and exercise habits, self-reported average fasting blood glucose levels, and 10 knowledge questions on the diabetes disease state. The same survey will be given after the 4th class to assess knowledge gained. A course evaluation will be used to measure participant satisfaction. A paired t-Test or descriptive statistics will be used to analyze the data.

Results: Seven patients were included in the study with no drop-outs. The mean number of diabetes knowledge questions correct out of 10 was 8 for pre-survey and 9.3 for post-survey (p = 0.11). Although knowledge was gained, results were not significant. In terms of secondary outcomes, there was no difference in self-reported fasting blood glucose levels before as compared to after the diabetes classes. Furthermore, number of days per week of fast food consumption decreased, however number of days at sit-down restaurants increased (mean value of 2.4 pre-survey and 1.3 post-survey (p = 0.11); 0.9 pre-survey and 1.5 post-survey (p = 0.06), respectfully). As far as exercise habits, the mean pre-value was 137 minutes per week compared to the post-value of 134 minutes per week. None of the changes in secondary outcomes were significant. Participants were satisfied with the diabetes education program. On a scale of 1 to 10 with 1 being strongly disagree and 10 being strongly agree, the mean standard deviation was >9.

Conclusion: Results did not show statistically significant gain in diabetes knowledge, improved self-reported fasting blood glucose levels, or improved nutrition and exercise habits. Overall, there was high patient satisfaction with the program. However, the study’s subject group was small and not enough patients to truly determine statistical significance with the primary and secondary outcomes. Also, knowledge questions on the diabetes exam were not challenging and patients answered most questions correctly in the pre-survey.