

Implementing a comprehensive, 24-hour emergency department pharmacy program

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Problem

The Joint Commission mandates that medical institutions conduct prospective medication order reviews in the emergency department (ED) before medication administration to patients.¹ Independently, our pharmacy service recognized that several tasks related to patient safety were not consistently performed in the ED, including medication reconciliation, communication from the ED to the admissions service, drug accountability, and documentation of administered doses. To address these deficits, the pharmacy service submitted a proposal for implementing an ED pharmacy program (EDPP) in the medical center. The main goals of the program were to improve patient care, decrease medication errors, perform medication reconciliation in concert with ED clinical staff, and optimize formulary management. Quality assurance for patient safety was demonstrated by clinical interventions performed by pharmacists. The targeted interventions were identified before implementing the program and were documented during the first six months of implementation.

Purpose. The implementation of a comprehensive, 24-hour emergency department pharmacy program (EDPP) is described.

Summary. An EDPP was created at the Veterans Affairs San Diego Healthcare System to address deficiencies identified by the pharmacy service within the ED, including medication tracking, documentation of doses administered, and formulary management. The documentation system used in the EDPP, including a computerized spreadsheet and documentation cards, allowed the activities of the ED pharmacists to be tracked on a 24-hour basis. This type of data collection allowed us to evaluate the impact of the program based on the quality of patient care delivered as well as cost. During the initial six-month implementation period, the ED pharmacists recorded 9,568 interventions. The information from these interventions was used to assess the safety components and to estimate the cost avoidance of their activities. A staff satisfaction survey was also created to assess the pharmacist's impact on providers and nurses, as well as its effect on workflow within the

ED. Among the many benefits realized, the EDPP improved the quality of patient care, decreased medication errors and patient wait times, improved the medication reconciliation process, enhanced formulary management, ensured prospective medication order review, and increased overall patient safety, as evidenced by the documented interventions and staff satisfaction survey. The projected cost savings for the medical center during the first year of EDPP implementation was calculated as \$1,691,185.

Conclusion. A tertiary care teaching hospital successfully implemented a 24-hour, comprehensive ED pharmacy service that enhanced the efficiency and delivery of patient care and resulted in significant cost savings.

Index terms: Department of Veterans Affairs; Documentation; Economics; Emergency services; Errors, medication; Hospitals; Hours; Patient care; Pharmaceutical services; Pharmacists, hospital; Pharmacy, institutional, hospital; Quality assurance

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Background

The Veterans Affairs San Diego Healthcare System (VASDHS) is a 238-bed, tertiary care teaching hospital with five off-site, community-

based clinics and two Veterans Affairs medical centers in the greater San Diego area. VASDHS provides state-of-the-art health care and treats approximately 32,000 patients in the

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ED each year. As a practice setting, the ED is a dynamic and often chaotic environment where patient care can be compromised and medication errors made. Data show that medications are administered or prescribed in almost 80% of ED visits, with three or more medications administered or prescribed in about 30% of patient visits.² At VASDHS, this number is approximately 40%.

The EDPP was created to address the deficiencies identified by the pharmacy service within the ED for medication tracking, documentation of administered doses, and formulary management. Although it was decided that a comprehensive program with round-the-clock pharmacist coverage was needed at VASDHS, we knew that creating such a program would pose several challenges.

To acquire funding for the EDPP, we submitted a business plan incorporating information gathered from a comprehensive literature review and from other ED programs in the country; however, we quickly discovered that resources were limited for the type of program we planned to create.²⁻⁷ Most ED programs provided limited hours of coverage, which made finding information on the type of program we had envisioned difficult. Since our EDPP was to be implemented under the supervision of the inpatient section, the inpatient supervisors applied to participate in the American Society of Health-System Pharmacists 2007 Patient Care Impact Program: Introducing an Emergency Pharmacist into Your Institution. Participation in the six-month program provided useful resources and access to mentors during the initial planning stages.

