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Gurbinder Singh Jassar

Dated: ____04/01/2016___

EVALUATING THE IMPACT OF AN OPERATIONAL DASHBOARD ON PHARMACY PRODUCTIVITY IN AN ACADEMIC VETERANS AFFAIRS MEDICAL CENTER

By

GURBINDER SINGH JASSAR

A project submitted in partial fulfillment of the requirement for the degree of

MASTER IN SCIENCE IN PHARMACY ADMINISTRATION AND LEADERSHIP

Non-Thesis Project Option

University of Houston

College of Pharmacy

Graduation Date:

May 2016

Masters Research Project

Title: Evaluating the Impact of an Operational Dashboard on Pharmacy Productivity in an Academic Veterans Affairs Medical Center

Principal Investigator:

Gurbinder Singh Jassar, PharmD

Health-System Pharmacy Administration Resident

Department of Pharmacy Services

Michael E Debakey VA Medical Center

Associate Investigators:

Julianna Fernandez, PharmD, BCPS, CGP

Thani Gossai, PharmD

Avani Desai, PharmD, MS

Kevin Garey, PharmD, M.S., FASHP

University of Houston Faculty Chair Correspondence:

Julianna Fernandez, PharmD, BCPS, CGP

Department of Pharmacy Practice and Translational Research

Texas Medical Center Campus, Room 436

1441 Moursund Street

Houston, TX 77030

832-842-8352

832-842-8383 (Fax)

jmferna7@central.uh.edu

Authors:

Gurbinder Jassar, PharmD

Pharmacy Administration Resident

Michael E. DeBakey Veterans Affairs Medical Center

2002 Holcombe Boulevard, Houston, Texas 77030

Gurbinder.jassar@va.gov

No conflict of interest

Thani Gossai, PharmD,

Clinical Director and Residency Program Directior

Houston Methodist Hospital

6565 Fannin Street, Houston Texas 77030

Tgossai@houstonmethodist.org

No conflict of interest

Avani Desai, PharmD, MS,

Inpatient Pharmacy Supervisor,

Michael E. Debakey VA Medical Center,

2002 Holcombe Boulevard Houston Texas 77030

Avani.desai@va.gov

No conflict of interest

Kevin Garey, M.S., FASHP

Department of Pharmacy Practice and Translational Research

Texas Medical Center Campus, Room 436

1441 Moursund Street

Houston, TX 77030

jmferna7@central.uh.edu

No conflict of interest

Corresponding author:

Julianna Fernandez, PharmD, BCPS, CGP

Department of Pharmacy Practice and Translational Research

Texas Medical Center Campus, Room 436

1441 Moursund Street

Houston, TX 77030

jmferna7@central.uh.edu

No conflict of interest

Abstract: Evaluating the Impact of an Operational Dashboard on Pharmacy Productivity in an Academic Veterans Affairs Medical Center

GS Jassar[1], TM Gossai[2], A. Desai[1], K Garey[3], JM Fernandez[3]

Michael E. DeBakey VA Medical Center[1], Houston Methodist Hospital[2] and University of Houston College of Pharmacy[3]

Purpose: The primary objective of this study was to evaluate whether the implementation of a productivity dashboard would impact productivity of the inpatient pharmacist staff. A secondary objective was to evaluate the impact of the dashboard on pharmacist opinion of management communication of productivity goals.

Methods: Data was gathered from the VISTA pharmacy package of the VA via Microsoft SQL queries. The data was presented to the staff in an Excel visual dashboard. Two months of baseline data was collected, the dashboard was introduced to the staff, and then two months of subsequent data was collected. Questionnaires regarding staff opinion on productivity information and goals were administered one week prior to implementation and one week after the study period ended.

Results: Sick leave increased from 7 and 11 instances in November and December, respectively, to 20 and 11 instances in January and February respectively. Overtime utilization increased from 0.48% of overall hours from the beginning study pay period to 3.50% at the end of the study period. Average number of inpatient orders increased 18% from 1717 orders per day in November to 2029 daily orders in February. There were an additional average of 133 orders per day on the day shift and 83 orders on the evening shift. The overnight shift saw no significant change. Outpatient orders increased from 1506 in November, peaking at 1788 orders in January and then falling to 1642 orders in February. 7.45% of all medications dispensed were considered missing in November, and then declined to 7.33% in February. There were a total of 2 EPRP related to pharmacy in the baseline period and 1 in the post-implementation period. 6 EPER's were reported in November and three in December. Post-implementation, two were reported in January and two in February. Overall questionnaire responses increased 0.7 points on Question 1, 0.7 points on Question 2, 1.35 points on Question 3 and 0.7 points on Question 4.

Conclusions: The dashboard implementation was effective in raising employee perception of awareness of management productivity goals and their own performance. It functioned effectively as a communication tool and highlighted several issues related to staffing and distribution of labor resources that will help equalize workload amongst different work areas and shifts. The claim cannot be made that the dashboard implementation increased pharmacy productivity, as defined as increased safety or orders processed.

Title: Evaluating the Impact of an Operational Dashboard on Pharmacy Productivity in an Academic Veterans Affairs Medical Center

Introduction:

Benchmarking is becoming an increasingly common standard in healthcare, with the pharmacy enterprise enduring increased levels of scrutiny in current times of severe drug shortages and compressed department budgets[1-2]. Dr. Paul Abramowitz notes in his 2009 Whitney Award lecture that pharmacy departments should develop dashboards that contain a "pharmacy personnel productivity index" to aide in evaluating the effectiveness of the medication use process[3]. Dashboards can also be excellent tools utilized for preventing and catching drug errors in real-time[4]. However, accurately measuring the productivity of an inpatient pharmacist is challenging. A hurdle for inpatient pharmacy supervisors and managers is not only how to capture and measure all of the productivity of their dispensing pharmacists, moving beyond simple "widgets" produced, but to also get buy-in from their front-line employees to achieve those goals. The authors believe that communicating with staff by enabling the employee to see their workload and productivity as well as have a better understanding of management goals and what is expected of them is likely to affect overall productivity in the pharmacy.

Many third-party companies have developed productivity trackers; however, no two pharmacy departments are alike, with many of their benchmarking applications having trouble tailoring their applications to specific sites. To the author's knowledge, there is currently no utilization of third party vendors to track pharmacist productivity at hospitals run by the Department of Veteran Affairs (VA). The VA does implement a tracking system across its regional Veterans Integrated Service Networks (VISN's) which include such measures as drug costs per unique Veteran, non-formulary medications costs and number of orders processed per full-time equivalent (FTE). This data is aggregated as a monthly report, without regard to staffing levels. The data is presented at both the regional level as well as the aggregate data for each individual hospital in that region. It does not break down the data further into

floors or units. Without this granular detail, it is difficult for an individual pharmacist to understand their workload and productivity.

The Michael E. DeBakey Veterans Affairs Medical Center (MEDVAMC) is a 538 bed academic medical center located in Houston, Texas. The facility contains 357 general hospital beds, a 40 bed spinal cord injury unit and 141 community living center beds, and is considered one of the most complex VA's in the country due to the wide variety of specialty services offered. It is a primarily decentralized operation with close to 40% of medications dispensed via automated dispensing cabinets (ADC's), with the rest being dispensed from a centralized pharmacy and a two satellite pharmacies. The inpatient staffing model consists of 27 clinical pharmacists (CP) who are responsible for managing the central and satellite pharmacies, as well as 41 clinical pharmacy specialists, who round with medical teams, approve and disapprove non-formulary medication requests and focus on more intensive clinical duties. The pharmacy technicians are responsible for filling medication carts, compounding medications, making sterile products and, a select few pharmacy technicians, are responsible for maintaining the ADC's. The clinical pharmacists are the individuals responsible for processing medication orders, as well as maintaining the central and satellite pharmacies.

