To the Faculty of the University of Houston, College of Pharmacy: The members of the committee appointed to examine the project of Nelvin Daniel find it satisfactory and recommend that it be accepted on April 31, 2015

__(signature on file)_____

Committee Chair, Kevin Garey, PharmD, MS, FASHP

__(signature on file)_____

Committee Member, Joseph Greco, RPh

__(signature on file)_____

Committee Member, William Lloyd, MSHA, MSHI

__(signature on file)_____

Committee Member, Paige Pitman, PharmD, MBA

__(signature on file)_____

Committee Member, Divya Varkey, PharmD, MS

__(signature on file)_____

Dean, F. Lamar Pritchard, BS, PhD

Impact of charge on administration on revenue and medication administration

Primary Investigator: Nelvin N Daniel

Co-Investigators:

Kevin Garey, PharmD, MS, FASHP

Joe Greco, RPh

Will Lloyd, MSHA, MSHI

Paige Pitman, PharmD, MBA

Divya Varkey, PharmD, MS

Master of Science in Pharmacy Administration

Master's Project

University of Houston College of Pharmacy

Masters Research Project

Title:	**Impact of charge on administration on revenue and medication administration**
Principal Investigator:	Nelvin N. Daniel, PharmD Health-System Pharmacy Administration Resident Department of Pharmacy CHI St. Luke's Health Baylor St. Luke's Medical Center
Associate Investigators:	Kevin Garey, PharmD, MS, FASHP Joe Greco, RPh Will Lloyd, MSHA, MSHI Paige Pitman, PharmD, MBA Divya Varkey, PharmD, MS

TABLE OF CONTENTS

Abstract:

Impact of charge on administration on revenue and medication administration

NN Daniel[12], W Lloyd[1], J Greco[1], P Pitman[2], DA Varkey[1]. K Garey[2]

CHI St. Luke's Health Baylor St. Luke's Medical Center[1] and University of Houston College of Pharmacy[2]

Background: The Affordable Care Act and subsequent healthcare reform has led to an increased focus on revenue integrity and has stimulated inpatient pharmacies to transition from a charge on dispense (COD) to charge on administration (COA) model. However, the transition to COA can result in a 10 to 20 percent reduction in gross charges and relies on accurate medication administration.

Objective: To determine the impact of the transition to charge on administration at a large, academic medical center.

Methods Data for the COD model was collected from September through December 2013 and compared with COA model data in 2014. Primary endpoint assessed percent change in gross charges of top ten medications by total charge and frequency. Rates of change were compared using pharmacy charge data from the medication administration record. Secondary endpoints assessed the effect of the change on barcode medication scanning compliance (BCMA) and MAR administration compliance.

Results: Total charges for top ten medications were $10.9 million and analysis of trends revealed an average decrease of 11.57% in total charges. Analysis of trends in top ten medications by total frequency revealed an average decrease of 34.13% in total charges. BCMA scanning trends increased from 92.7% at the beginning of the study period to 96.6% post COA implementation.

Conclusion: The transition to charge on administration led to an overall decrease in billed charges at our institution. Changes in charge capture workflow with an emphasis on nurse scanning led to an overall increase in barcode medication scanning compliance.

Background

The Affordable Care Act and subsequent healthcare reform has led to an increased focus on technology and its implementation in healthcare. Fueled by the Health Information Technology for Economic and Clinical Health (HITECH) Act and Meaningful Use, increased expectations of reporting on quality and clinical metrics have led to vast adoptions of health information technology associated with healthcare reform. As institutions are faced with increased quality metrics, a renewed emphasis is placed on accurate charging and reduction of revenue loss in an era of decreasing reimbursement.

Over the last few years, the United States government has encouraged health institutions and providers to adopt electronic health records (EHR) and related health information technology. Definitions of the core components of EHR include basic functions of a medical record, documentation of patient vital signs and demographics, active medications and allergies, up-to-date problem lists of current and active diagnoses, and smoking status. Meaningful use criteria are divided into various stages to allow institutions to progressively implement technology including EHR to improve safety and quality of care in a systematic manner. Implementation of clinical decision support tools and use of EHR to enter orders and medications are core components of this integration. HITECH has also specified meaningful use criteria to include electronic reporting of data on the quality of care[3]. Changes in healthcare reform provide framework for increasing quality of care while decreasing payments for provision of care.

The emphasis on revenue integrity is seen with the release of Medicare provider utilization and payment data by Centers for Medicare and Medicaid Services (CMS) this year[4]. In the current healthcare landscape, each institution determines the charge for services provided to patients. CMS has released two years of hospital-specific charge data for the top 100 frequently billed

discharges paid based on Medicare Severity Diagnosis Related Group (MS-DRG) for more than 3,000 institutions that receive inpatient prospective payment systems. This allows patients to compare costs of care between institutions for the same MS-DRG and can lead to increased transparency and scrutiny of reimbursements to institutions.

