IMPACT OF CLINICAL PHARMACY SERVICES IN A VETERNS AFFAIRS HOSPITAL EMERGENCY DEPARTMENT

by

MICHAEL J. MELDRUM, Pharm.D.

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Abstract

The Impact of Clinical Pharmacy Services in a Veterans Affairs Hospital Emergency Department

Problem: The Michael E. DeBakey Veterans Affairs Medical Center is a large tertiary care teaching hospital with a busy emergency department. Currently there are no pharmacy services provided in the emergency department, which is similar to national trends.

Methods: A one-month pilot was arranged to place a clinical pharmacist in the emergency department during the day shift. Pharmacist interventions and activities were chronicled and translated into financial savings for the hospital. In addition to intervention tracking the pharmacist focused on Adverse Drug Event reporting and discharge counseling. Review of the number of Adverse Drug Event reports during the month was compared to the months surrounding the pilot period. Readmission rates for patients seen for Chronic Obstructive Pulmonary Disease were also compared to the months surrounding the pilot. Comparisons were made using Chi Square analysis.

Results: The pharmacist made a total of 68 quantifiable interventions for a total cost avoidance of $97,953.90. In addition, the pharmacist completed 207 medication reconciliations, 29 discharge counseling sessions, and a small number of other interventions. There were a total of 10 Adverse Drug Events reported during the pilot period, which demonstrated a significant increase in reporting during the pilot ($p < 0.01$). There was no difference seen in readmission rates.

Conclusions: Addition of a clinical pharmacist to the emergency department resulted in significant cost savings for the hospital. In addition, there was a significant increase in

Adverse Drug Event reporting, which would more accurately reflect the number of medication events in the hospital.

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Chapter 1

Introduction

Medication Safety

Medication errors are a known problem in healthcare. The Institute of Medicine released a report to document the scope of this problem in the American healthcare system. *To Err is Human* changed the landscape of medication safety, and helped bring this large-scale problem into the public eye. This report also provided recommendations to help improve the medication use system (Kohn et al., 1999). The Institute of Medicine followed up with a second publication intended to help shape the goals of the 21st century healthcare system. Crossing the Quality Chasm provided further recommendations for ideals that could help improve the medication use system. Among the recommendations there was advice to improve evidence based care for patients (IOM, 2001). These two landmark reports created the awareness of the problem, but progress towards a safe medication system is still lacking. Many known improvements to the system have not been widely adopted after successful demonstration in individual hospitals or systems (Leape and Berwick, 2005).

Within the Veterans Affairs (VA) health system, medication safety is of high importance. The VA Adverse Drug Event Reporting System (VA ADERS) is designed to allow facilities to record adverse reactions of patients to medications. The system electronically records all information related to the event and determines the likelihood of the event resulting from the use of a specific medication. The system is designed to automatically report the information to the Food and Drug Administration when any reactions are severe or occur for drugs that are newly approved. VA policy defines an

Adverse Drug Event (ADE) as an injury resulting from the use of a drug, including harm caused by the drug as a result of adverse drug reactions, drug-drug interactions, product quality problems or drug overdoses (whether accidental or intentional). This definition includes Adverse Drug Reactions, which are defined as a response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis, or therapy of disease or for the modification of physiologic function (VHA 2008). ADE reporting can be accomplished by any staff member of the VA, but is often catalogued by either the provider or the pharmacist. Involvement of a pharmacist in the emergency department has been shown to increase the reporting of adverse drug events in other healthcare systems (Weant et al., 2010).

The pharmacy department is responsible for effective medication distribution within the hospital. The Joint Commission Standards require all orders to be reviewed by a pharmacist prior to administration unless they are under the direct supervision of the physician from ordering to preparing and administering the medication (MM.05.01.01) (TJC, 2012). This measure is intended to improve patient safety and reduce medication errors. Increased involvement of clinical pharmacists has been shown to improve the medication delivery system. System changes in pharmacy departments have already shown improvement in patient safety through the reduction of medication errors. Programs related to computerized physician order entry, bar coded medication administration, and smart pump technologies have demonstrated improved patient safety (Roberts et al., 2010; Marini and Hasman, 2009; Trbovich et al., 2010). In addition to technological changes for patient safety, the involvement of a clinical pharmacist has been shown to improve patient safety (Kaboli et al., 2006).

