



Direct patient care activities and interventions of emergency medicine pharmacists

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Abstract

Background Emergency medicine (EM) pharmacists are increasingly recognized as integral team members in the care of emergency department (ED) patients but there is variability in the scope of direct patient care services. **Objectives** The primary objective was to categorize direct patient care activities and drug therapy recommendations. The secondary objectives were to categorize recommendations based on drug class and to determine the proportion of recommendations associated with Institute for Safe Medication Practices (ISMP) high-alert medications. **Methods** This retrospective, single-center, chart review was conducted in an academic ED with 65,000 annual visits. EM pharmacists documented direct patient care activities in the electronic health record. Documented activities from 1/1/2015 through 3/31/2015 were abstracted electronically for analysis by a trained reviewer. **Results** There were 3567 interventions and direct patient care activities documented. The most common activities were facilitation of medication histories (n = 1300) and drug therapy recommendations (n = 1165). Of 1165 drug therapy recommendations, 986 were linked to a drug class such as antimicrobial agents (31.9%), cardiovascular agents (16.6%), and analgesic agents (13.2%) and 20% of these interventions were associated with ISMP high-alert medications. **Conclusion** EM pharmacists documented several types of direct patient care activities with the majority being drug therapy recommendations and medication histories.

Keywords Emergency department · Medication safety · Patient safety · Pharmacist · Pharmacotherapy · United States

Impacts on practice

- Direct patient care activities of emergency medicine pharmacists are varied but frequently include facilitation of medication histories and provision of drug therapy recommendations.
- The impact of drug therapy recommendations associated with ISMP high-alert medications should be further explored.

Introduction

The emergency department (ED) is a dynamic practice environment that requires provision of medical care to patients spanning many medical specialties. High patient volumes, complex medical issues, and the frequent use of high-risk medications likely contribute to observations that the ED can be a common site for avoidable medication errors [1–4]. Considering the need for high-risk medication therapies in the ED, pharmacists represent a valuable resource in the delivery of safe and effective pharmacotherapy.

The American College of Emergency Physicians (ACEP) highlighted the critical role of ED pharmacists in ensuring the safe and effective use of medication therapy in a 2015 policy statement [5]. Emergency medicine (EM) pharmacist

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involvement has been shown to decrease medication errors and lead to cost-avoidance, but the scope of EM pharmacist services remains variable [2–4, 6, 7]. In addition to variability in the scope of services, there is a paucity of data categorizing drug therapy recommendations by drug class and especially the association of interventions with known high-risk medications to further characterize the benefit of EM pharmacist interventions.

Aim of the study

The purpose of this study was to describe the scope of direct patient care services provided by EM pharmacists in an academic medical center. The primary objective was to describe and categorize direct patient care activities and drug therapy recommendations. The secondary objectives were to categorize drug therapy recommendations based on therapeutic drug class and to determine the proportion of drug therapy recommendations associated with Institute for Safe Medication Practices (ISMP) high-alert medications.

Ethics approval

Approval and waiver of informed consent was obtained from the institutional review board for this study.

Methods

Study design and setting

This was a retrospective, single-center, chart review conducted in the academic ED of an urban tertiary care center with 65,000 annual ED visits between January 1, 2015 and March 31, 2015. The 75-bed ED includes a 20-bed 23-hour observation unit and evaluates both adult and pediatric patients with approximately 24% of patients admitted for inpatient care. The ED is staffed by EM-trained physicians, residents, advanced practice providers (physician assistants and nurse practitioners), EM pharmacists, nurses, and additional ancillary staff. ED providers utilize computerized physician order entry (CPOE) as part of the EPIC® (Verona, Wisconsin) electronic health record (EHR) for all patient care activities.

EM pharmacists provided clinical support from 0700 to 2300 daily including weekends and holidays. Given the nature of EM practice, pharmacists would routinely reprioritize patient care activities to ensure the provision of care to the most acutely ill patients and those with the most urgent pharmacotherapy needs; drug therapy recommendations could be provided during any stage of the medication

use process. EM pharmacists routinely documented direct patient care activities, including drug therapy recommendations, directly within the EHR as part of the I-Vent documentation tool in EPIC® (Verona, Wisconsin) according to departmental standards. I-Vent documentation could be directly linked to a specific medication and/or patient but linking was not required. All EM pharmacist documentation completed during the study period was eligible for inclusion. A concurrent pharmacy resident project evaluated the impact of EM pharmacist review of discharge prescriptions during the same study period. Documentation linked to this concurrent product was excluded a priori from the present study because our practice model does not include routine pharmacist review of discharge prescriptions. Additionally, the EM pharmacist team provides remote clinical support for three freestanding EDs in addition to the academic ED; however, all documentation related to the freestanding ED patient population was excluded due to fundamental differences in the nature of direct patient care provided for this patient population. Finally, documentation relating to non-direct patient care activities such as administrative projects, educational initiatives, and scholarly activities was excluded.