Understanding third party reimbursement processes provides insights into the importance of accurate charging and billing. A simplified process of conversion of charge to revenue is seen in figure 1. Institutions have the potential to lose millions of dollars as a result of missing, incomplete and inaccurate pharmacy billing data[8]. Third party claims submitted with inaccurate data lead to billing rejections causing a delay or loss in reimbursement. An increased need for institutional monitoring of expenses, charge capture and reimbursement is evident. As part of the focus on accurate charging and revenue integrity, health systems are transitioning from a charge on dispense (COD) to a charge on administration (COA) charge capture model. Table 1 outlines key differences between the two charge capture methodologies. The primary objective of the study is to determine the impact of the transition to charge on administration at the study institution.

Baylor St. Luke's Medical Center is an 850 bed non-profit, quaternary academic hospital located in the Texas Medical Center, and utilizes a variety of technology and automation within the medication use system. Technology implemented includes bar code medication administration, automated medication dispensing cabinets, medication carousels, computerized physician order entry and electronic health record. The study institution transitioned from a COD to a COA model for charge capture in August of 2014 and a connected EHR and BCMA technology provided a closed loop to the medication use process with its ability to capture data at various points of the system. The transition to COA allows the institution to charge patients accurately at

the time of administration and eliminate the manual charge and credit process associated with COD.

In a COD charging environment, the patient is charged when a medication is dispensed. This charge is triggered at the time of dispense from a centralized pharmacy location or removal from an automated dispensing cabinet. Medication dispenses not administered are returned to the pharmacy for crediting. After COA implementation, the patient is charged at the time of administration on the MAR. For this reason, a documentation of medication administration is essential for charge capture. Since the patient is not charged at the time of medication dispense, any medications not administered are not charged and can be returned to stock without a credit process. A comparison of the flow of information from order entry to administration in COD and COA charging models is seen in figures 2 and 3.

Pre-study process

The transition to COA had multiple phases of planning and execution. In April 2014, a departmental audit of charge data was conducted using a custom report on unreconciled dispenses, revealing a potential loss of $1 million per month in undocumented medication charges. An unreconciled dispense is defined as any medication dispense without a corresponding administration or return credit. A detailed audit was conducted during the month to identify common trends in potential losses and create action plans prior to COA implementation. A system level committee of pharmacy, respiratory and nursing leadership was tasked with the preparation and communication plans for the transition in August 2014. Charge data was analyzed on a unit and system level and shared with nursing leadership. Unit specific unreconciled dispense trends were crucial to improving processes in specific areas. Focused efforts on high impact units and medications led to improvements in potential losses in the

months prior to the COA transition. MAR actions, a part of the EHR documentation, were discussed at nursing committees for identification of MAR actions that resulted in a charge. To increase compliance and documentation, nurses were able to scan the medication to facilitate the charge. Education was provided to nursing units to reinforce this process and audits conducted to ensure all medications would scan readily. This emphasis on bar code medication administration for charge capture provided a metric to monitor unit and provider- specific scanning rates.

Objectives

To determine the impact of the transition to charge on administration at a large academic medical center.

Specific Aims

Compare rates of change of the following between the two time periods:

- Gross charges of top 10 medications by total charge
- Gross charges of top 10 medications by frequency
- Bar code medication administration

Hypothesis:

The transition to charge on administration will lead to a reduction in billed pharmacy doses and emphasis on BCMA will lead to an increased percentage of medications scanned upon administration

Study Design

A quasi-experimental design was used to assess the impact of charge on administration on gross pharmacy charges. The study consisted of a pre COA time period from September to December 2013 compared with post COA from September to December 2014. The institutional review

board at CHI St. Luke's Health Baylor St. Luke's Medical Center and the University of Houston approved all data points collected in this study.

Methods

Outcome Variables

The study has two primary outcomes: (1A) compare the percent change in gross charges of top ten medications by total charge before and after charge on administration and (1B) compare the percent change in gross charges of top ten medications by frequency before and after charge on administration. The secondary outcome will measure rates of barcode medication administration before and after charge on administration.

Data collection

Data collection was completed using a report that identified all charges in the institution for the specified date. All medication dispensed in the pre COA time period were considered as administered. Any returned doses were credited to the patient. All charges for adult patients treated at the study institution from September through December 2013 were included in the pre COA group and compared with charges for adult patients from September through December 2014. Charges for saline flushes, normal saline and respiratory gases were excluded in this study. Daily rates of BCMA scanning were collected using a report for each medication scanned at the time of administration for both time periods.

Analysis

All charges in the system were analyzed and top ten medications by total charge were identified for the pre COA time period. Each medication charge consisted of a purchase cost and mark up formula and was based on billing quantity. To ensure a consistent process, total billing quantity

for the pre COA time period was divided by total charges for the medication for the same time period, resulting in an average charge per billing quantity. This average charge per billing quantity was applied to billing quantities for each medication in the top ten list of medications by charge and divided by overall institutional adjusted patient days to account for volume differences during these time frames. This methodology was similarly applied for top ten medications by frequency. Daily barcode medication administration rates were averaged along with total doses charged during the study period.

