



# The impact of an emergency medicine clinical pharmacist on nursing satisfaction

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## Abstract

**Background:** In the United States, emergency medicine clinical pharmacists have become more common over the last several decades. Despite being a vital component of the emergency department interdisciplinary team, there is very limited information published regarding the direct impact emergency medicine clinical pharmacists have on other emergency department-based professions. **Objective:** To determine if the addition of an emergency medicine clinical pharmacist improves nursing satisfaction with pharmacy services. **Setting:** The study was conducted at a 422-bed urban teaching hospital consisting of approximately 60 emergency medicine nurses. **Methods:** This was a prospective study that evaluated nursing satisfaction prior to the initiation of an emergency medicine clinical pharmacist and one year after implementation. The survey consisted of 29 questions and was designed to assess three areas of pharmacy: general pharmacy, pharmacy information technology, and emergency medicine clinical pharmacy services. For the majority of questions, a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree was utilized. Responses for the 5 point Likert scale were further tabulated into either positive or negative responses. All emergency department nurses employed during the study period (September 2015 and 2016) were eligible to participate anonymously. **Main outcome measure:** The main outcome assessed was the difference in satisfaction scores between study periods. **Results:** A total of 52 surveys were returned over the course of the study (22 [36.7%] in the pre-intervention group versus 30 [50%] in the post-intervention group). All general pharmacy questions were improved at one year with timely resolution of pharmacy related issues, medication procurement, and satisfaction with pharmacy services achieving statistical significance. Pharmacy information technology questions were significantly improved with respect to satisfaction with the automated medication dispensing system inventory, prevention and resolution of medication stock outs, and ease of medication removal compared to baseline. The perceived impact of emergency medicine clinical pharmacy services in the pre-intervention group was validated after the one-year implementation period. **Conclusion:** An emergency medicine clinical pharmacist increases nursing satisfaction with central pharmacy and pharmacy technology services and was able to maintain the nurses' perceived expected role of the clinical pharmacist.

**Keywords** Clinical pharmacy services · Emergency department · Emergency medicine pharmacist · Interprofessional team · Nurses' satisfaction · United States

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## Impacts on practice

- The addition of an Emergency medicine clinical pharmacist improves nursing satisfaction with central pharmacy and pharmacy technology. Improvements in timely resolution of pharmacy related issues, medication procurement, smart infusion pump programming and automated medication dispensing system inventory were among the areas with the greatest impact on satisfaction.
- According to nurses, the presence of an EM pharmacist significantly improves patient safety by preventing medication errors and enhancing the nurse's ability to deliver safe and quality care.

## Introduction

Over the past several decades, the number of clinical pharmacists in the emergency department (ED) has been on the rise in the United States [1]. In 2015, the American College of Emergency Physicians formally recognized emergency medicine (EM) pharmacists as playing a critical role in ensuring efficient, safe, and effective medication use in the ED [2]. Services provided by EM pharmacists range from answering drug information questions and assisting with appropriate medication dosing, to performing pharmacokinetic monitoring and responding to medical/trauma resuscitations [1, 3]. They also play a key role in reducing medication errors in the ED through direct patient care activities and preventing verbal order errors, by serving as a medication consultant for prescribers, providing prospective medication order review, and ensuring appropriate medication administration rates/techniques [4]. Significant cost savings based on EM pharmacist interventions has also been documented in previously published literature, with the largest cost avoidance attributable to prevention of adverse drug events, resource utilization/formulary adherence, individualization of care, and direct bedside management [5, 6].

Although EM clinical pharmacists have become a vital component of the interdisciplinary team, there is very limited information published regarding the direct impact this role has on other ED-based professions. Previously published literature has shown pharmacy services can improve nursing job satisfaction through initiatives such as expansion of pharmacy hours, decentralization of pharmacists, pharmacist-led education, and improvement in medication accessibility [7, 8]. There are also a few published studies that capture and highlight the attitudes of ED staff towards

EM pharmacists, all supporting the role and value of this position [9–11]. However, to our knowledge, there are no studies comparing nursing satisfaction with pharmacy services prior to and after the implementation of an EM pharmacist.

## Aim of the study

To determine if the addition of an EM clinical pharmacist would improve nursing satisfaction scores.

## Ethics approval

This study was exempt from requiring Institutional Review Board approval as it was identified as a performance improvement project.

## Methods

### Study design

This study evaluated nursing satisfaction with pharmacy services prior to the initiation of an EM clinical pharmacist and one year after implementation. All ED nurses who were employed at our institution in September 2015 and September 2016 were eligible to participate in this study.