Outcome measures

The primary outcome was the number and types of direct patient care activities and drug therapy recommendations documented by EM pharmacists. The secondary outcomes were the proportions of drug therapy recommendations related to specific drug classes and the proportion of drug therapy recommendations associated with Institute for Safe Medication Practices (ISMP) high-alert medications. ISMP maintains a list of high-alert medication therapies for acute care settings composed of medications that pose a heightened risk of patient harm if used incorrectly based on data submitted to ISMP as well as published reports [8].

Data analysis

Pharmacist documentation of direct patient activities was electronically extracted by querying I-Vent documentation data within EPIC® and importing into a Microsoft Excel® (Redmond, Washington) database stored on a secured network drive. The I-Vent categories are discrete fields that cannot be modified and are selected by the EM pharmacist at the time of documentation. To simplify data analysis, the study investigators agreed to group I-Vent types into clinically-relevant categories for direct patient care activities (see Table 1). All data were analyzed descriptively and proportions were reported with 95% confidence intervals (STATA version 14.2, College Station, Texas).

Table 1 Emergency medicine pharmacist direct patient care activities and interventions

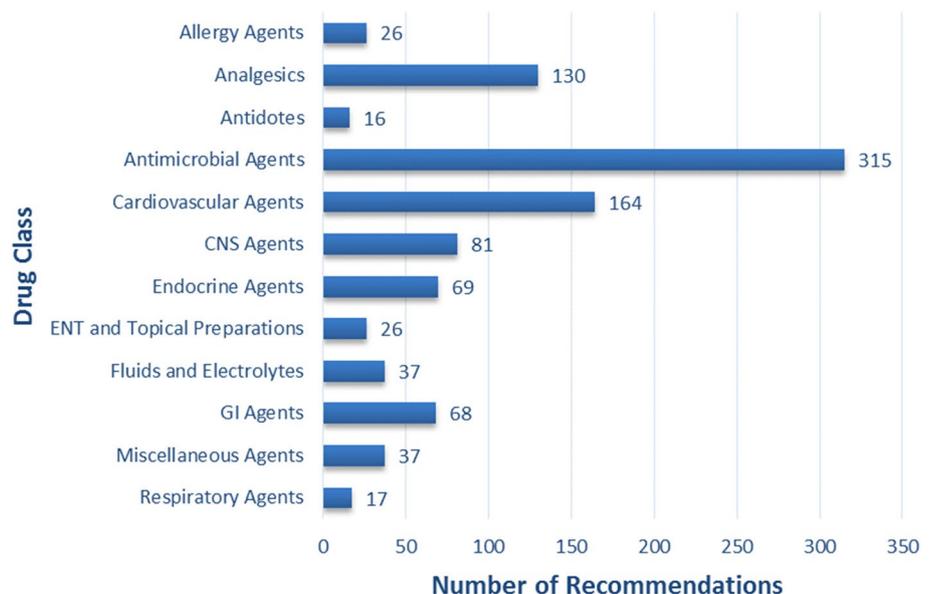
Type of intervention or clinical activity	Number	Percent (95% CI ^a)
Medication history	1300	36.4 (34.9–38.0)
Drug therapy recommendation	1165	32.7 (31.1–34.2)
Medication order clarification	377	10.6 (9.6–11.6)
Formulary adherence and therapeutic interchanges	240	6.7 (6.0–7.6)
Adherence to hospital drug therapy monitoring policies	238	6.7 (5.9–7.5)
Drug information	121	3.4 (2.8–4.0)
Allergy/adverse drug reaction documentation	65	1.8 (1.4–2.3)
Code blue/stroke/STEMI participation	43	1.2 (0.9–1.6)
Patient counseling	9	0.3 (0.1–0.5)
Medication identification	9	0.3 (0.1–0.5)
Total	3567	100%

^aDenotes 95% confidence interval

Results

A total of 6443 interventions were documented by EM pharmacists during the study period. Of these interventions, 2383 I-Vents relating to the concurrent pharmacy resident project were excluded as well as an additional 321 I-Vents related to freestanding ED patients. Finally, another 172 I-Vents were excluded because documentation related to non-direct patient activities. Consequently, a total of 3567 direct patient care activities documented by EM pharmacists met inclusion criteria. Direct patient care activities were documented for a total of 2301 unique ED patient encounters. The most common direct patient care activities were facilitation of medications histories

($n = 1300$; 36.4%) followed by provision of drug therapy recommendations ($n = 1165$; 32.7%). Table 1 categorizes all direct patient care activities documented by EM pharmacists. For drug therapy recommendations, a total of 986 of the 1165 documented interventions (84.6%) were linked to specific drug classes in the EHR. The most common drug classes linked to drug therapy recommendations were antimicrobial agents (31.9%), cardiovascular agents (16.6%), and analgesic agents (13.2%). All drug therapy recommendations linked to therapeutic drug classes are described in Fig. 1. A total of 20% (200 of 986) of these drug therapy recommendations were linked to medications on the ISMP high-alert list. The most common high-risk medication categories were antihyperglycemic agents (33.5%), anticoagulants (23.0%), and opioids (21.5%).