The primary objective of this study was to evaluate whether the implementation of a readily accessible dashboard would impact productivity of the inpatient staff that consists of 27 clinical pharmacists (CP) who are responsible for processing medication orders, as well as maintaining the central and satellite pharmacies. A secondary aim was to evaluate the impact of creating an operational dashboard on the understanding of management goals by the inpatient pharmacy staff.

Methods

Study Design

This was a retrospective, quality improvement project that was approved by the University of Houston Institutional Review Board. A "go-live" date for the dashboard was set for January 1st, 2016. Consideration was given to the length of the study period, which was determined that two months of data collection was feasible. It was determined that the two months prior to January 1st would serve as the baseline data. The dashboard was created via Microsoft Excel. There were three main categories that were tracked for the dashboard: workload, safety and operations. The Excel workbook had a "home page" that served as the main communication page to the pharmacy staff. Each component of the three categories had their own dedicated tab within the workbook.

The workload data was drawn from the VISTA package via Microsoft SQL queries. One query retrieved all inpatient unit dose and IV orders processed by the inpatient staff for the baseline period of two months. This data was then separated into number of orders processed per pharmacist per day, average number of orders processed per hour, and then further broken down by unit. A separate query was run to process all outpatient orders processed by the inpatient staff, stratified by hour and then aggregated on a monthly basis. Finally, the workload data included a query for number of missing doses filled per day broken down by unit. This data was presented aggregated by month.

Safety data was divided into Electronic Patient Event Reports (EPERs) and External Peer Review Program (EPRP) errors. The EPERs are electronically generated reports of patient safety incidents voluntarily reported by the staff at the facility. The EPERs are stratified as Safety Assessment Codes (SAC) by the medication safety officer of the facility. SAC is a numerical score that rates incidents affecting a patient or security incidents. The score is based on the consequence of that incident and also the likelihood of its recurrence. Incidents are divided into SAC 1 (minor), SAC 2 (moderate) and SAC 3 (major) categories.

The report was sent to the author on a monthly basis and was inputted manually into the dashboard. The EPRP system is designed to provide medical centers with diagnosis and procedure-specific quality of care information. It provides a database for analysis and internal and external comparison of clinical care. Data used for these analyses are abstracted from a random sample of both paper and electronic medical records. This study looked specifically at post-surgical diagnoses and errors that were flagged. The IV room supervisor would look at the daily report, tabulate the number of errors for the month and then decide which errors were the responsibility of the pharmacy department. This information was sent to the author and manually inputted into the dashboard.

Operational metrics included tracking employee leave and call-outs as well as overtime utilization. Employee leave was documented daily by the inpatient supervisor in a separate Excel document, which was imported into the dashboard on a bi-weekly basis. This data was then stratified into annual leave, care and bereavement leave, overtime and sick leave and aggregated by month. The second operational metric, overtime utilization, was provided by the Financial Office of the facility. The total hours of overtime per pay period, stratified by cost center, was sent to the author one week after each pay period. This data was manually entered into the dashboard and then presented as a percentage of all hours worked per cost center.

		Source			
Category	**Metric**	**Microsoft SQL/ VISTA**	**Inpatient Supervisor**	**Medication Safety Officer**	**Financial Office**
Workload	Number of orders/pharmacist/day	X			
	Average number of	X			

	orders processed per hours				
	Outpatient orders	X			
	Missing medication requests	X			
Safety	EPER			X	
	EPRP		X		
Operational	Employee leave and call-outs		X		
	Overtime utilization				X

The staff was given four training sessions during the week prior to implementation to familiarize themselves with the layout of the dashboard as well as the information presented in the dashboard. Any individuals that could not attend the training sessions were scheduled on a one-on-one basis.

Questionnaire

The questionnaire developed for the staff asked the staff to mark their primary shift as “Day”, “Evening” or “Overnight”. After this question, the staff was asked four questions, with the responses ranging from 1-4, with 1 noting “I strongly disagree” to 4 noting “I strongly agree” to the question. The questions in the questionnaire are listed below:

1. I understand management’s goal for inpatient pharmacy productivity
2. Management keeps the staff informed of goals
3. I know where productivity information is located and available to me
4. I am provided with sufficient information to understand departmental productivity

The pharmacist questionnaire was given prior to dashboard implementation to all available inpatient pharmacists and then repeated at the end of the study period. One pharmacist on the evening shift did not complete the post-intervention survey while a newly hired pharmacist completed a post-intervention overnight pharmacist questionnaire. The overnight shift responses were not analyzed as the number of participants before and after implementation were too low for meaningful analysis.

Results:

Average monthly staffing levels for the day shift were not statistically different after an ANOVA test was conducted(p-value = 0.10) with November having 6.57 ± 0.46 pharmacists, December having 6.45 ± 0.52 pharmacists, January having 6.39 ± 0.25 pharmacists and February having 6.79 ± 0.53 pharmacists, not including the two pharmacists in the IV room and chemotherapy pharmacies.

Average monthly staffing levels for the evening shift were not statistically different after an ANOVA test (p-value = 0.196) was conducted with November having 5.63 ± 0.24, December having 5.45 ± 0.32, January having 5.48 ± 0.25 and February having 5.34 ± 0.24.

Results were divided into three categories including operational tracking, safety tracking and workload tracking.

Operational

The operational bucket tracking employee call-outs is shown in Figure 1. There were 7 and 11 instances of sick leave in November and December respectively, with an increase seen in January and February to 20 and 11 instances respectively. Each instance is one shift. There were 5 instances and 2 instances of overtime in November and December respectively. This increased to 7 and 13 instances of overtime in January and February respectively. Annual leave stayed constant at 1 instance each for both November and December, before increasing to 3 instances in January and then 2 instances in February. Care and bereavement leave was utilized twice in November, once in December, none in January and four times in February. Overtime utilization percentages per total hours worked are shown in Figure 2. Group 353 includes the IV pharmacist as well as the technicians assigned to the IV room. These technicians are free to pick up extra shifts for overtime if they are qualified for the shift. Group 354 includes all inpatient pharmacists and group 355 includes the remaining inpatient pharmacy technicians.

Workload

In the workload bucket, the average number of inpatient orders per day increased each successive month as shown in Figure 3. The increase from the baseline 1717 average daily orders in November to 2029 average daily orders in February represented nearly an 18% increase in order volume. Further breaking down the average number of daily orders into hourly volume, as shown in Figure 4, the largest increases in volume were seen between the hours of 9:00 AM and 7 PM, correlating with the entirety of the day shift and the first three hours of the evening shift. The overnight shift average daily volume was mostly unchanged between the baseline period and the study period. Outpatient orders, which are processed by

the evening and overnight shifts, increased from 1506 in November and 1679 in December, to 1788 orders in January. They then dropped to 1642 orders in February as shown in Figure 5.