Emergency Department

The emergency department serves as an entry point to most hospitals and provides the first opportunity for the facility to provide quality care. However, only 28.6% of hospitals currently have a pharmacist assigned to cover the emergency department (Pedersen et al., 2010). The rates of medication errors in emergency departments have been reported at 26.4% (Liu et al., 2009) to 30% in the absence of a pharmacist (Ernst et al., 2011). These numbers indicate that while there are many errors that take place in the emergency department, there are few hospitals that have been proactive to place a pharmacist in the emergency department to reduce these error rates.

The Veterans Affairs Hospital in San Diego implemented a 24-hour emergency department pharmacy program in 2007. The San Diego VA is a 238-bed teaching hospital, and their ED sees approximately 32,000 patients per year. Their program involved five pharmacists providing 24-hour coverage to the ED, and measured interventions for the first six months of the program. The pharmacists documented 7,598 medication reconciliation encounters and 9,568 clinical interventions during the study period. The cost avoidance from these interventions was calculated to be $845,592 for the six-month trial period, and extrapolated to one-year results in $1,691,185 of cost avoidance. An employee satisfaction survey was also included as part of the study, and revealed that 90% of ED staff was strongly satisfied with the ED pharmacy program (Alderidge et al., 2009).

Readmission Rates

While controversial, hospital readmission rates have been used as a proxy measure to estimate the quality of care that patient's receive (Joynt and Jha, 2012). Pharmacist interventions have been demonstrated to show changes in the cost and appropriateness of hospital care, but have not shown any differences in readmission rates (Walker et al., 2009; Koehler et al., 2009). Generally, pharmacist interventions in this area revolve around patient counseling and medication reconciliation. Further information is needed to determine the most beneficial aspects of pharmacist care affecting readmission rates.

Purpose

While pharmacy services in the emergency department have been evaluated in many settings, the methods for creating a new program have not been explored. The purpose of this project is to pilot clinical pharmacy services in the emergency department, and analyze the impact of these services on the hospital.

Specific Aims

To determine the financial viability of a clinical pharmacist emergency department program through evaluation of daily activity reports.

1. Daily activity logs of pharmacist activities were used to convert interventions into financial cost savings for the hospital.
2. Impact on adverse medication event reporting was used to determine the impact of a pharmacist on safety measures in the ED.
3. Impact of pharmacist counseling on readmission rates was determined through 30 day readmission rates for patients seen for COPD in the emergency department.

Chapter 2

Methods

The Michael E. DeBakey Veterans Affairs Medical Center (MEDVAMC) is a large teaching hospital in Houston, Texas. The facility contains 359 acute care medicine beds, 40 spinal cord unit beds, and 141 long-term care nursing home beds. This is one of the largest VA hospitals in the country. The current workload volume for the emergency department has been steadily increasing over the past few years as the number of eligible patients has continued to increase. The volume of patient encounters has increased from approximately 1700 encounters per month in the fall of 2000 to approximately 3100 encounters in the summer of 2011. This doubling of workload has placed stress on the emergency department staff, and increased the need for additional help in the department.

Setting up the clinical pharmacist pilot in the emergency department involved coordination between multiple departments. The pharmacy department analyzed the staff resources available to conduct such a pilot, and the emergency department staff provided space for inclusion of a pharmacist in the workflow. In order to maximize the benefits of pharmacist participation in the ED, the pharmacy department reviewed potential employees to include in the pilot. One internal medicine clinical pharmacist was found that was qualified, capable, and desired involvement in the project. She was selected to take part in the ED pilot and provided pharmacy services during her regularly scheduled daytime shift during the week. At this time due to staffing issues in other areas, the VA was unable to provide further coverage of the ED during the pilot. Therefore, we had a

pharmacist in the ED for forty hours per week for the entire month. Interactions with the ED staff helped to shape the functions that the pharmacist provided during the pilot.

During discussions with the ED staff, we determined potential areas of impact for the pharmacist to include medication reconciliation, increased adverse event reporting, recommending alterations to therapy regimens, and drug information education. The pharmacist was involved in the determination of potential roles in the ED as well. These areas were specifically targeted as areas for pharmacist impact, but other areas of involvement were expected once the pharmacist was incorporated into the work flow.