Fig. 1 Drug therapy recommendations classified by therapeutic drug class ($n = 986$)

Discussion

The most frequently documented types of direct patient care activities were facilitation of medication histories and provision of drug therapy recommendations, accounting for nearly 70% of all documented direct patient care activities. Similar to the results of our study, previous single-center studies have reported 29% to 38% of documented interventions completed by EM pharmacists relate to optimization of drug therapy regimens [6, 9]. We identified 3567 documented interventions during the study period corresponding with an average of 19.8 interventions per shift. Lada et al. reported an average of 5.8 to 6.6 interventions per shift over three distinct shift assignments [6]. This difference in observed intervention rate may be due to inclusion of medication reconciliation as a routine EM pharmacist service at our institution and higher inpatient admission rates at our institution (24% vs. 15%).

EM pharmacist interest in infectious disease therapeutics at our site may have contributed to the large proportion of drug therapy recommendations linked to antimicrobials. Additionally, 20% of the recommendations linked to a drug class were related to a medication on the ISMP high-alert list which is higher than 10.9% of EM pharmacist interventions reported in a recent prospective single-center study [10]. However, nearly 70% of interventions captured in the recent study conducted by Perez-Moreno et al. were provided during medication reconciliation which may explain the lower incidence relative to our study [10].

There are several limitations to this study. First, retrospective data collection may have resulted in under-reporting of direct patient care activities. EM pharmacists contributed to a concurrent pharmacy resident project as well as completed routine administrative tasks during the study period; these activities were excluded from our study but may have led to a reduction in the time available to provide and/or document direct patient care activities. Additionally, specific details to further characterize the nature of drug therapy recommendations were not consistently available; therefore, we were unable to determine whether recommendations reflected changes in medication selection and/or dosing regimens. Furthermore, some of the documented interventions included a combination of several related recommendations such as simultaneous medication selection and dose optimization but only a single I-Vent was documented. However, we determined a priori to only tabulate each discrete I-Vent as a single intervention. Finally, EM pharmacists linked direct patient care activities to 2301 unique ED patient encounters but the total number of patients impacted is likely higher given interventions made for freestanding ED patients were excluded.

Conclusion

EM pharmacists at our institution provided a variety of direct patient care activities with the majority consisting of drug therapy recommendations and facilitation of medication reconciliation. A large proportion of drug therapy recommendations occurred with antimicrobial agents and approximately 20% of EM pharmacist recommendations were related to ISMP high-alert medications. Future research should focus on efforts to evaluate whether drug therapy interventions associated with high-risk medication classes improve clinical outcomes such as ED length of stay or ED re-admission rates.

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Conflicts of interest The authors have no conflicts of interest to declare.

References

1. Rothschild JM, Churchill W, Erickson A, Munz K, Schuur JD, Salzberg CA, et al. Medication errors recovered by emergency department pharmacists. *Ann Emerg Med.* 2010;55(6):513–21.
2. Patanwala AE, Warholak TL, Sanders AB, Erstad BL. A prospective observational study of medication errors in a tertiary care emergency department. *Ann Emerg Med.* 2010;55(6):522–6. <https://doi.org/10.1016/j.annemergmed.2009.12.017>.
3. Patanwala AE, Sanders AB, Thomas MC, Acquisto NM, Weant KA, Baker SN, et al. A prospective, multicenter study of pharmacist activities resulting in medication error interception in the emergency department. *Ann Emerg Med.* 2012;59(5):369–73.
4. Brown JN, Barnes CL, Beasley B, Cisneros R, Pound M, Herring C. Effect of pharmacists on medication errors in an emergency department. *Am J Health Syst Pharm.* 2008;65(4):330–3. <https://doi.org/10.2146/ajhp070391>.
5. Clinical Pharmacist Services in the Emergency Department// ACEP. American College of Emergency Physicians Policy Statement. <https://www.acep.org/clinical—practice-management/clinical-pharmacist-services-in-the-emergency-department/>. Published 2015. Accessed January 18, 2018.
6. Lada P, Delgado G. Documentation of pharmacists' interventions in an emergency department and associated cost avoidance. *Am J Health Syst Pharm.* 2007;64(1):63–8. <https://doi.org/10.2146/ajhp050213>.
7. Thomas MC, Acquisto NM, Shirk MB, Patanwala AE. A national survey of emergency pharmacy practice in the United States. *Am J Health Syst Pharm.* 2016;73(6):386–94. <https://doi.org/10.2146/ajhp150321>.
8. Institute for Safe Medication Practices (ISMP) Institutional High-Alert Medications. Institute for Safe Medication Practices (ISMP). <https://www.ismp.org/sites/default/files/attachments/2018-08/highAlert2018-Acute-Final.pdf>. Published 2018. Accessed October 29, 2018.
9. Ling JM, Mike LA, Rubin J, Abraham P, Howe A, Patka J, et al. Documentation of pharmacist interventions in the emergency department. *Am J Health Syst Pharm.* 2005;62(17):1793–7. <https://doi.org/10.2146/ajhp040588>.

10. Perez-Moreno M, Rodriguez-Camacho J, Calderon-Hernanz B, Comas-Diaz B, Tarradas-Torras J. Clinical relevance of pharmacist intervention in an emergency department. *Emerg Med J*. 2017;34(8):495–501. <https://doi.org/10.1136/emermed-2015-204726>.

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