In July 2007, after undergoing rigorous panel interviews, four pharmacists were hired. All four ED pharmacists had a doctor of pharmacy degree and completed an ASHP-accredited postgraduate year 1 (PGY1) residency. We established specific qualifications for day-shift

positions (e.g., minimum of three years of experience in hospital pharmacy practice), as these positions would be instrumental in establishing relationships with the ED clinicians and helping identify needs and deficiencies during the first year of the EDPP. Given the identified needs of our program and the current infrastructure of our ED, the role of the ED pharmacists at our institution was both clinical and operational in nature. Thus, the pharmacists underwent two months of training in clinical topics, pharmacy operations, and hospital policy. Because of their role in the ED, the ED pharmacists also received training to ensure that they would be proficient in both inpatient and outpatient processes. A series of meetings was held in August 2007 to review the pharmacists' duties and clinical responsibilities, proper documentation of interventions, and other expectations of the ED pharmacists. The interventions previously identified for the EDPP were incorporated into an Excel (Microsoft Corp., Redmond, WA) spreadsheet to help track the medication errors that occurred or were prevented and the time spent providing patient or provider education. These interventions were also printed onto pocket-sized data collection cards so that the pharmacists could easily document their activities during their shifts.

Coordinating an overall effort among various departments in the hospital to implement the EDPP by the projected start date (September 2007) was the next challenge. Many multidisciplinary meetings were held to discuss the logistic aspects of the EDPP. We included input from departments that had a vested interest in the program, including clinical and various support services. We focused on making procedural changes to the infrastructure of ED operations, ensuring prospective order review by pharmacists for nonadmitted patients, and determining the goals and expectations from the perspective of

the ED and the pharmacy service. The introduction of a VA-designed computerized prescriber-order-entry (CPOE) software program, Inpatient Medications for Outpatients (IMO), was particularly challenging as it had to be interfaced with the existing CPOE program for the inpatient setting. The implementation of IMO required collaboration among pharmacy, nursing, physicians, and information technology staff.

The next task was to address operational issues. The ED area itself imposed physical limitations for the pharmacists and for patient interactions. Patients were often seen in the hallways and triage areas due to the unavailability of ED beds. Computers were also scarce, and we needed to ensure that the addition of pharmacy staff to an already-congested working environment would not impede the EDPP from becoming a success. We obtained additional computers and worked with the ED staff to add extra workstations, including a designated workspace for the ED pharmacists. We also formulated a system of alerting the ED pharmacist for timely patient consultations by posting flags above patient rooms. More importantly, we faced the challenge of peer acceptance by the ED clinical staff. In the beginning of EDPP implementation, ED staff were somewhat resistant to the new workflow and the requirement for prospective order review. Stressing the importance of teamwork and working to build rapport with the clinical staff helped overcome these barriers.

We also addressed logistic issues specifically related to the ED pharmacists' duties. Templates for the ED pharmacists were created for documenting notes and interventions in patient charts, including templates for medication reconciliation and discharge, which were incorporated into the existing computerized charting program. To facilitate communication between the ED pharmacists and other ED and pharmacy staff,

e-mail groups were created; text and emergency resuscitation pagers were acquired for the ED pharmacists to shorten their response times. Early on, we also identified that the stock list for the ED was rather limited. Additional medications for stroke, upper-gastrointestinal-tract bleeding, nausea, and agitation were added, as well as various antimicrobials to cover a broad spectrum of infections. Drug accountability issues were also addressed with the incorporation of automated dispensing units with profiling capability in the ED.

Analysis and resolution

The EDPP was launched on September 4, 2007. ED-pharmacist-initiated interventions were documented between September 2007 and March 2008. A nonvalidated staff satisfaction survey was developed in November 2007 and administered in March 2008 to assess the effect of the EDPP and estimate the value of the program as perceived by the ED staff. The survey was adapted from another published instrument for measuring satisfaction with ED pharmacist services.⁸ The final survey contained 21 items and measured satisfaction using a 5-point Likert scale (strongly satisfied, satisfied, neutral, dissatisfied, and strongly dissatisfied). The results of this survey were analyzed, and areas for improvement were subsequently identified and addressed.

After launching the program, regularly scheduled meetings were held every two months with the newly formed ED team and the two inpatient pharmacy section supervisors in order to further fine-tune and expand the program. An ED rotation was added to the rotation schedule for the PGY1 general practice residents and postgraduate year 2 critical care specialty residents for the 2008–09 year. Moreover, plans for adding an ED rotation for pharmacy students were also discussed, with a projected start date in fall 2009.