Surveys were designed to assess three areas of pharmacy practice that directly impact daily nursing workflow. The first section focused on nursing satisfaction with general pharmacy services; evaluating staff accessibility, timeliness, professionalism, and responsiveness to solving identified problems. The second section focused on pharmacy information technology (IT) and primarily assessed satisfaction with the automated medication dispensing (AMD) system and smart infusion pumps. The third section focused on the nurses' perceptions of having a clinical pharmacist in the ED. During the one-year follow-up survey the nurses were asked the same questions in the third section, but wording was changed to evaluate the perceived impact of the EM pharmacist.

### Setting and population

The study was conducted at a 422-bed urban teaching hospital where ED visits exceed 90,000 patients annually. ED nursing staff is comprised of both hospital and contract agency nurses, totaling approximately 60 employees.

EM clinical pharmacy services were initiated in September 2015. The EM clinical pharmacist completed 2 years of postgraduate residency training, specializing in Emergency Medicine. The pharmacist is physically in the ED between the hours of 10 am to 6 pm Monday through Friday.

EM clinical pharmacy services provided include bedside involvement in medical, trauma and stroke codes and during intubation, procedural sedation, and other time dependent emergencies for both pediatric and adult patients. The pharmacist serves as a pharmacotherapy consultant, drug information resource, assists in prospective order verification, expedites medication delivery, and troubleshoots pharmacy operational issues.

### Development of the survey

The 29-question survey was developed with guidance from previously published validated and unvalidated questionnaires evaluating satisfaction with pharmacy services [5–7]. Questions that were not pertinent to the ED setting were excluded and others were modified to reflect our workflow. The final survey was approved by the Departments of Pharmacy, Nursing, and Emergency Medicine prior to dissemination.

All questions in the survey used a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree with the exception of one question (number 20) in which nurses could select all answers that applied. Paper surveys were distributed and collected for a two-week period in both September 2015 (baseline, prior to EM pharmacist services, “pre-intervention”) and 2016 (one year after the implementation of EM pharmacist services, “post-intervention”). Surveys were completed on a voluntary basis and there were no respondent identifiers on the survey tool. Completed paper surveys could be dropped off in a specific ED office or given to a nurse administrator.

### Data analysis

Descriptive statistics were used to present the demographic information provided by the EM nurses including sex, shift (days, nights, both), location (adult ED, pediatric ED, both), work status (full-time, part-time, agency), and years of experience. Responses for the 5-point Likert scale were further tabulated into either positive or negative responses. A positive response consisted of “agree” or “strongly agree” answers, or the reverse worded statements when applicable. A negative response was comprised of “strongly disagree”, “disagree”, or “neutral” answers. Likewise, the question in which nurses were able to choose all applicable answers was then further categorized as “yes” or “no” depending on if the answer was selected. Differences in the pre- and post-implementation survey responses were evaluated utilizing Chi squared analysis or Fisher’s Exact probability test for statements with low response rates. The a priori level of significance for all analyses was 0.05.

## Results

A total of 52 surveys were returned over the course of the study (22 [36.7%] in the pre-intervention group and 30 [50%] in the post-intervention group). Demographic data can be found in Table 1.

All comparisons between pre- and post-intervention nursing satisfaction survey scores can be found in Table 2. All questions related to general pharmacy services showed improvement in the post-intervention survey after the implementation of EM pharmacy services. The majority of respondents agreed that the pharmacy staff were able to answer drug information questions more thoroughly (59% vs. 97%,  $p=0.001$ ) and timely (55% vs. 97%,  $p<0.001$ ). More nurses also agreed that there was a timelier resolution of drug-related problems (e.g., missing medications, low stock levels) between the pre- and post-intervention study periods (27% vs. 64%,  $p=0.012$ ). Likewise, all questions relating to medication preparation time and delivery showed statistically significant improvements at the post-intervention evaluation. Overall fulfilment of nursing expectations with pharmacy services increased from 27 to 86% ( $p<0.0001$ ) between study groups following the implementation of the EM pharmacist.

The majority of pharmacy IT-related survey questions showed significant improvement. The greatest areas of