Figure 6 further breaks down the outpatient orders by hour and by month. As previously stated, the hours between 8 AM and 3 PM were unchanged between the baseline and study periods as the day shift does not process outpatient orders (other than eye kits which were not captured in this data). Between the hours of 3 PM and 7 PM, January had the highest number of orders at 252 orders, while the rest of the months were very similar. This was consistent until midnight, when the overnight shift took over, and there was tremendous fluctuation in outpatient order processing between the months, varying as much as 107% at the midnight hour between November and February

Missing medication requests also increased month over month, as shown in Figure 7, from November with 4031 requests, to December at 4266 requests to finally, January at 4765 requests, which was 14.8% higher than the average of November and December combined. They then decreased to 4583 requests, which was roughly 10% higher than the average of the combined sums of November and December. The percentage of total dispensed doses that were labelled as missing is shown in Figure 8. The baseline period showed a steady rate at 7.83% and 7.84% in November and December respectively, while increasing to 7.96% in January and declining to 7.79% in February.

Safety

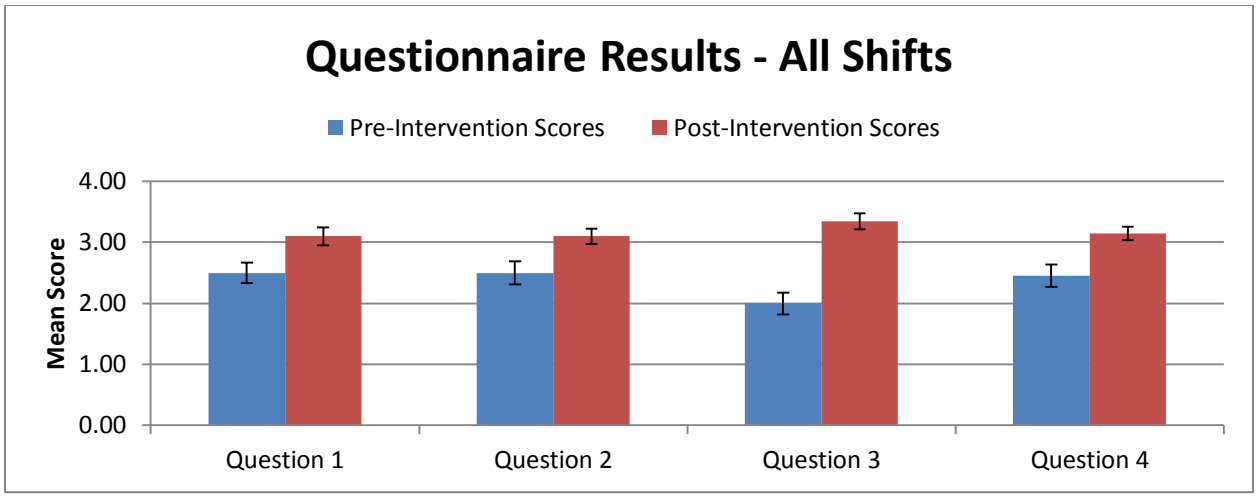
The safety bucket comprised of EPERs and EPRP's. The baseline months of November and December had 0 and 2 pharmacy incidents respectively, while January and February had zero

and one incident respectively, as shown in Figure 9. Figure 10 shows the total number of EPER events, further broken down into SAC 2 and SAC 3 events. There were no SAC 3 events during the baseline or study periods. There were a total of 21 SAC events in November, with a 6 of those classified as SAC 2. December had 23 total SAC events, with three of them classified as SAC 2 events. During the study period, the total number of SAC events declined to 14 with two classified as SAC 2 events and February had a total of 21 SAC events with two classified as SAC 2 events.

Questionnaire

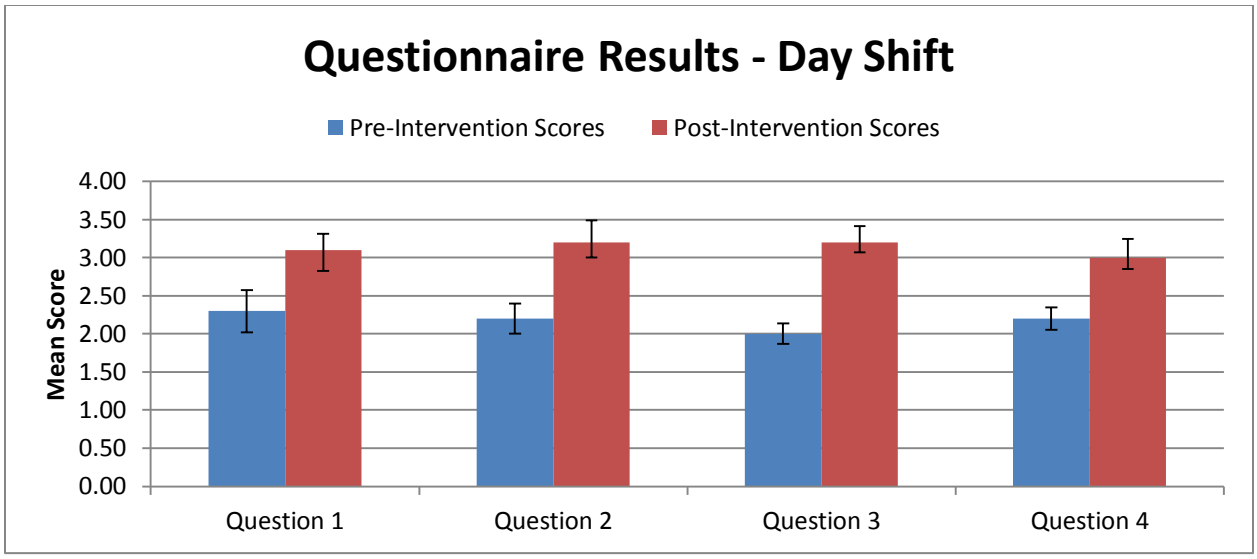
All shifts combined increased their responses to their understanding of management goal for inpatient productivity on Question 1 by 0.60 points from 2.5 ± 0.17 points to 3.10 ± 0.14 points. Question 2 asked participants if management kept the staff informed of goals saw an increase of 0.6 points from 2.5 ± 0.18 points to 3.10 ± 0.12 points. Question 3 asking the staff if they knew where the productivity information is located and available saw an increase of 1.35 points from 2.00 ± 0.18 points to 3.35 ± 0.13 points. Question 4 asking the staff if they were provided with sufficient information to understand departmental productivity rose by 0.8 points from 2.45 ± 0.18 points to 3.15 ± 0.11 points. The Wilcoxon Ranked Sum test showed a difference for all questions.

Whole Group (n = 20)				
	Question 1	Question 2	Question 3	Question 4
Pre-Intervention Scores	2.50	2.50	2.00	2.45
BI Std Error	0.17	0.18	0.18	0.18
Post-Intervention Scores	3.10	3.10	3.35	3.15
AI Std Error	0.14	0.12	0.13	0.11