All patients seen in the ED were seen by a pharmacist before discharge for patient counseling and medication reconciliation. These interventions were documented in the patient's computerized chart. Between September 2007 and May 2008, the ED pharmacists documented a total of 7598 medication reconciliation encounters. The mean $\pm$ S.D. time spent on medication reconciliation was 5.08 ± 3.47 minutes, and the mean $\pm$ S.D. number of prescriptions for which patients received counseling was 1.92 ± 1.29 . All changes in the patient's medication profile during an ED visit and all necessary follow-up laboratory tests and appointments identified during these sessions were communicated to the patient's primary care physician by means of an electronic alert system. The total time spent performing the medication reconciliation and patient counseling components of the EDPP was approximately 645 hours during the six months of documentation. Based on an average hourly salary of \$55 for an ED pharmacist, the total cost to the medical center for these medication reconciliation consultations was \$71,072 per year.

A total of 9568 clinical interventions were documented during the documentation period. All of the documented interventions were initially reviewed by a team of six pharmacists with a combined 29 years of clinical practice experience. Reviewers selected only those interventions with a high probability of preventing serious harm to the patient.^{3-7,9} The expected results were then categorized by type of intervention based on interventions previously identified by Lee et al.⁷ Any disagreements regarding intervention categorization were resolved through discussion. Incomplete or indecipherable entries and those lacking sufficient information to critically evaluate the intervention were excluded. Of the qualifying interventions, 668 were identified as containing usable data.

Cost avoidance per pharmacist intervention was estimated by extrapolating data from a study by Lee et al.⁷ and adjusted based on consumer price index values for 2008. Cost avoidance was calculated by multiplying the number of interventions by the estimated cost avoidance per event.

Based on the analysis, 668 (7%) of the interventions performed during the first six months of the EDPP resulted in the prevention of serious patient harm. The estimated potential for cost avoidance for these six months was \$845,592, which was then extrapolated to an annual cost saving of \$1,691,185 (Table 1). The interventions that resulted in the most cost avoidance were preventing or managing an adverse drug event and adjusting the dose or frequency of a medication order, with estimated savings of \$346,807 and \$280,363, respectively.

The ED staff survey revealed that the implementation of the EDPP enhanced the level of quality patient care provided. Of the 29 ED staff members surveyed, 26 (90%) responded that they were strongly satisfied with the introduction of the EDPP. There were no responses in any of the categories labeled strongly dissatisfied, dissatisfied, or neutral. If analyzed by personnel categories, all nurses and medical residents were strongly satisfied with the EDPP, while 98% of the attending physicians and 92% of all other staff responded as strongly satisfied. This translates into an overall satisfaction rate of 98% for the EDPP. Moreover, 93% of those surveyed responded that they considered the ED pharmacist as an integral member of the ED team.

The ED staff was also asked to identify the most important duties performed by the ED pharmacist. The three most important roles identified were consultations to the clinical staff (27%), patient education (26%), and prospective medication order review (13%). During the first four weeks of IMO implementation, the total number of medication or-

Table 1.
Estimated Potential Cost Avoidance Over Six Months from
Pharmacists' Interventions

Type of Recommendation/ Intervention	Adjusted Average Cost Avoided Per Recommendation (\$) ^a	Total Cost Avoided (\$)
Drug interaction (n = 29)	1,963	56,929
Prevent or manage drug allergy (n = 9)	1,639	14,750
Adjust dosage or frequency (n = 198)	1,416	280,363
Untreated diagnosis (n = 57)	1,318	75,140
Prevent or manage adverse drug event (n = 265)	1,309	346,807
Drug not indicated (n = 75)	863	64,720
Duplication of therapy (n = 35)	197	6,883
Total cost avoidance		845,592

^aThe values were initially extrapolated from reference 7 and adjusted for 2008 (based on a consumer price index inflation rate of 19.19%).

ders prospectively reviewed by the ED pharmacist went from 0 to 943.

Discussion

Because there were very few institutions in the country providing 24-hour pharmacist coverage in the ED, creating an effective and workable model for the EDPP was a challenging experience. It was important for our pharmacy service to be able to justify the operation cost of the EDPP to the medical center; hence, our approach to the program was strongly influenced by the need to measure cost avoidance. As we developed the program, we recognized that the EDPP had far-reaching effects in other sections of our own service, as well as on the overall quality of patient care delivered throughout the medical center. Consequently, our focus became more global, as we also aimed to validate the value of having a pharmacist in the ED as an integral member of the clinical team and to improve the delivery of pharmacy services throughout the hospital.

