Abstract Session E3: Hospital-Based Medicine

Effects of an Electronic Post-Discharge Medication Reconciliation Tool on the Accuracy of Ambulatory Medication Documentation Jeffrey L. Schnipper 1; Catherine L. Liang 1; Claus Hamann 2; Andrew S. Karson 3; Jennifer Lee 1; Elisabeth Burdick 1; David W. Bates 1. 1Brigham and Women's Hospital, Boston, Massachusetts; 2Massachusetts General Hospital, Boston, Massachusetts. (Proposal ID # 12324)

BACKGROUND: Serious medication errors occur commonly in the period after hospital discharge. Medication reconciliation in the post-discharge ambulatory setting may reduce the frequency of these errors. This process allows primary care physicians to identify and correct any errors of inpatient medication reconciliation, make additional changes to the post-discharge regimen based on their knowledge of the patient, and document an accurate regimen in the medical record to prevent future medication discrepancies. The aim of this analysis was to determine the effects of an electronic post-discharge medication reconciliation tool on the accuracy of medication documentation one month after discharge.

METHODS: As part of a Center for Education & Research on Therapeutics funded by AHRQ, we designed a novel tool built into an ambulatory electronic medical record (EMR). The tool compares the preadmission medication list in the ambulatory EMR to the hospital discharge medication list, highlights all changes, and allows the EMR medication list to be easily updated. To evaluate its effects, we conducted a controlled trial in 19 primary care practices affiliated with an integrated health care delivery system, each matched and randomized to receive the tool or usual care. Inpatients belonging to these practices, over age 55, and on 5 or more medications were recruited to participate. Thirty days after discharge, patients were contacted by phone, and a research assistant obtained the "gold-standard" post-discharge medication regimen by including all discharge medications, removing any planned completions in therapy, and incorporating any reported changes made by patients' physicians since discharge. The documented ambulatory EMR medication list at the time of the call was compared to this gold-standard regimen and the proportion of concordant medications (exact matches in medication, dose, and frequency) was calculated. Analyses were conducted using binomial logistic regression, adjusted for hospital affiliation of each practice.

RESULTS: The study included 759 patients: 380 in intervention practices, and 379 in usual care practices. The post-discharge medication reconciliation tool was used in approximately 16% of intervention patients. In an intention-to-treat analysis, the accuracy of the EMR medication list 30 days after discharge was 23% among intervention patients and 22% among usual care patients (adjusted odds ratio 1.09, 95% confidence interval 1.00 - 1.17, p=0.04). Among patients in whom the tool was used, the accuracy of the EMR medication list was 25% (p=0.02 for comparison with patients in whom it was not used). The most common inaccuracy was documentation of medications the patient was no longer prescribed.

CONCLUSION: In this cluster-randomized controlled trial, we found that the accuracy of documented medication regimens 30 days after discharge to be poor. An electronic post-discharge medication reconciliation tool led to a small improvement in documented regimens, in part because the tool was only occasionally used. Further improvements to the tool and efforts to increase implementation may have greater effects on accurate medication documentation as well as other measures of medication safety during transitions in care.
Hospital-Acquired Sepsis is Associated with Modifiable Risk Factors John S. Hughes 1; Jon Eisenhandler 2; Norbert Goldfield 2. 1Yale School of Medicine, New Haven, Connecticut; 23M Health Information Systems, Wallingford, Connecticut. (Proposal ID # 11825)

BACKGROUND: The Medicare requirement for recording whether diagnoses on hospital discharge abstracts were present on admission (POA) has made it possible to screen for in-hospital complications that may have been preventable. There is little evidence so far to support an association of hospital-acquired complications with modifiable factors such as problems with the quality of in-hospital care, however. Our purpose in this study was to see if chart review could identify a higher occurrence of modifiable risk factors among patients with hospital-acquired sepsis compared to matched controls.