Results

Analysis of all medications during the study time period revealed top ten medications by total charge and frequency (Fig 4, 5). Total charges for top ten medications during the time period were $10.9 million and analysis of trends revealed an average decrease 11.57% in total charges (Fig 4, Table 2). Charges for insulin detemir were not compared due to variation in unit of use between pre and post COA time periods. Variations in top five medications were compared with adjusted patient days for trends (Fig 8, 9).Analysis of trends in total frequency revealed an average decrease of 34.13% in total charges (Fig 5, Table 3). Comparisons of pantoprazole and docusate charge data were not completed due to limitations in accessibility of charge data.

Discussion

Analysis of charge data for the top ten medications by charge demonstrated an 11.57% decrease based on charge per adjusted patient day. This decrease for the top ten medications was within the expected range of 10-20% decrease for charge on administration. The analysis for top ten medications by frequency had a 34.13% decrease utilizing the same methodology. Variations in billing charge between the two time periods could have attributed to this decrease. Trends in

billing variability of anti-thymocyte globulin provide an example of this variation, leading to a calculated decrease in billed charges (Fig 8, Table 2).

Analysis of BCMA trends further demonstrated an increased scanning compliance in the post COA time period. Trends in figure 7 indicate steady increase month to month rather than a drastic shift in scanning compliance post COA.The increased emphasis on bar code medication administration for charge capture as part of the preparation for COA transition and unit specific data may have led to this increase. BCMA scanning rates provided a metric to monitor for nursing compliance and a continued increase in BCMA scanning compliance rate may be indicative of improved nursing processes for documentation of administration and decreased potential of lost charges due to lack of administration.

Loss of charges can be multi-factorial between the pre and post COA time periods and data analyzed is unable to take into account a variety of factors have influence medication use in the post COA time period. Prescribing patterns between physicians during the two time periods cannot be compared. The impact of drug shortages on medication cost cannot be compared between the two time periods. Changes due to service line expansions and drug build could have influenced results of this study. An analysis of insulin detemir in the top medications by charge revealed a change in EHR drug configuration between the study time points, preventing an accurate side by side a comparison between the two time periods for this drug. Prior to COA, each patient was charged for a patient specific 10ml vial of insulin upon dispense and were charged the same regardless of actual insulin administered. However, the unit of use for insulin was changed between the two time periods and the post COA era reflected a transition to a charge per 5 units administered. This difference did not allow not for equal comparison between the two time periods. Furthermore, overall charge loss may be charges for due to missing doses.

In the pre COA time period, missing medications redispensed resulted in a duplicate patient charge. The same workflow in the post COA time period did not result in a charge and available data does not allow for a comparison of lost charges for this workflow. Similarly, this study cannot account for any medications that may not have been returned back to central pharmacy for manual credits in the pre COA time period. All medications returned were credited, however a portion of the medications returned may not have been credited due to missing or legible information in the pre COA time period. Overall, the transition to charge on administration is seen as a step to revenue integrity as patients as charged only for medications administered.

Conclusion:

The transition to charge on administration led to an overall decrease in billed charges at our institution. An analysis of the top ten medications by total charge revealed a decrease of 11.57% in total charges, which is within an acceptable range reported in prior literature. Changes in charge capture workflow with an emphasis on nurse scanning demonstrated an increase in barcode medication scanning compliance.

References

1. Common definitions. Healthcare Financial Management Association, 2014. Web. 10 Oct 2014. http://www.hfma.org/
2. Latimer, Bruce. 2009. Avoid Missed Revenue Opportunities with an Automated Revenue Integrity Program. Pharmacy Purchasing & Products. May. http://www.pppmag.com/pp-p-may-issue-2009
3. Kirschenbaum, Bonnie. Want to Cut Billed Doses? Bill on Administration. Pharmacy Practice News. 2007 June;34(6)
4. Poon EG, Keohane CA, Yoon CS, et al. Effect of Bar-Code Technology on the Safety of Medication Administration. N Engl J Med. 2010; 262:1698-1707.
5. Seibert HH, Maddox RR, Flynn EA, Williams CK. Effect of barcode technology with electronic medication administration record on medication accuracy rates. Am J Health Syst Pharm. 2014; 71(3):209-18.