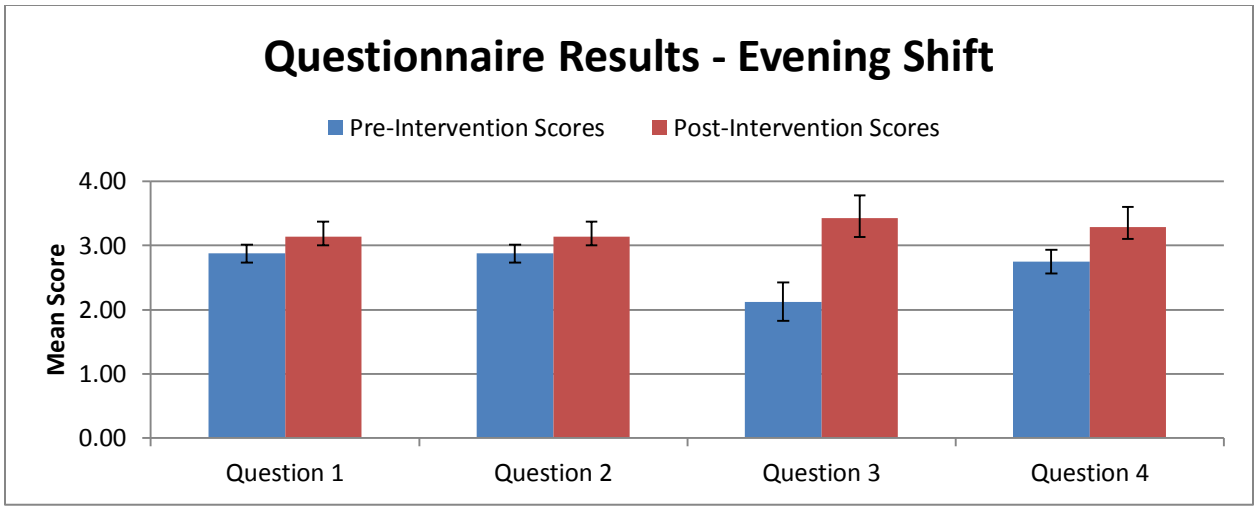
Day shift employees increased their responses to their understanding of management goal for inpatient productivity on Question 1 by 0.80 points from 2.3 ± 0.21 points to 3.10 ± 0.28 points. Question 2 asked participants if management kept the staff informed of goals saw an increase of 1.0 points from 2.2 ± 0.29 points to 3.20 ± 0.20 points. Question 3 asking the staff if they knew where the productivity information is located and available saw an increase of 1.20 points from 2.00 ± 0.21 points to 3.20 ± 0.13 points. Question 4 asking the staff if they were provided with sufficient information to understand departmental productivity rose by 0.8 points from 2.20 ± 0.25 points to 3.00 ± 0.15 points. The Wilcoxon Ranked Sum test showed a difference for all questions.

Day Shift				
	Question 1	Question 2	Question 3	Question 4
Pre-Intervention Scores (n=10)	2.30	2.20	2.00	2.20
BI Std Error	0.21	0.29	0.21	0.25
Post-Intervention Scores (n=10)	3.10	3.20	3.20	3.00
AI Std Error	0.28	0.20	0.13	0.15



Evening and overnight shift employees increased their responses to their understanding of management goal for inpatient productivity on Question 1 by 0.26 points from 2.88 ± 0.23 points to 3.14 ± 0.14 points. Question 2 asked participants if management kept the staff informed of goals saw an increase of 0.26 points from 2.88 ± 0.23 points to 3.14 ± 0.14 points. Question 3 asking the staff if they knew where the productivity information is located and available saw an increase of 1.30 points from 2.13 ± 0.35 points to 3.43 ± 0.30 points. Question 4 asking the staff if they were provided with sufficient information to understand departmental productivity rose by 0.54 points from 2.75 ± 0.31 points to 3.29 ± 0.18 points. The Wilcoxon Ranked Sum test did not show a difference for any of the questions except for question 3.

Evening and Overnight Shift (n=10)				
	Question 1	Question 2	Question 3	Question 4
Pre-Intervention Scores	2.88	2.88	2.13	2.75
BI Std Error	0.23	0.23	0.35	0.31
Post-Intervention Scores	3.14	3.14	3.43	3.29
AI Std Error	0.14	0.14	0.30	0.18



Discussion:

Operational

Of those 20 instances of sick leave in January, half were due to one pharmacist. The corresponding lack of overtime was due to the unforeseen nature of these call outs as well as the fact that the pharmacist was the third pharmacist on the overnight shift, which is an additional pharmacist over the minimum requirement of two pharmacists. This was done because the pharmacist was going through some re-orienting after an extended absence. Because of the additional pharmacist, the overtime used in January did not correspond to the additional sick leave taken in January. This arrangement changed in February, as the traditional staffing model of minimum staffing of two pharmacists was implemented. The same pharmacist was responsible for 4 of 11 the sick leaves, and overtime was needed for those instances. There was also a slight increase in care and bereavement leave which lead to an additional increase in overtime utilization.

If the shifts by the pharmacist were staffed, then January would not have been an outlier in sick leave. This pharmacist was also responsible for 4 of the 11 of the sick leave instances in February. Overtime utilization for the IV room cost center was primarily driven by the technicians in that cost center, as the pharmacist only worked two overtime shifts during the entire study period, which would make up a negligible percentage of their total hours worked.

Workload

As expected, there was a tremendous increase in workload for the day shift during normal business hours. The day shift handled double the amount of orders compared to the evening shift, with only one additional pharmacist dedicated to a floor and two additional pharmacists for the IV room and narcotic vault. Furthermore, the day shift handled more than 133 average extra orders daily per shift post-implementation compared to the baseline period with no increase in average staffing levels. The evening shift took on an additional average of 83 orders per shift with the bulk added in the first hour hours of the shift. There was no overall change in staffing levels, however, there was the addition of a more experienced pharmacist that moved from the overnight to evening shift during the study period. The overnight shift experienced no significant changes in inpatient orders during the study period. There is no clear explanation for the surge in orders during the study period compared to the baseline period, as the census data was not accurate. An interesting follow up would be to track the changes in time to medication administration with this additional workload.

Outpatient orders also saw an increase in January, however, declined in February. Of note, the day shift fills between 20-30 eye kits for the outpatient ophthalmology clinic, with each kit consisting of four orders. This data was not captured in the dashboard. The evening shift and overnight shifts accounted the majority of the outpatient orders.

Safety

There was not a clear correlation between the dashboard and the safety monitors. The EPRP's went from 2 incidents related to pharmacy in the study period, to 1 incident post-implementation; however, a claim cannot be made that the dashboard influenced this decline as safety reporting is very reliant on good self-reporting. The same can be said for the SAC 2 EPER's, as the post-implementation numbers declined from the baseline period, however, with no standardized reporting procedure, it is difficult to make the claim that the dashboard led to the decrease in EPERs. There was verbal feedback at the end of the study period from the inpatient pharmacists that appreciated the tracking of the safety metrics and the specifics of the each incident.

Questionnaire

The secondary objective of the study aimed to measure the staff understanding of the dashboard instrument. Many of the pharmacists were unfamiliar with not only how management looked at productivity, but also how to utilize a dashboard. Overall, the dashboard was a success in raising staff awareness of productivity, with the biggest improvement seen in locating the information as indicated by the responses to Question 3. This

was expected as the dashboard was emailed out to the staff every pay period with specific details relating to processing volume and missing medication request data highlighted. One surprising result was the difference in responses between the day and evening shifts. The day shift is a larger, more tenured staff with assigned staffing duties, whereas the evening shift is comprised of a smaller, less tenured group that cover more floors per pharmacist. The evening shift also started at a higher level of understanding based on their initial responses despite having less tenure, mainly due to the evening staff having increased familiarity with various technology as many have graduated from pharmacy school within the past 5-10 years. The day shift initially ranked lower across all questions prior to the implementation, but realized the largest gains of the dashboard compared to the evening shift. A Wilcoxon Signed Rank test found that there was a difference made in The Wilcoxon Signed Rank test indicated that there no difference was found for questions 1, 2 and 4 for the evening shift. There was no difference in delivery of the dashboard as it was done via email and discussed at the conjoined huddles between all shifts. There is no clear explanation for this difference in responses, however, the author assumes that since the day shift is divided into specific floors and units, they were more acutely aware of the data points as they pertained to their workload (the dashboard was operational to the floor and unit level). A follow up point would be the annual All Employee Survey (AES) that asks a variety of questions to the pharmacy staff broken down by inpatient, outpatient and clinical staff. It would be interesting to see the results of the management communication section if this dashboard were continued throughout the year.