METHODS: Case-control study. Nurse reviewers from a peer-review organization (PRO) reviewed hospital charts from 30 New York state hospitals, each of which contributed from 6 to 10 charts of patients with hospital-acquired sepsis and equal numbers of matched controls. There were 205 cases with one of several secondary diagnoses of sepsis that were coded not POA, and an equal number of controls without sepsis matched for hospital, gender, age within 5 years, All Patient Refined Diagnosis-Related Group (APR DRG) and severity of illness level. There were 89 cases belonging to surgical APR DRGs and 116 cases from medical APR DRGs. PRO nurses recorded the occurrence of modifiable risk factors and possible lapses in the quality of care that are thought to increase the risk of hospital-acquired infection and sepsis. Specific factors examined included the use and duration of foley catheters, improperly administered blood transfusion, intravenous catheters inserted under emergent conditions, and improper administration of prophylactic antibiotics for surgical patients. We compared the frequency of each factor among cases and controls, calculated the odds ratio (OR) of the numbers of patients with each factor among cases and among controls, and used the McNemar chi-square test to determine statistical significance.

RESULTS: Three factors occurred with statistically significant greater frequency among cases than among controls: transfusion lasting more than 4 hours (OR 3.37, P < 0.0001), foley catheter placed at least two days before sepsis (or the matching date, for controls) (OR 3.118, P < 0.0001), and an intravenous line inserted under emergency conditions (OR = 5.00, P = 0.0005). Violations of several guidelines for care of surgical patients occurred fairly often but without statistically significant differences among cases and controls. These included failure to deliver prophylactic pre-operative antibiotics within 2 hours of surgery (52%) or to stop them within 24 hours after surgery (40%), failure to remove a foley catheter within 24 hours post-op (8.4%), and failure to provide prophylactic antibiotics at all (16.3%).

CONCLUSION: Prolonged transfusion time, the presence of foley catheters, and emergently inserted intravenous catheters were all associated with the development of sepsis after admission to hospital. All three are potentially modifiable with improved technique and more judicious usage. This study provides validation for the use of a screening mechanism for a single potentially preventable complication. Screening for other in-hospital complications using diagnoses coded not POA, when tested, are likely to be associated with modifiable risk factors also.
Reduction of catheter-associated urinary tract infections through a bundled intervention in a community hospital

Karen Ann Clarke 1; Bonnie Norrick 2; Kirk Easley 1; Yi Pan 1; David Tong 1; Alan Wang 1; Pennie Hill 2; Jason Stein 1. 1Emory University, Atlanta, Georgia ; 2West Georgia Health, LaGrange, Georgia .

(Proposal ID # 10083)

BACKGROUND: Urinary tract infections (UTIs) are the most common type of hospital-acquired infection, and 80% are associated with indwelling urinary catheters. The relatively high frequency of catheter-associated UTIs (CAUTIs) leads to clinical and financial concerns for both patients and hospitals. Since Medicare and other payers no longer cover the costs of treating CAUTIs, the development of cost-effective strategies to reduce their incidence has received increased attention.

METHODS: We retrospectively examined the effect of a bundle of four evidence-based interventions, introduced in staggered fashion, upon the incidence of CAUTIs in a 276-bed community hospital. Rates of CAUTI per 1000 catheter days were estimated and compared using exact methods based on the Poisson distribution. The first intervention was the exclusive use of silver alloy catheters in the acute care areas of the hospital, the use of which had been sporadic in the hospital over the previous 3 years. The second intervention was a new securing device to limit movement of the indwelling catheter after insertion. The third intervention consisted of repositioning the catheter tubing if it was found to be touching the floor. A two-month run-in period began when the first intervention was started in January 2009, and ended when the routine use of the second and third interventions was introduced the following month. The fourth intervention, which was implemented in October 2009, was the removal of indwelling urinary catheters on postoperative day 1 or 2, for most surgical patients.

RESULTS: For the 3 month baseline (October 1-December 31, 2008) before the run-in period, the mean rate of CAUTI per 1000 catheter days was 5.2, and that for January 1-February 28, 2009 was 6.5. For the 7 months after full implementation of the first three interventions (March 1 - September 30, 2009), the mean rate of CAUTI per 1000 catheter days was 3.1, which was a nonsignificant reduction compared to January 1-February 28, 2009 (p=0.09). For the seven months after the implementation of the fourth intervention (October 1, 2009 - April 30, 2010), the mean rate of CAUTI per 1000 catheter days decreased further to 1.5, which was significantly lower than the rate for January 1-February 28, 2009 (p=0.009).