Disclosures:

Nelvin Daniel, PharmD	Nothing to disclose
Kevin Garey, PharmD, MS	Nothing to disclose
Joseph Greco, RPh	Nothing to disclose
William Lloyd, MSHA, MSHI	Nothing to disclose
Paige Pitman, PharmD, MBA	Nothing to disclose
Divya Varkey, PharmD, MS	Nothing to disclose

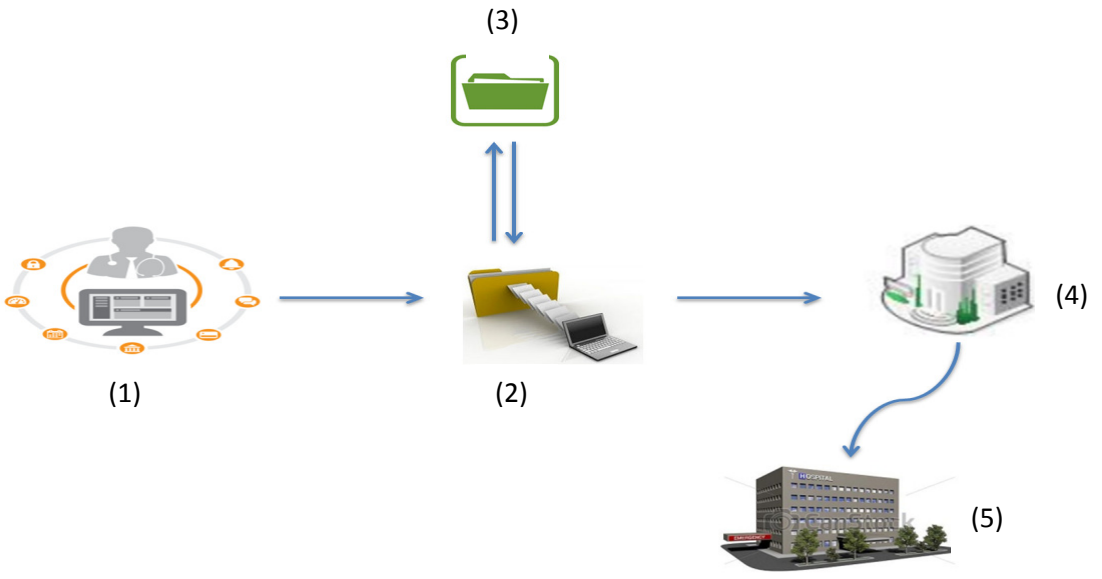
Appendix:

List of Acronyms:

- BCMA: Bar Code Medication Administration
- COA: Charge on Administration
- COD: Charge on Dispense
- CPOE: Computerized provider order entry
- EHR: Electronic health record

Figure Captions, Tables and Figures

Figure 1: Simplified Billing Methodology



1. Provider enters a medication order into EHR 2. Charges in EHR are converted to a billing code 3. Each billing code is converted to a charge by the chargemaster 4. All charges for patients are sent to an insurance clearinghouse. 5. Institutions receive payment for charges submitted. Incorrect information in any part of the process can lead to delays in reimbursement