Limitations of the study included a small trial window complicated by the federal holidays of Thanksgiving, Christmas and New Years Day. Days around these holidays are often requested off, thus complicating the accuracy of a "normal" staffing schedule. Another complicating issue is that annual leave over 240 hours must be used prior to January XX, thus many employees "back-end" their vacation time to ensure they are able to utilize it without losing it. Participants may have also altered pharmacist behavior as they knew their work was now being track, leading to a Hawthorne Effect. This may have influenced behavior and lead to an inaccurate reflection of their productivity. A more nuanced view of the orders processed would have been to stratify the orders processed based on complexity or new orders. This was not possible to do with the search methods, but would have lent to a greater understanding of the time required to process orders on different units and would better explain differences in missing medications and orders processed by each pharmacist and their respective unit. Finally, an accurate hospital census was not able to be obtained for the study period. This would have been an excellent tool to correlate workload volume to actual patient admissions, allowing for insight on the need for potential flex staffing or anticipated annual trends when compared to previous years.

Conclusions:

The dashboard implementation was effective in raising employee perception of awareness of management productivity goals and their own performance. It functioned effectively as a communication tool and highlighted several issues related to staffing and distribution of labor resources that will help equalize workload amongst different work areas and shifts. The claim

cannot be made that the dashboard implementation increased pharmacy productivity, as defined as increased safety or orders processed.

Disclosures:

The authors have nothing to disclose concerning possible personal or financial relationships with commercial entities that may have a direct or indirect interest in the subject matter of this study.

Acknowledgements

The authors would like to acknowledge the MEDVAMC inpatient pharmacy staff and managers for their participation in this study, research committee for their guidance and mentorship and Mr. Tai Vu for his technical support.