CONCLUSION: A bundle of four evidence-based interventions reduced the incidence of CAUTIs by two-thirds in a community hospital. These relatively simple interventions should be easily sustainable and could be readily transferable to other hospitals.
**Information Needs and Sign-out Utilization Habits of Cross Covering Physicians.** Robert Fogerty ¹; Leora Horwitz². ¹Yale-New Haven Hospital, New Haven, Connecticut; ²Yale University School of Medicine, New Haven, Connecticut. (Proposal ID # 10144)

**BACKGROUND:** Patients who are cared for by covering physicians have higher adverse event rates and increased delays to treatment. These adverse events can be the result of inaccurate or inadequate sign-out. However, the actual data needs of covering physicians, and where they obtain these data, are currently unknown.

**METHODS:** During a four-week period from July 7 to August 3, 2010, interns on general medical services were asked to prospectively record data about their cross cover experience during a traditional 30 hour on-call shift. Each intern was provided with a pocket card and asked to record data directly on the card, which was collected the next day. Each time the intern was contacted regarding a patient received during sign-out (one call), the intern was asked to record who initiated the contact (ie, nursing, patient), what the situation was about (ie medications, test results), where the intern found the desired information (ie written sign-out, Electronic Medical Record[EMR]), whether all required data was located, whether the call was anticipated by the primary team, whether the call could have been anticipated by the primary team, and if the received sign-out was sufficient. Each intern was eligible to participate once during the study period.

**RESULTS:** A total of 14/24 (58%) of eligible interns completed data collection, with 123 unique calls recorded. Interns were able to find all desired information for 91% of calls. Information was found most often in the written sign-out (44%), followed by the EMR (24%), and verbal sign-out (21%). Questions regarding orders (25%) were most common, followed by medications (20%), plan of care (17%), and test results (11%). Interns sought information in different places depending on the questions they were asked. Interns were more likely to use the written sign-out rather than the EMR when asked about medications or test results, and were equally likely to use the written sign-out or the EMR for questions regarding orders and plan of care (P=0.01). Nursing staff were responsible for 89% of calls. Interns judged 66% of all events as possible to anticipate, yet only 40% of all events were anticipated by the primary team. Calls regarding plan of care and medications were most likely to be anticipated, whereas events regarding test results were least likely to have been anticipated (p=0.009).

**CONCLUSION:** Even with widespread EMR usage, covering physicians remain most likely to reference information received during physician-to-physician sign-out. With 2/3 of cross cover calls being predictable, accurate sign-out remains vital to safe patient handoff and should include an emphasis on expected overnight events.
The Effect of the Number of Admissions to Inpatient Medical Teaching Team on Patient Safety Outcomes Yelena Averbukh 1; William Southern 2. 1 Montefiore Medical Center, New York, New York; 2 Montefiore Medical Center, Sleepy Hollow, New York. (Proposal ID # 10516)

BACKGROUND: An estimated 44,000 to 98,000 preventable deaths caused by medical errors occur each year in the U.S. In teaching institutions house staff are involved in over half of the cases of medical errors. Excessive workload and inadequate supervision are among most commonly sited reasons for resident error. First in 2003 and then in July 2010 the Accreditation Council for Graduate Medical Education (ACGME) enacted new limits on the number of patients residents were allowed to care for with the hope that lower workload would improve the quality of care and patient safety. However an observational study of 8,529,595 Medicare recipients admitted to acute care hospitals showed that duty hour reform was not associated with any consistent improvements or worsening in mortality. In 2009 ACGME also called for Internal Medicine programs to ensure for 4:1 ratio of the learner to faculty and need for sufficient supervision and teaching during each rotation or major learning experience. In spite of the growing body of evidence suggesting that inadequate supervision of house staff is associated with sub optimal safety and care outcomes for the patients, there is very little evidence on how medical team workload affects quality of supervision and patient safety outcomes. To address this we examined the associations between the number of patients seen by a teaching team and length-of-stay, 30-day readmission, and 60-day mortality.

METHODS: In this retrospective observational study we examined all admissions to the medicine teaching service of an urban academic medical center from March 1st 2009 to June 30th 2010. Each month, approximately 18 teaching teams provide care at 2 hospitals within the medical center. First, we examined the total number of admissions seen by each team each month. Next, we defined each team as “less busy” (total admissions 49). Admissions were assigned to the teams without bias according to an on-call schedule. The primary outcome measures were length-of-stay, 30-day readmission, and 60-day mortality. The two patient groups were compared with respect to demographic characteristics, co-morbidities (Charlson score), severity of illness (Laboratory-based Acute Physiology Score, LAPS), and length of stay using t tests, chi-squared, and rank sum tests, as appropriate. Logistic regression models were constructed to determine the independent association between assignment to a busy team and readmission and mortality, after adjustment for demographic and clinical characteristics. In additional analysis, teams were placed in to quintiles of number of admissions, and the readmission rate for each quintile was determined.