Figure 2: Charge on Dispense Process

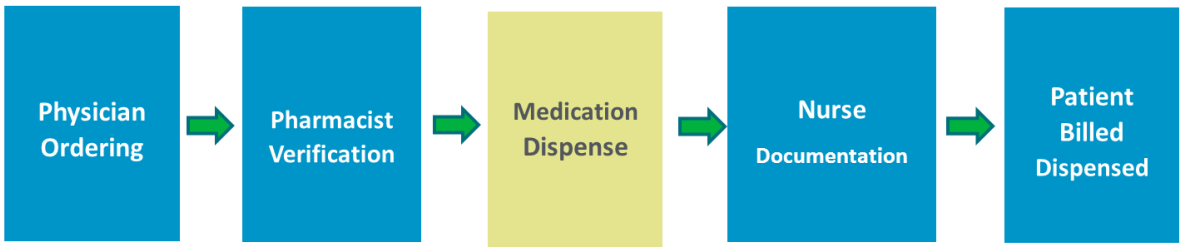


Figure 3: Charge on Administration Process

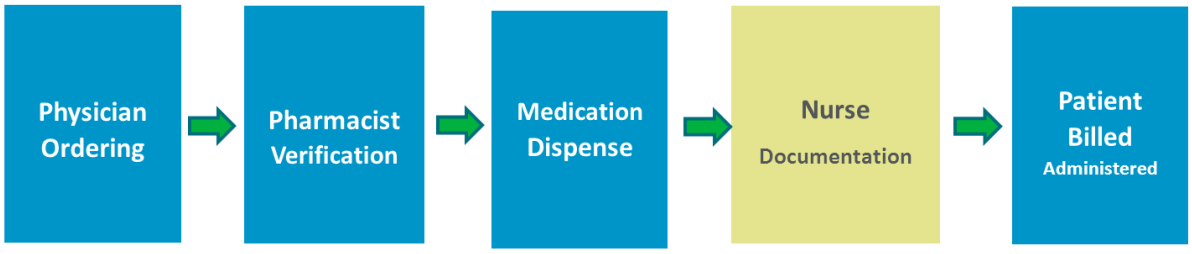


Figure 4: Top ten medications by total charge

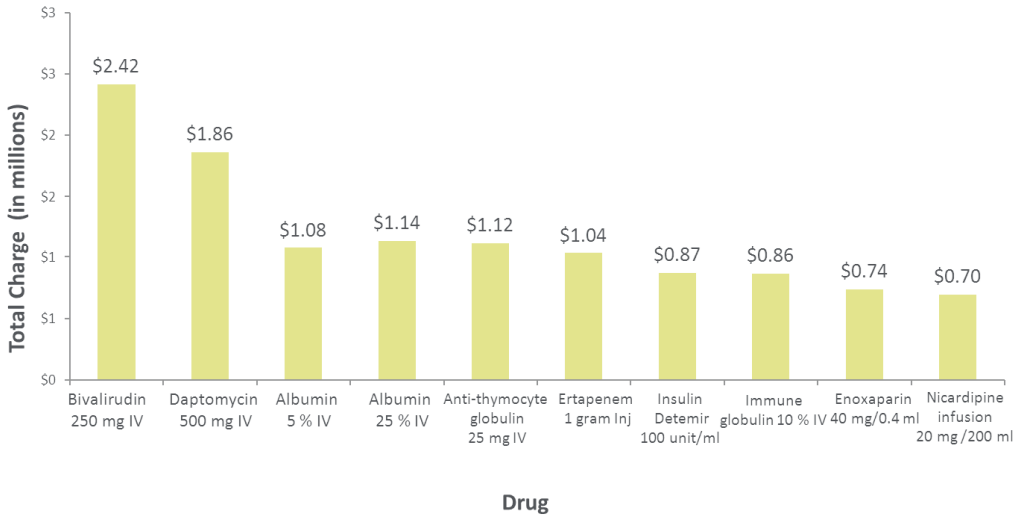