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Figure 1

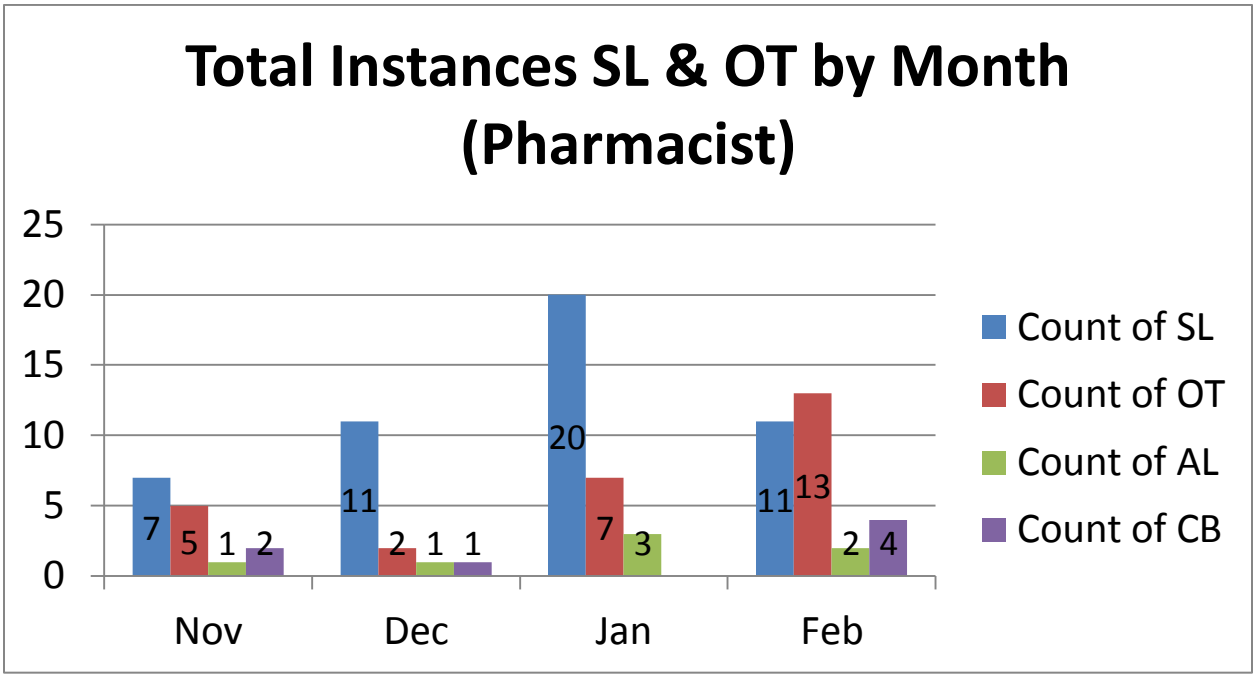


Figure 2

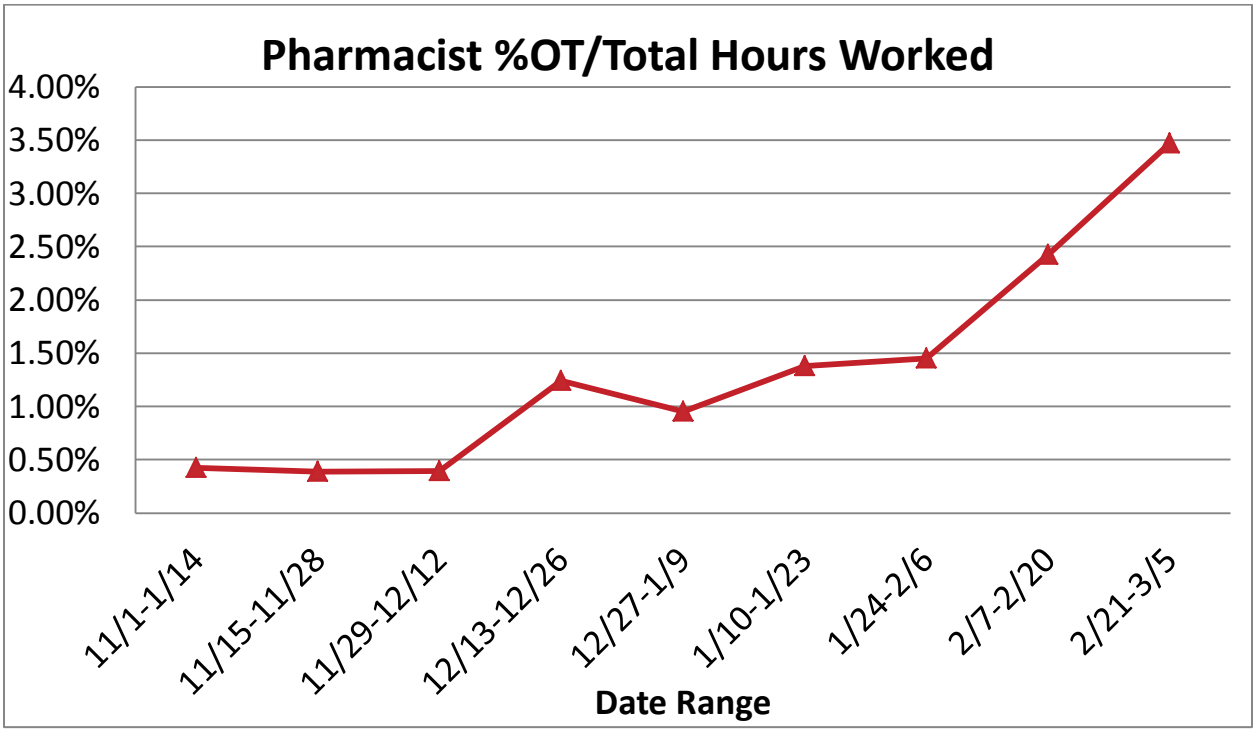


Figure 3

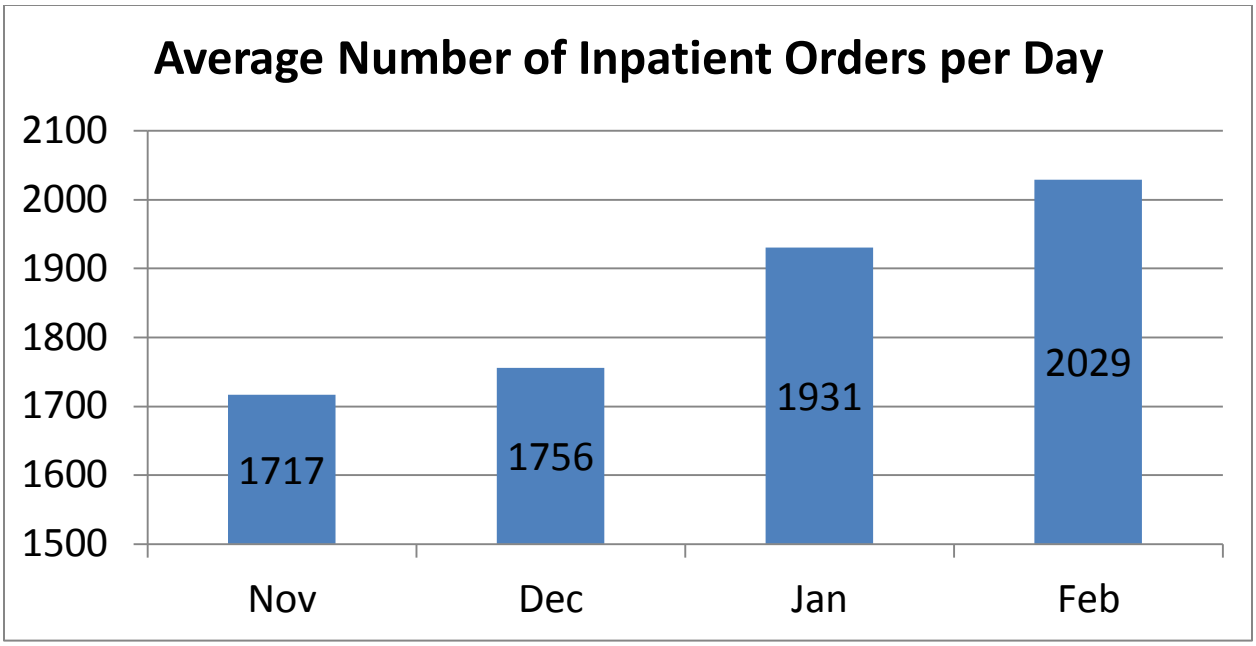


Figure 4

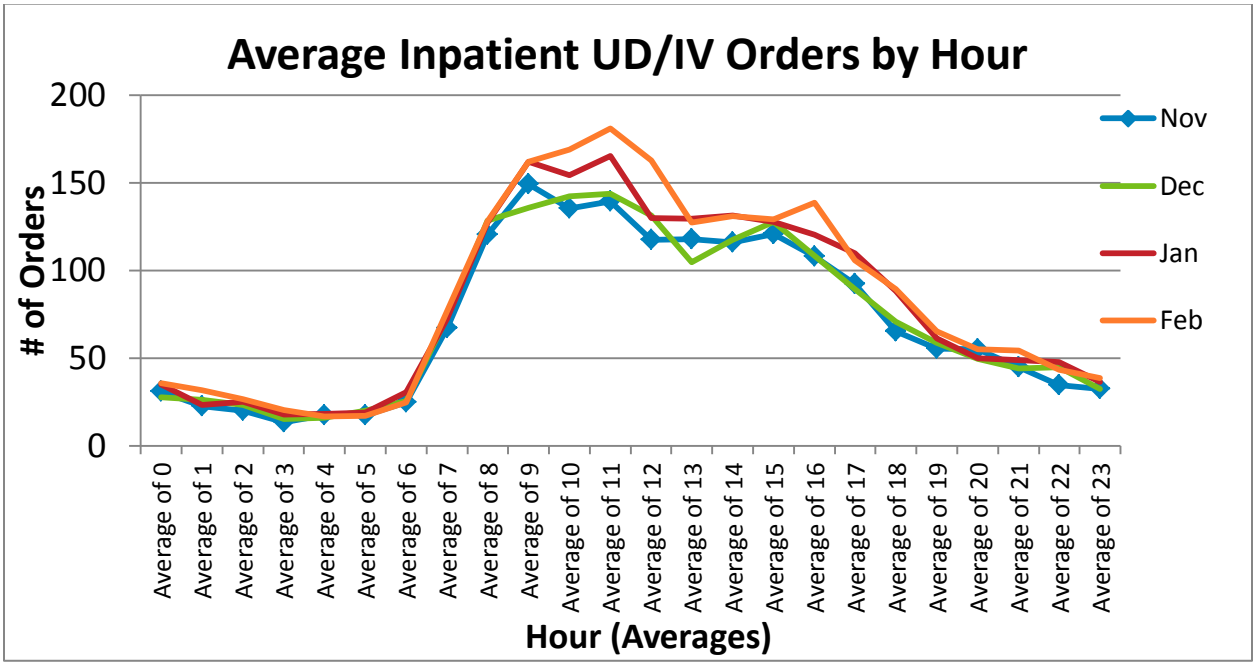


Figure 5