Clinical pharmacy services were provided to the emergency department from 7:30 AM to 4:00 PM five days per week from Monday, November 28, 2011 through Friday, December 30, 2011. The pharmacist shared space in the emergency department nursing station in order to remain visible to all staff in the area. All providers share office space within the same nursing station to allow for informal consultation and discussion of patients. The pharmacist took a proactive role in patient care by performing medication reconciliation on newly admitted patients prior to the physician examination and conveyed important findings as needed. Through these interactions, the providers gained greater trust in the pharmacist and used her for drug information questions.

The current intervention tracking system for VA pharmacists is an online web-based recording system. This system was viewed as impractical based on the requirements for internet access to record all interventions, time to connect to the server, and limitations on the type of interventions recorded. Instead a small pocket card was created to record only the essential elements of the interventions such as action

performed, time spent, and patient reference in case the pharmacist needed to review the patient further. The pharmacist recorded a short description of each intervention or activity on the card that provided enough information to determine what was done. These interventions were categorized based on previous research conducted at another VA facility (Lee et al., 2002). Once categorized all interventions were translated into financial impact using the median inpatient financial impact determined by Lee and colleagues. In their previous research, they determined the financial cost avoidance for the VA based on pharmacist interventions. Factors included in their cost analysis included the cost of medications, changes in the length of stay, cost for treatment of adverse events, and salary for healthcare providers. In their study, a physician and pharmacist both independently reviewed interventions to determine a range for the cost avoidance of each type of intervention. The average cost was taken between these two reviewers and determined to be the estimated cost avoidance of each intervention type (Lee at al., 2002).

After categorizing each pharmacist intervention, the median cost avoidance was multiplied by the number of interventions within each category. Next the cost avoidance figures were adjusted to current values to account for inflationary impacts on cost. The Medical Purchase portion of the Consumer Price Index was used to adjust the figures from the 2002 dollars from the previously published study to 2011 dollars at the time of the pilot. Adjustment is made through dividing the 2002 cost figure by the 2002 Medical Purchase portion cost and then multiplying by the 2011 Medical Purchase portion cost. This provides an adjustment based on the ratio of the different costs. The Medical Purchase portion was used for adjustment since it provides a specific measure for medical

care. The index factors medication costs, provider costs, and hospital costs each year as part of the calculation of the annual Consumer Price Index by the Bureau of Labor and Statistics (BLS, 2002; BLS, 2011). The Medical Purchase portion cost was used instead of the overall Consumer Price Index for inflation because medical costs have been increasing at a rate higher than inflation in the United States (Mitka, 2009).

Reported interventions were also analyzed for severity. In order to assess severity of the interventions, a scale was used based on the potential for harm if the intervention was not made. To determine intervention severity, a previously reported ADE severity scoring criteria was applied (Appendix B) (Morimoto et al., 2004). One pharmacist reviewed each specific intervention and determined the patient harm that may have resulted if the intervention was not followed. Interventions that were categorized as serious or life threatening were then separated out for additional cost avoidance calculations to determine the impact of the more serious interventions.

During the pilot, the pharmacist was instructed to ensure accurate reporting of adverse Drug events according the VA policy. The pharmacist recorded ADEs from the ED and placed the report in the VA ADERS system as time permitted. Classification of ADEs follows the VA definitions of ADE as "an injury resulting from the use of a drug. For the purposes of this Directive, this definition includes harm caused by the drug as a result of adverse drug reactions, drug-drug interactions, product quality problems or drug overdoses (whether accidental or intentional)" while an adverse drug reaction is defined as "a response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis, or therapy of disease or for the modification of physiologic function. (VHA, 2008)" These definitions were utilized for

all ADE reporting from the pilot performed in the ED to ensure equal comparison to any reports filed during the comparator months when a pharmacist was not present in the ED. Information included in the reporting is the date of event, type of event, and potential preventability based on questions related to monitoring and appropriateness of therapy. To determine the pharmacist impact on ADE reporting, the number of reports filed during the month prior to the pilot and the month following the pilot were compared to the pilot month. Data was taken from the VA ADERS reporting system, which collects the reports from all sources and maintains a database. Events were quantified along with the number of patient encounters within the ED to determine an ADE rate per encounter. Comparisons of ADE reports were made using Chi Square Fisher exact analysis (SAS 9.2, Cary NC).