Figure 5: Top ten medications by frequency

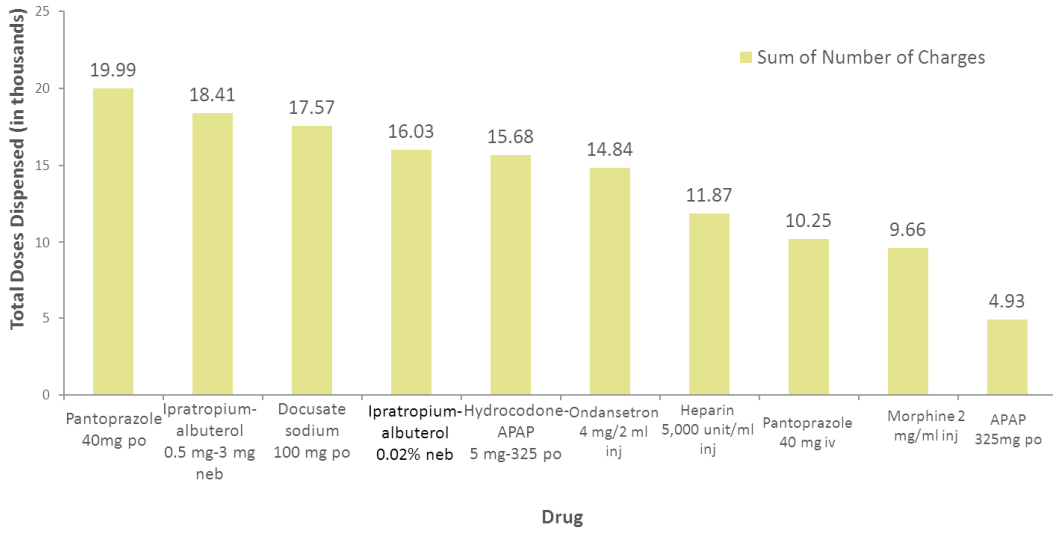


Figure 6: Charge on administration timeline

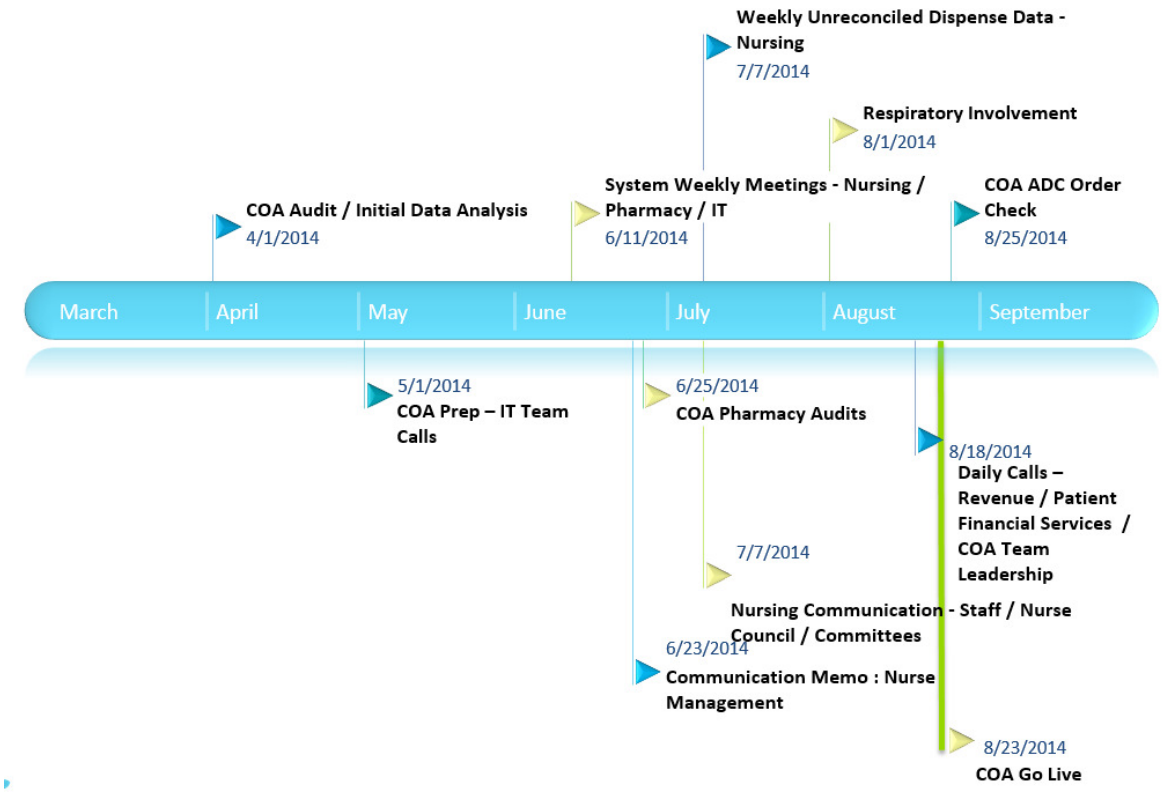


Figure 7: Barcode medication administration scanning compliance