RESULTS: Of 12,119 admissions examined, 6,398 (52.8 %) were assigned to the less busy teams and 5,721 (47.2 %) were assigned to busy teams. Patients assigned to busy teams were older, were more likely to be female, white, have Medicaid, and had higher LAPS score. Mean length-of-stay was not statistically different between the groups (5.2 vs 5.3 days, p = 0.08). After adjustment for demographic (race, sex, ethnicity, insurance type) and clinical characteristics (LAPS and Charlson score), care by a busy team was associated with greater 30-day readmission rate (OR 1.21, 95% CI 1.10-1.34). After adjustment for demographic and clinical characteristics, care on a busy team was not associated with increased risk of mortality (OR 1.05, 95% CI 0.88-1.27). There was a significant linear association between the number of monthly admissions to teams and readmission rate (Figure 1).

CONCLUSION: Admission to a busier medical teaching team is associated with 21 % increased odds of 30-day readmission. We found no association between admission to a busy team and length of stay or 60-day mortality. Further research is needed to determine if controlling for the number of monthly admissions to inpatient teaching teams will improve readmission rates.
OUTCOMES OF LOCALIZING HOSPITALIST-PHYSICIAN ASSISTANT TEAMS TO A NURSING UNIT
Siddhartha Singh 1; Sergey Tarima 1; Mary Conti 2; Kathlyn Fletcher 1; Vipulkumar rana 3; David Marks 1. 1Medical College of Wisconsin, Milwaukee, Wisconsin; 2Froedtert Hospital, Milwaukee, Wisconsin; 3Medical College of Wisconsin, Brookfield, Wisconsin. (Proposal ID # 10605)

BACKGROUND: Localization of medical teams to a hospital unit has been shown to improve nurse-provider communication but its affect on patient outcomes is unknown.

METHODS: Between April 1, 2010 and July 10, 2010 we conducted a trial of localizing patients assigned to two hospitalist’s “physician assistant (HPA) teams to one nursing unit. We concurrently compared their outcomes to patients assigned to two similar HPA teams with patients dispersed throughout the hospital to over 10 different units (the usual practice). Patients with a principal diagnosis of sickle cell disease (SSD) were excluded from the analysis as they were preferentially assigned only to the non-localized teams. A faculty admitting medical officer (AMO) assigned patients to each team and did not use any clinical criteria (other than diagnosis of SSD) to make this assignment. The AMO was asked to assign at least 5 admissions to each non-localized team every day. Non-localized teams did not take new patients beyond a maximum census of 16 patients each. The AMO assigned new patients to the localized teams to keep the nursing unit patient census (32) full. Beyond these guidelines the AMO was asked to consider the team’s perceived workload and use judgment in deciding assignment. We used linear mixed models for comparing log-transformed length of stay and charges, and generalized linear mixed models for comparing 30 day risk of readmission. We controlled for age, race, gender, payer status, weekend admission/discharge, co-morbidities, principal diagnosis and the effect of repeat admissions of the same patient. This study was reviewed by the institutional review board and granted an exemption as a quality assurance project.

RESULTS: 655 admissions were assigned to the localized teams and 541 (non-sickle cell) admissions were assigned to the non-localized teams. These admissions were similar except that patients on localized teams were older. As compared with patients cared for by non-localized teams, patients cared for by localized teams had a 11% longer adjusted length of stay (P =0.022) but similar charges and similar 30-day risk of readmission (see table).

CONCLUSION: Our study reveals a counterintuitive finding of higher length of stay when we localized HPA teams- an intervention designed to promote efficiency. This finding needs to be further explored within a wider context of other measures of quality of care such as patient satisfaction, failure to rescue rates and process measures. In addition, as new patients could be assigned to the localized teams only when the nursing unit had open beds due to discharges, there may have been a perverse incentive promoting higher length of stay to keep unit census high.