With the creation of the documentation system, utilizing both a computerized spreadsheet and documentation cards, we were able to track the activities of the ED pharmacists on a 24-hour basis. This type of data collection allowed us to

evaluate the impact of the program based on the quality of patient care delivered, as well as cost avoidance. Furthermore, it also provided a continuous picture of the activities occurring in the ED, which allowed us to address needs and resolve issues quickly. By using electronic alerts, changes made to medication therapy and issues brought to the attention of the ED clinicians were communicated to the primary providers by the pharmacist, ensuring timely follow-up. Needed laboratory tests and appointments were recommended in the pharmacist's progress notes, and medication profiles were updated and made more comprehensive with the addition of nonprescription herbal preparations and medications prescribed by outside providers.

Introduction of the prospective order review and medication reconciliation components to our program decreased the potential for medication errors. Since its inception, the EDPP has resulted in 2133 pharmacist-initiated medication safety interventions. Of these, 1948 interventions were directly related to medication order recommendations or corrections. The ED pharmacists also documented 185 new drug allergies and adverse drug reactions during the initial six months of the EDPP.

In addition, the EDPP resulted in several unforeseen benefits. In February 2007, before the implementation of the EDPP, VASDHS released a report documenting 184 cases of patients waiting over 6 hours to be seen by a provider in the ED and 157 cases of patients leaving before being evaluated. During this same time, pharmacy wait times for ED patients often exceeded 30 minutes on weekdays and 2 hours after regular business hours, since the ED was staffed by pharmacists who were also covering other areas of the hospital. Although pharmacy wait times postimplementation of the EDPP were not measured, the EDPP may have reduced these types of delays by having a pharmacist specifically dedicated to cover the ED 24 hours a day. The processing of ED orders and prescriptions was handled directly by the ED pharmacist, and changes or issues regarding medication orders were quickly triaged, resulting in timely dispensing of medications and counseling. Having the ED pharmacist perform medication reconciliation also helped patients move through the ED more efficiently, freeing beds and other ED staff time. Moreover, workload was shifted away from pharmacists in the outpatient pharmacy during regular business hours, simultaneously improving patient care in the ED and outpatient pharmacy.

Workload was also shifted away from the inpatient pharmacists. The ED pharmacist was identified as the emergency resuscitation team member for the ED and all areas on the first floor and basement of the medical center. In the past, the intensive care unit (ICU) pharmacist was responsible for answering all emergency resuscitation calls throughout the entire medical center, often needing to leave critical areas and interrupting care in the ICU. By having an ED pharmacist, code blue response times by the pharmacy service were reduced for those occurring on the

first floor or basement of the medical center. Before the EDPP, all medication orders originating from the ED area after regular business hours, including weekends, were handled by one of the inpatient pharmacists. This required them to leave their designated work areas on the floors to fill outpatient orders in the outpatient pharmacy located on the first floor. If urgent orders needed to be processed on the wards while the inpatient pharmacist was filling outpatient orders, the pharmacist had to leave the outpatient area. Consequently, patient wait times for the outpatient area increased. Nursing staff on the floors were also feeling the effects of having the pharmacist cover multiple areas; delays in returning text pages or processing orders were not uncommon after regular business hours, especially when the census was at a peak in the inpatient areas and the ED. The EDPP has enhanced our ability to provide quality patient care in a timely manner throughout the hospital.

The EDPP also increased clinicians' access to pharmacy consultations for drug information, including questions on drug-drug interactions, drug metabolism, drug compatibilities, drug administration, adverse drug effects, and appropriate antimicrobial selection. The availability of a pharmacist in the ED area translated

to better communication between pharmacy and other clinical services. Clinicians and pharmacists were able to track doses given in the ED by having the orders entered into the IMO system.

The EDPP also assisted with meeting VASDHS goals. Although formal data collection to measure the effect of the EDPP on these initiatives was not performed, anecdotal reports from ED clinical staff have indicated improvements in overall response times by pharmacy. For example, having pharmacists in the ED expedited the time to administration of antibiotics to patients for community-acquired pneumonia and sepsis. Orders were reviewed and processed immediately, and the ED stock, which was expanded to include medications needed for such diagnoses, was within easy access.

The EDPP has proven to be not only cost saving for our medical center but also invaluable as a means of improving patient care and minimizing medication errors in the ED. More importantly, the EDPP has become a critical element in validating and demonstrating the value of the pharmacist as a member of the health care team.

Conclusion

A tertiary care teaching hospital

successfully implemented a 24-hour, comprehensive ED pharmacy service that enhanced the efficiency and delivery of patient care and resulted in cost savings.

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