Readmission rates for patients seen for Chronic Obstructive Pulmonary Disease (COPD) in the ED were reviewed. A list of patients with an encounter with COPD as a diagnosis in the ED was created for each month in the evaluation period. Patients were excluded from the analysis if they were admitted to the hospital directly from the ED because alternate education and interventions take place at hospital discharge. Any patient seen and discharged directly from the ED was included in the analysis irrespective of the time of day they were seen in the ED. If a patient experienced multiple admissions during the study period, only the first encounter was used for analysis. Patient charts were then reviewed to determine the 30 day all cause readmission rate for patients seen in the ED. Readmission was defined as return to the ED or admission to the hospital for any cause during the first 30 days following the encounter in the ED. COPD specific readmission rates were also determined through review of secondary admission data. The

readmissions were compared using the number of readmissions per patients seen for COPD each month. Comparison of readmission rates was made using Chi Square analysis.

Chapter 3

Results

Financial Analysis

During the course of the five-week pilot study, the pharmacist was able to perform 207 medication reconciliations, and provided discharge counseling for 29 total patients. These activities were not translated into financial benefit, but provided additional services to patients and staff in the ED. The total number of interventions recorded by the pharmacist and their categorization were catalogued and demonstrated a total of 68 interventions for financial analysis (Table 1). This provided a total of $69,894 of cost avoidance from pharmacist interventions. Adjustment of financial data was made to reflect 2011 dollar values by adjusting for inflation the numbers based on the 2002 data source. After adjustment for inflation the cost avoidance of pharmacist interventions was calculated to be $97,953.90. Expected savings from a pharmacist in the ED would be $1,018,720.52 per year.

Table 1: Financial Impact of Pharmacist Interventions

Type of intervention	**Number of interventions**	**Cost in 2002 Dollars ($)**	**Cost in 2011 Dollars ($)**
Drug Interaction	5	8,235	11,541.05
Prevent/Manage Drug Allergy	1	1,375	1,927.01
Adjust dosage or frequency	28	33,264	46,618.28
Untreated diagnosis	18	19,908	27,900.34
Drug not indicated	8	5,792	8,117.28
Duplication of therapy	8	1320	1,849.93
Total Interventions	68	69,894	97,953.90

The financial impact of the pharmacist interventions was also determined based on the severity of the intervention. When interventions were categorized based on the potential for patient harm, a total of thirty-four interventions were deemed serious or life threatening (Table 2). When only these interventions were used for cost avoidance the financial impact is reduced to a total of $56,012.30 for the intervention period, and $582,527.87 extrapolated over the full year (Table 3).

Table 2: Severity Scoring for all Pharmacist Interventions

Severity Level	**Number of interventions**
Fatal	0
Life Threatening	7
Serious	29
Significant	18
Minor	14

Table 3: Cost Avoidance from Serious or Life Threatening Interventions

Type of intervention	**Number of interventions**	**Cost in 2002 Dollars ($)**	**Cost in 2011 Dollars ($)**
Drug Interaction	2	3,294	4,616.42
Prevent/Manage Drug Allergy	1	1,375	1,927.01
Adjust dosage or frequency	17	20,196	28,303.96
Untreated diagnosis	13	1,4378	20,150.24
Drug not indicated	1	724	1,014.66
Duplication of Therapy	0	0	0
Total Interventions	34	39,967	56,012.30

In addition to the interventions used to calculate financial impact, the pharmacist was able to provide other services that were not categorized (Table 4). These services are valuable services to the hospital, but could not be quantified in a similar manner.

Table 4: Other Activities of the Pharmacist in the Emergency Department

Additional Duty	**Number of Occurrences**
Medication Reconciliation	207
Discharge Counseling	29
Order/Interpret labs	5
Complete allergy assessment	2
Update order sets	4
Education/Drug information	8
Added med to ward stock based on usage	1

Adverse Drug Event Reporting Analysis

Previous reporting of ADEs has varied greatly in the MEDVAMC ED. Over the past three years, the number of ADEs reported through VAADERS has ranged from 0 to 21 per quarter. There were 16 total ADEs reported during the study period in the emergency department. The month prior to the pilot there were a total of 6 ADEs reported and in the month following the pilot there were 0 ADEs reported. During the pilot period a total of 10 ADEs were reported in the ED (Table 5). The change in the number of ADEs reported was found to be statistically significant ($p < 0.01$).