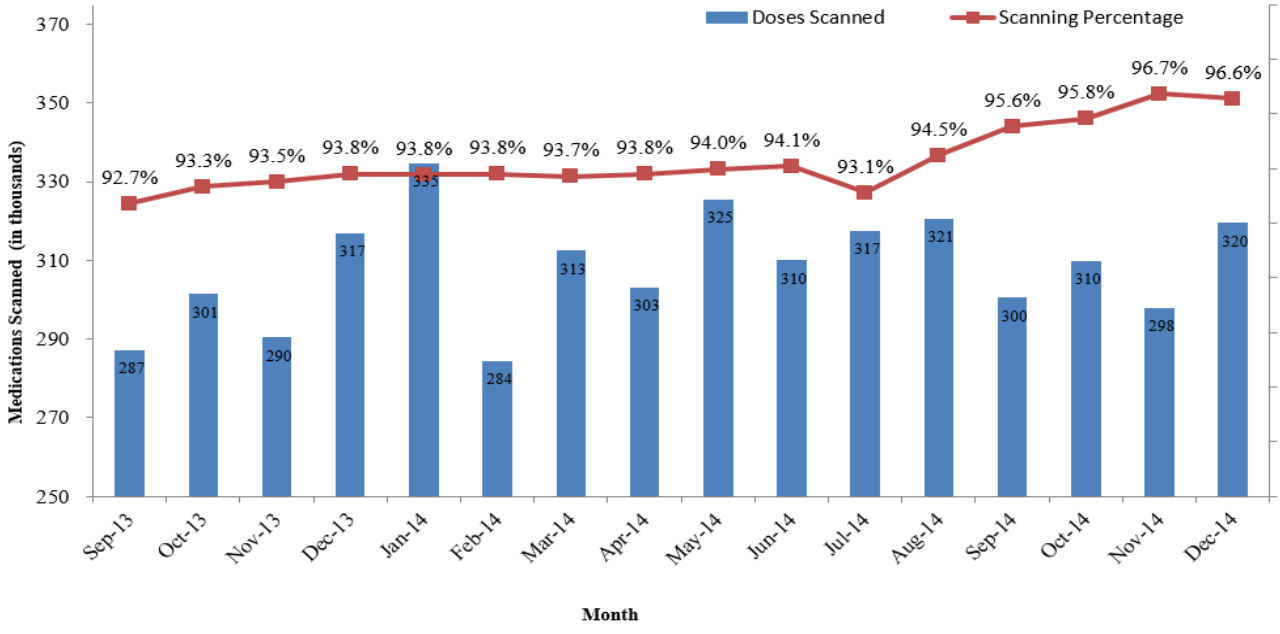


Figure 8: Billing variability for top 5 medications by total charge by month

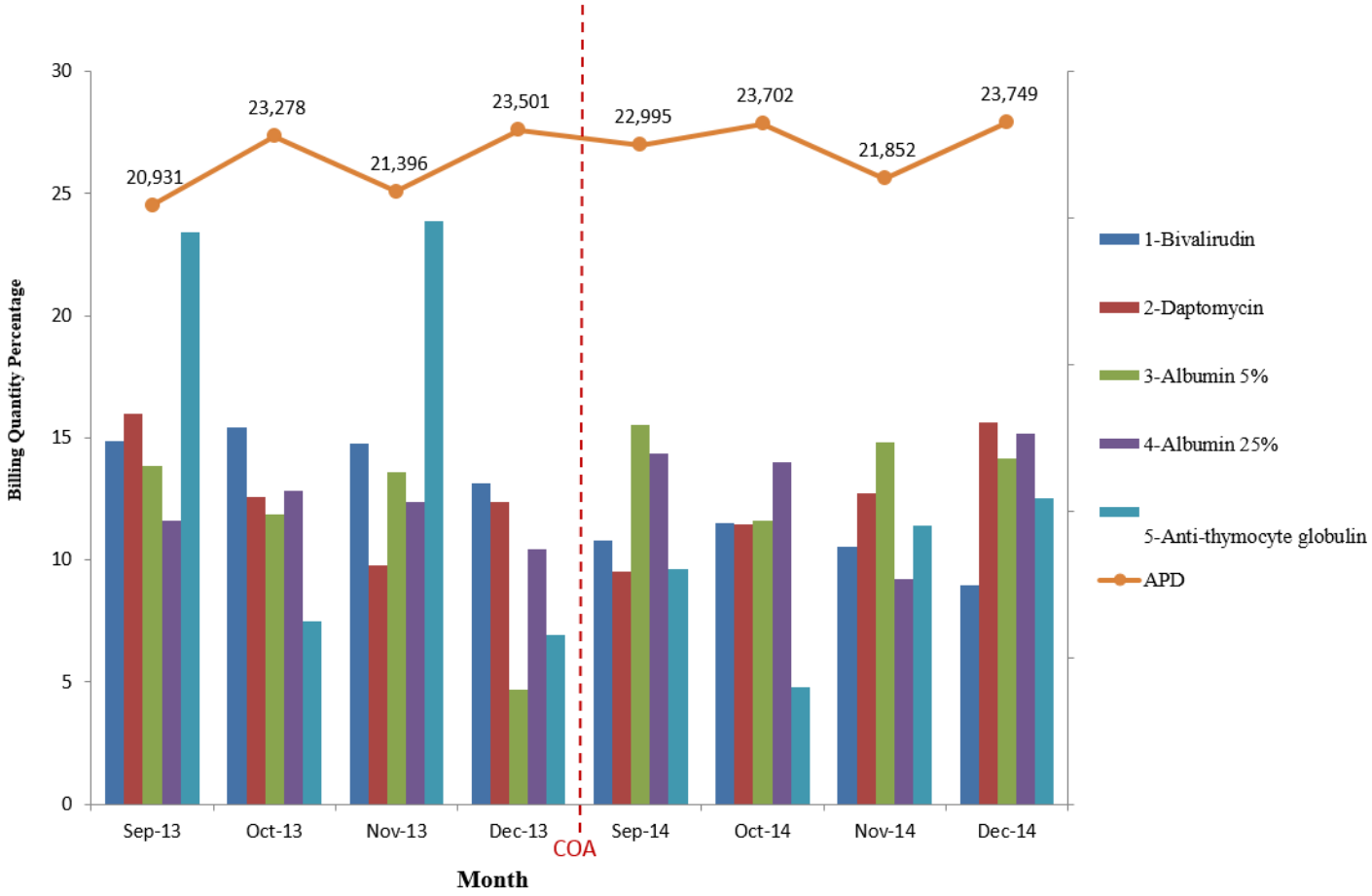


Figure 9: Billing variability for top 5 medications by total charge by medication