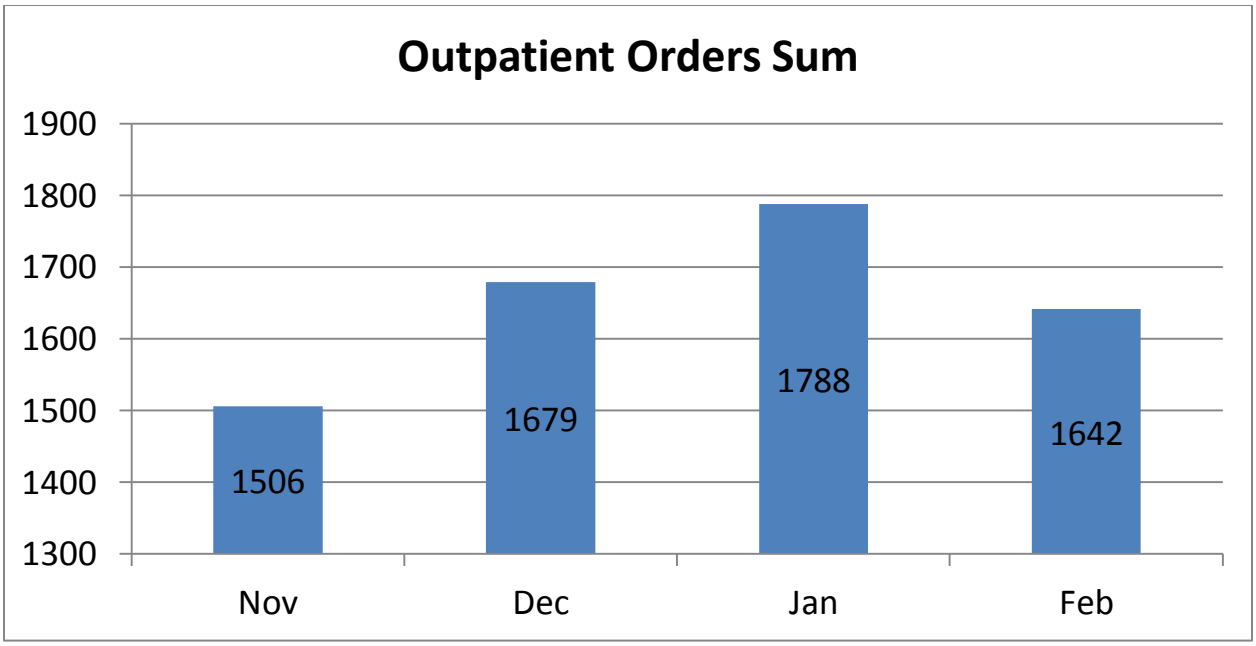


Figure 6

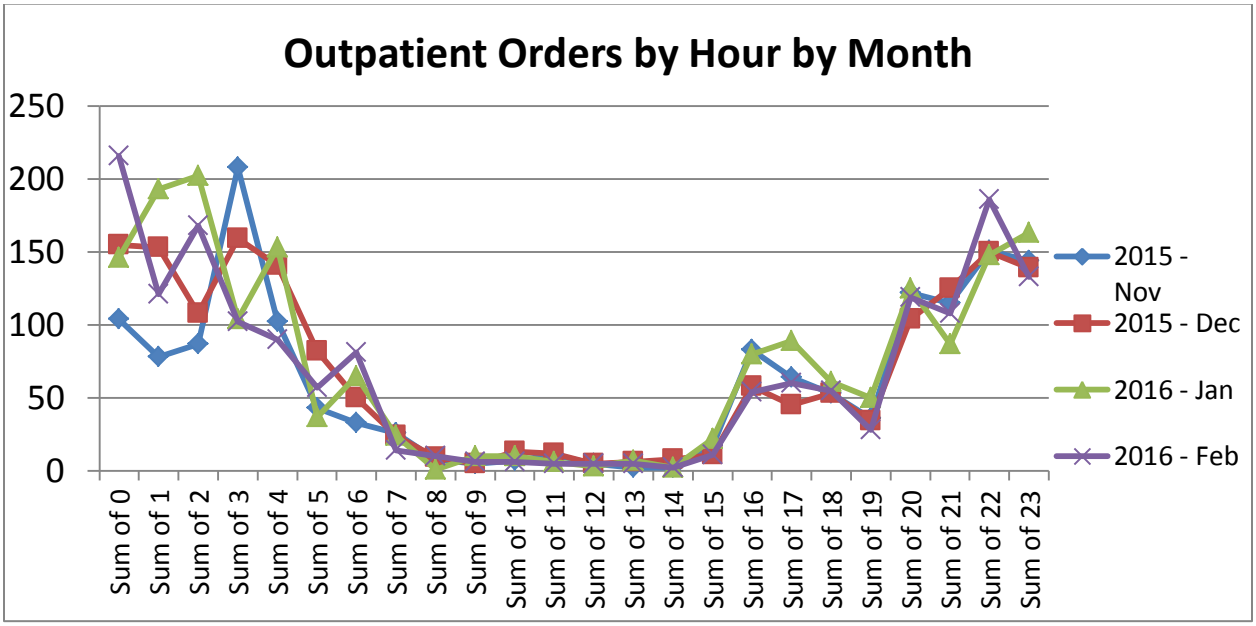


Figure 7

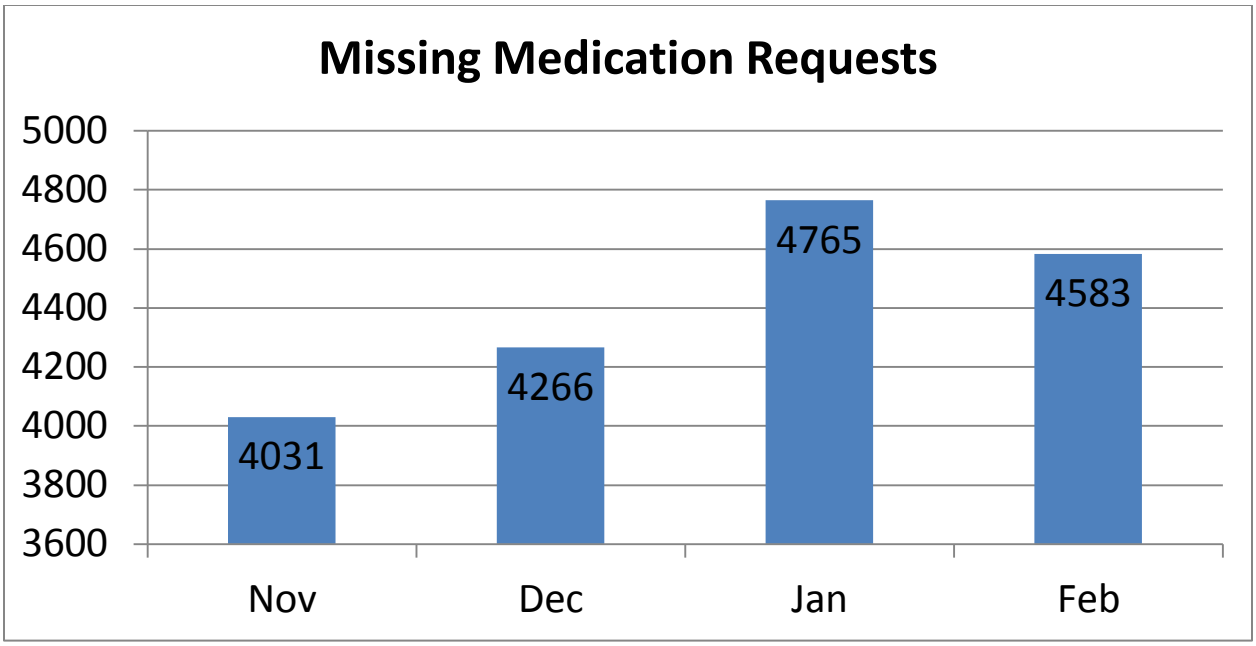


Figure 8

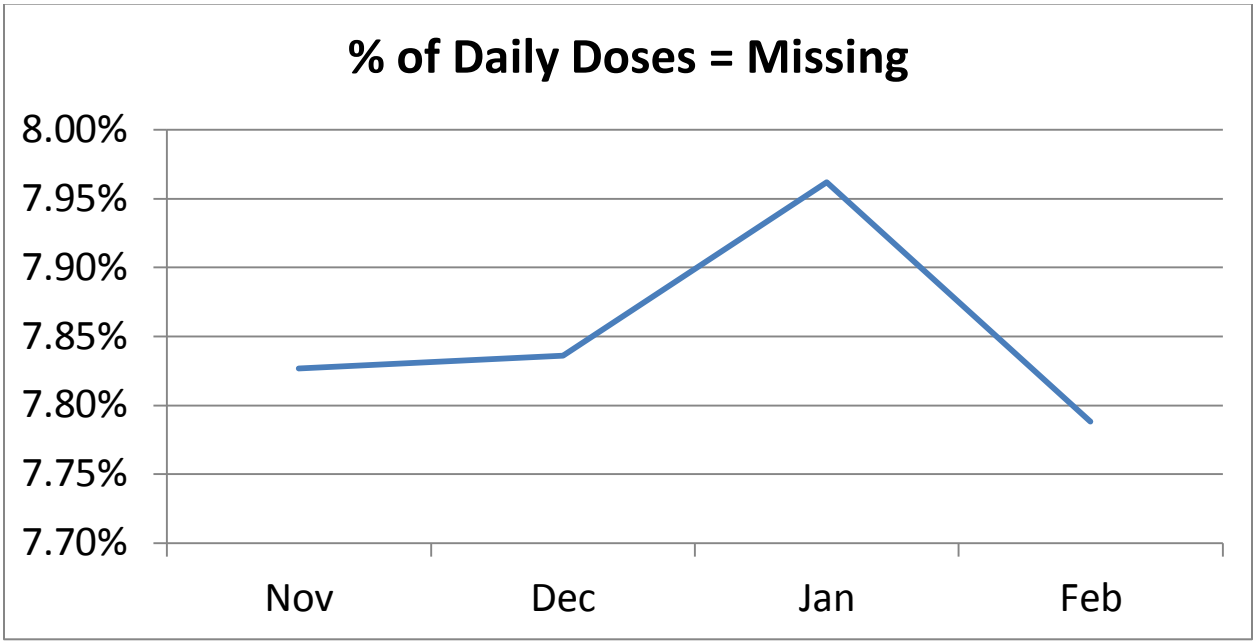


Figure 9

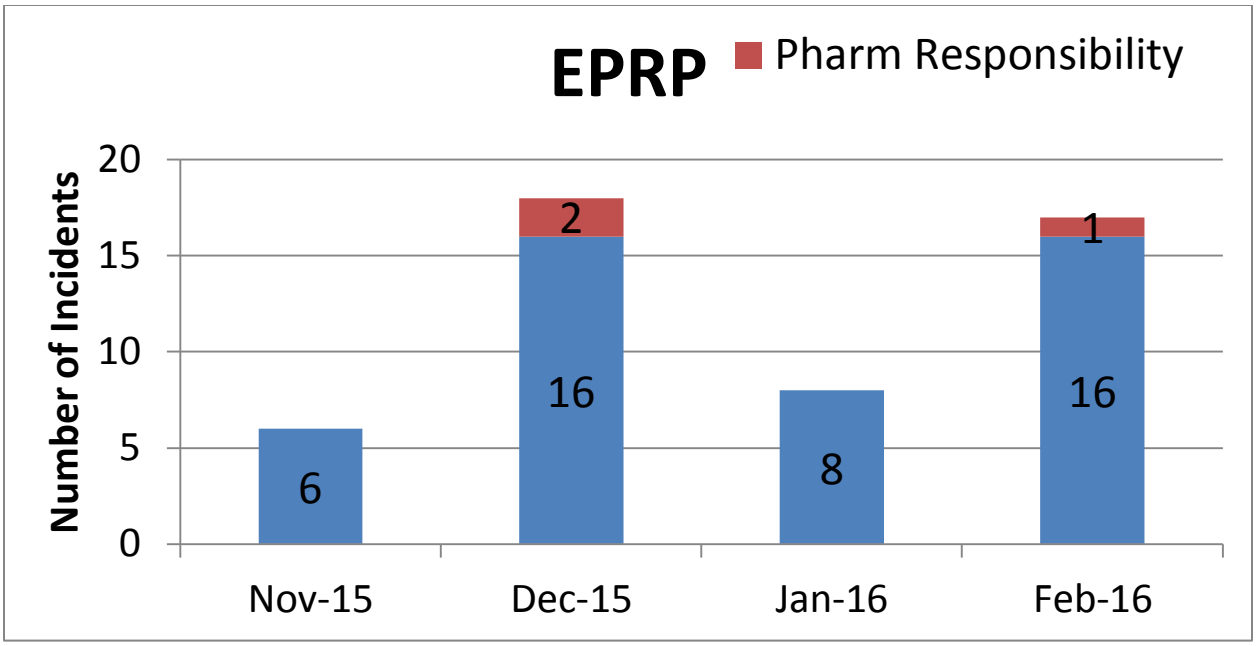
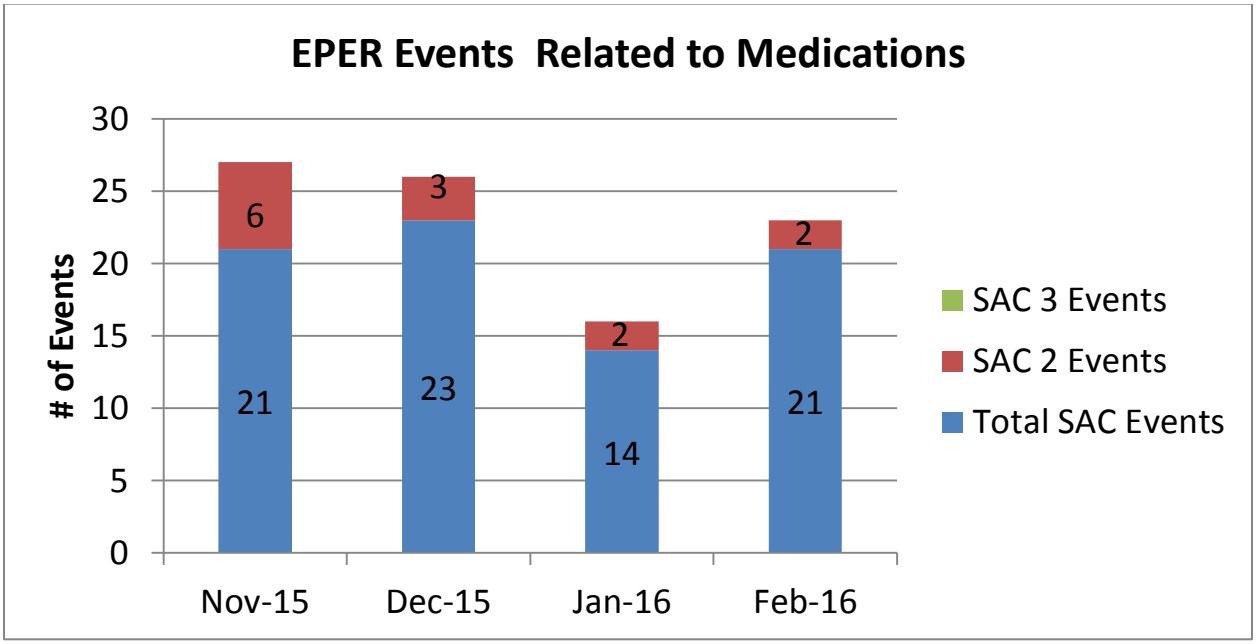

EPRP
Pharm Responsibility
Number of Incidents
20
15
10
5
0
6
16
2
8
16
1
Nov-15
Dec-15
Jan-16
Feb-16

Figure 10


EPER Events Related to Medications
# of Events
30
25
20
15
10
5
0
21
6
23
3
14
2
21
2
Nov-15
Dec-15
Jan-16
Feb-16
SAC 3 Events
SAC 2 Events
Total SAC Events