Table 5: Adverse Drug Events reported in the Emergency Department

Month	**ADEs reported**	**Total ED encounters**
November	6	3,138
December	10	2,962
January	0	3,339

Readmission Rates of COPD Patients

Review of the 30-day readmission rates for patients seen for COPD in the ED were reviewed. In the month prior to the pilot there were a total of 52 patients seen for COPD in the ED. The 30-day all cause readmission rate was 21.2% (11 patients). During the study period a total of 36 patients were seen for COPD, and there was a resultant readmission rate of 25% (9 patients). The month following the pilot study had 46 patient encounters for COPD, and showed a readmission rate of 39.1% (18 patients) (Table 6). Further review of the readmitted patients revealed no difference in the rate of readmission specific to COPD, and showed an increasing trend over the three-month period. The change in readmission rates was not statistically significant.

Table 6: Readmission Rates for Patients Seen for COPD

Month	**COPD patient encounters**	**30 day Readmission rate (%)**	**30 day COPD specific Readmission rate (%)**
November	53	18.9	15.4
December	39	33.3	16.7
January	44	38.6	26.1

Chapter 4

Discussion

The results of this study are valuable for the host institution to know the specific impact that could be expected from having clinical pharmacist coverage of the ED. The financial results are overwhelmingly in favor of having a clinical pharmacist cover the ED, because the return on investment would be approximately $7.84 for each $1 spent for the clinical pharmacist using total intervention savings and $4.48 for each $1 spent using only serious interventions. This is based on the yearly-extrapolated cost avoidance and the estimated cost of one clinical pharmacist's salary and benefits (Estimated at $130,000 per year). The findings from this study are in line with the expected cost savings seen from other studies of clinical pharmacist services that have shown to provide a return on investment of $4.81 for every $1 spent (Perez et al., 2008).

Compared to other previous studies looking at pharmacist financial impact in the ED, this study was within the range of accepted values. Cost avoidance figures have been provided with multiple retrospective studies. The range for cost avoidance has been shown to be between $100,000 per year to upwards of $3,000,000 per year (Levy, 1993; Fairbanks et al., 2004; Ling et al., 2005; Lada et al., 2007; Aldridge et al., 2009). The capacity of the ED in these studies has generally been around 80,000 to 100,000 patient visits per year, but in the San Diego VA study the volume of patient visits was approximately 30,000 per year. When healthcare inflation is added to the previously published studies, this study provided a mid range value for cost avoidance for clinical pharmacist coverage of the ED.

The pharmacist was able to provide patient interventions through performing medication reconciliation, answering drug information questions, and helping develop treatment plans. Due to the nature of the ED in our facility, the pharmacist was required to be proactive to get involved with patient care. The easiest way for the pharmacist to gain involvement was through medication reconciliation. The pharmacist was able to perform 207 medication reconciliations, which lead to an average of 0.32 interventions per medication reconciliation. With the current organization of our emergency department, this would be the most valuable function of the pharmacist. However, if the VA's computerized physician order entry system and bar coded medication administration system were extended to the ED the pharmacist could perform prospective medication order review. This would likely lead to increased interventions and work for the pharmacist within the ED. From this project the most important role of the pharmacist would be deemed to be medication reconciliation, and prospective medication order review would only enhance their activities.

In addition to the financial benefits to the hospital, the pilot demonstrated an increased number of ADEs reported. This indicates that ADEs are currently underreported in the ED, because the pharmacist was only reporting observed events. This change represents an almost doubling of ADEs reported during the pilot period, which was followed by a complete lack of any reports the following month. This data shows a significant increase in reporting with a clinical pharmacist present in the ED. Without accurate reporting of ADEs it is impossible for the hospital to know what the best way to improve patient medication related care. The number reported without

clinical pharmacist involvement is an underestimate of the actual number of ADEs that occur.