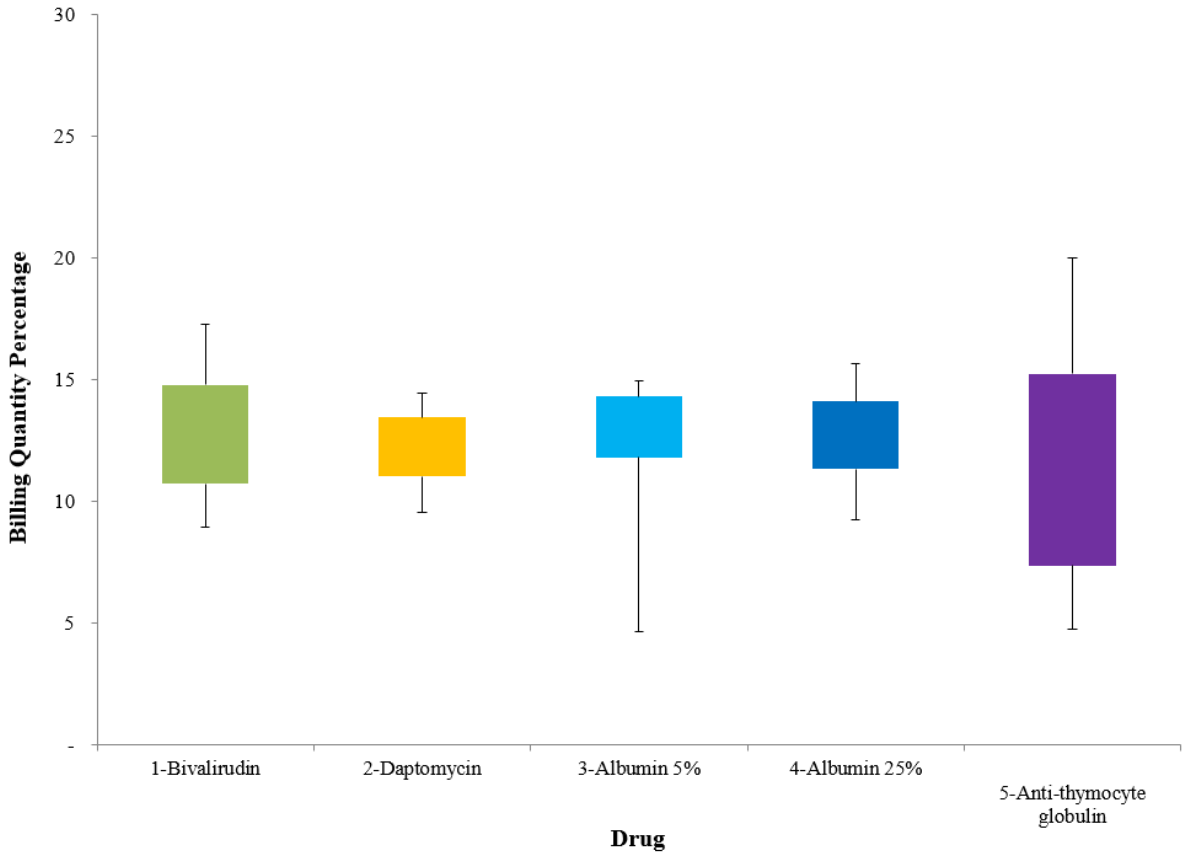


Table 1: Comparison of Charge Capture Methodologies

	Charge on Dispense	**Charge on Administration**
Patient Charge	All medications dispensed	All medications administered
Charge Method	ADC dispense or central pharmacy	Nurse EHR documentation
Missing Medications	Charged on re-dispense	Charged upon documentation of administration
BCMA	Patient Safety	Charge and patient safety

Table 2: Impact of COA transition on charge per APD for top ten medications by total charge

Top	Drug	Pre COA Charge per APD	Post COA Charge per APD	Difference	Change (%)	Gross Revenue Impact (Sep-Dec)
1	Bivalirudin 250 mg IV	$27.14	$18.81	-8.32	-30.67	($741,511)
2	Daptomycin 500 mg IV	$20.93	$19.66	-1.27	-6.07	($113,189)
3	Albumin 5 % IV	$12.07	$14.89	2.82	23.34	$251,146
4	Albumin 25 % IV	$12.80	$13.81	1.01	7.90	$90,078
5	Anti-thymocyte globulin 25 mg IV	$12.60	$7.54	-5.06	-40.18	($451,287)
6	Ertapenem 1 gram Inj	$11.63	$9.53	-2.1	-18.03	($186,853)
7	Insulin detemir 100 unit/ml	-	-	-	-	-
8	Immune globulin 10 % IV	$10.00	$10.55	0.55	5.49	$48,885
9	Enoxaparin 40mg /0.4 ml	$8.28	$7.51	-0.77	-9.32	($68,755)
10	Nicardipine infusion 20 mg /200 ml	$7.82	$6.70	-1.12	-14.32	($99,696)

Table 3: Impact of COA transition on charge per APD for top ten medications by total doses

Top	Drug	Pre COA Charge per APD	Post COA Charge per APD	Difference	Change (%)	Gross Revenue Impact (Sep-Dec)
1	Pantoprazole 40mg po	-	-	-	-	-
2	Ipratropium-albuterol 0.5 mg-3 mg neb	$0.84	$0.88	0.05	5.69	$4,238.09
3	Docusate sodium 100 mg po	-	-	-	-	-
4	Ipratropium-albuterol 0.02% neb	$0.62	$0.42	-0.2	-32.22	($17,856)
5	Hydrocodone- APAP 5 mg-325 po	$0.85	$0.49	-0.36	-42.80	($32,430)
6	Ondansetron 4 mg/2 ml inj	$3.78	$2.82	-0.96	-25.42	($85,690)
7	Heparin 5,000 unit/ml inj	$4.84	$3.90	-0.94	-19.35	($83,413)
8	Pantoprazole 40 mg iv	$0.25	$0.21	-0.04	-17.63	($3,908)
9	Morphine 2 mg/ml inj	$5.75	$3.92	-1.83	-31.88	($163,289)
10	Acetaminophen 325mg po	$0.10	$0.08	-0.02	-20.48	($1,836)