The readmission data indicate that clinical pharmacist involvement in the ED has no effect for patients with COPD. This result was not surprising based on the small amount of time the pharmacist was able to spend with each unique patient. In addition, the analysis did not exclude patients seen in the ED when the pharmacist was not working, which indicates that many of the patients cared for during the pilot period had no pharmacist care. The readmission numbers for return visited related to COPD increased in the January period of the study over the previous two months. This increase was not significant but represented a substantial change in the percent of patients readmitted specifically for COPD. This could be related to chance due to the small sample size of patients seen in all three months, and could also be related to the time of year. January is a colder month and traditionally is part of the cold and flu season in the area. While the numbers are not significant there is the potential for a targeted counseling program to show benefit in COPD patients. This would need to be tested with further studies that incorporate a randomized design and include many more patients.

While this study provides evidence for the value of clinical pharmacy services in the ED, there is not explicit proof that the pharmacist interventions would not have occurred without them. In order to determine the complete impact of the pharmacist in the ED, future studies would be needed. A randomized trial would be warranted to determine the exact financial impact on the facility. In order to create this comparison, patients would be randomized at entry to the ED to a pharmacist followed team or a traditional coverage team, and comparison of patient costs would then be analyzed for not

only the time spent in the ED but also the remainder of the hospital course. This type of study would require vast resources and may be unfeasible for any single institution, but would provide a definitive answer to the financial impact of clinical pharmacy services in the ED.

Limitations

While this pilot study has provided great data for the justification of clinical pharmacy services in the ED, there are many limitations to the pilot. First, the month the study was conducted was in December 2011. The time of the study could lead to increased potential interventions for the pharmacist due to alternate medical staff coverage during the holiday season. Many physicians and nurses take additional vacation time during this time of year.

Conversely the number of interventions was limited for the pharmacist because there is not prospective medication order review by the pharmacist in the MEDVAMC ED. The results discovered from this study are likely a dramatic underestimation of cost avoidance. The clinical pharmacist was forced to be proactive to interact with physicians in recommending medication changes. Having prospective review of all orders would lead to greater opportunity to intervene with allergy avoidance, dosage adjustment, and drug interactions. The pharmacy could not provide this service at the time of the pilot due to limitations in the computer software. If this were to be pursued in the future there would need to be 24-hour coverage of the ED to accommodate the increase in workload for the pharmacy department.

The clinical pharmacist work schedule was during the day shift for the hospital. Due to scheduling conflicts, we were unable to alter that schedule during the pilot. It is known that the greatest number of ED encounters occur during the day and evening shifts. Thus the ED was getting busier as the pharmacist shift was ending. This indicates that the shift selected was not the ideal shift to maximize pharmacist interventions. If the

pilot was conducted during an alternate shift that covered the early afternoon through early evening times, the number of interventions would be expected to increase.

The number of patients the pharmacist was able to see during the pilot period limits the review of readmission rates. Many patients way have been in the ED during other portions of the day and had no interaction with the pharmacist. Thus the readmission rates may not accurately reflect the rates from patients seen during pharmacist coverage hours. This makes a difference more difficult to demonstrate during the pilot period.

Conclusions

Addition of a clinical pharmacist to the ED demonstrated significant cost avoidance and increased ADE reporting. There was no difference in readmission rates of COPD patients. The addition of a full time clinical pharmacist to cover the ED would provide positive financial returns for the hospital.

Appendix A

Intervention Documentation Sheet

Date:

Patient Intervention: Code blue, ADR, toxicology, allergy
Provider Intervention: Drug info, duplicate therapy, intiate/d/c therapy, DDI, inservice/training
Medicaiton Intervention: PRN indication, renal/hepatic dosing, formulary substitution

Intervention	Approximate time	Issue	Notes

Appendix B

Severity	Examples
Fatal	Patient died due to the incident
Life Threatening	Patient transferred to ICU
	Respiratory failure requiring intubation
	Mental status change: patient falls and gets intracranial hemorrhage
	Tongue swelling/anaphylactic shock
Serious	Gastrointestinal bleed
	Altered Mental Status: excessive sedation
	Increased Creatinine
	Decreased blood pressure: patient feels lightheaded
	Allergic reaction: shaking chills/fever
	Additional visit to clinic or treatment with additional medication
Significant	Rash
	Diarrhea due to antibiotics
	Thrombocytopenia due to histamine type 2 antagonist
	Nausea resulting from oral potassium
	Nausea and Vomiting from erythromycin
	Any significant event identified by the patient but not requiring a change in therapy

Taken from Morimoto et al.

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