**Table 1** Demographic characteristics of nursing staff

| Variable   | Baseline (pre-intervention) | One year (post-intervention) <sup>a</sup> |
|--|-----------------------------|---|
| Male—no. (%)                                     | 6 (33.3)                    | 4 (13.8)                                  |
| <i>Shift</i>                                     |                             |   |
| Days—no. (%)                                     | 11 (57.9)                   | 18 (64.3)                                 |
| Afternoon/Evening—no. (%)                        | 4 (21.1)                    | 5 (17.9)                                  |
| Nights—no. (%)                                   | 2 (10.5)                    | 4 (14.3)                                  |
| > 1 shift—no. (%)                                | 2 (10.5)                    | 1 (3.6)                                   |
| <i>Location</i>                                  |                             |   |
| Adult—no. (%)                                    | 12 (63.2)                   | 15 (60.0)                                 |
| Pediatric—no. (%)                                | 0 (0)                       | 1 (4.0)                                   |
| Both—no. (%)                                     | 7 (36.8)                    | 9 (36.0)                                  |
| <i>Work status</i>                               |                             |   |
| Full-time—no. (%)                                | 21 (95.5)                   | 27 (93.1)                                 |
| Part-time—no. (%)                                | 0 (0)                       | 0 (0)                                     |
| Agency—no. (%)                                   | 1 (4.5)                     | 1 (3.4)                                   |
| More than 1—no. (%)                              | 0 (0)                       | 1 (3.4)                                   |
| Mean years as RN $\pm$ SD                        | 14.7 $\pm$ 14.0             | 12.2 $\pm$ 12.5                           |
| Mean years as RN at current institution $\pm$ SD | 10.7 $\pm$ 11.3             | 9.6 $\pm$ 11.2                            |

<sup>a</sup>No statistical differences in any demographic endpoint

RN registered nurse

**Table 2** Survey responses for general pharmacy and pharmacy IT<sup>a</sup>

| Question  | Percent of nurses' in agreement (pre-intervention) | Percent of nurses' in agreement (post-intervention) | <i>p</i> value |
|---|--|---|----------------|
| <i>General pharmacy services</i>  |  |   |                |
| 1. The pharmacy staff are easily accessible (by phone or in person)   | 64   | 86  | 0.095          |
| 2. When I interact with the pharmacy staff, they are courteous and professional   | 67   | 90  | 0.073          |
| 3. I know at least one pharmacist by name that I can call   | 50   | 72  | 0.145          |
| 4. Orders are verified in a timely manner (<30 min)   | 29   | 55  | 0.086          |
| 5. The medications I receive for my patients are correct (in regards to drug, strength, dosage form, etc.)                              | 86   | 100   | 0.074          |
| 6. If I have a medication related question, the pharmacist is able to answer it completely  | 59   | 97  | 0.001          |
| 7. I receive a timely response to drug-related questions (<30 min)  | 55   | 97  | <0.001         |
| 8. There is a timely resolution of drug-related problems when brought to the pharmacy's attention (e.g. missing meds, low stock levels) | 27   | 64  | 0.012          |
| 9. Routine medications being prepared in main pharmacy are delivered in a reasonable time frame (<1 h)                                  | 14   | 69  | <0.001         |
| 10. STAT medications coming from pharmacy are delivered in a reasonable time frame (<30 min)  | 18   | 59  | 0.005          |
| 11. When I notify pharmacy that I am picking up medications, they are usually ready by the time I arrive                                | 32   | 69  | 0.012          |
| 12. Unused/return drugs are dealt with in a timely manner   | 41   | 52  | 0.573          |
| 13. The service I receive from pharmacy fulfills my expectations  | 27   | 86  | <0.0001        |
| <i>Pharmacy IT services</i>   |  |   |                |
| 14. The AMD systems contain the majority of medications needed in the ED  | 57   | 87  | 0.024          |
| 15. Medications from the AMD system are easily retrievable  | 43   | 80  | 0.009          |
| 16. I currently inventory out the majority of medications I retrieve from the AMD system  | 60   | 53  | 0.773          |
| 17. The AMD systems are appropriately stocked to prevent stock outs   | 19   | 70  | 0.001          |
| 18. When a medication stock out occurs and is brought to the attention of pharmacy, it is resolved in a timely manner (<1 h)            | 19   | 69  | 0.001          |
| 19. When using smart pumps, all medications have a specific profile (in other words, no medications have to run as basic infusions)     | 45   | 80  | 0.015          |
| 20. The greatest challenge(s) to KBMA (barcoding of medications) include (circle all that apply):                                       |  |   |                |
| A. Not enough computers   | 90   | 76  | 0.286          |
| B. Not enough space for C.O.W. (computer on wheels)   | 74   | 76  | 1.000          |
| C. Equipment (e.g., scanner) malfunction  | 79   | 83  | 1.000          |
| D. Medication not in KBMA drug library  | 68   | 31  | 0.018          |

<sup>a</sup>Agree statements include the total of "agree" plus "strongly agree" responses expressed as percentages or in the case of reverse-worded statements, "disagree" plus "strongly disagree" responses

ED emergency department, AMD automated medication dispensing, KBMA knowledge-based medication administration, STAT immediate

improvements were related to AMD system inventory, prevention and resolution of medication stock outs, as well as ease of medication removal. There was also an improvement in satisfaction with the smart infusion pump library content for medications used in the ED (45% vs. 80%,  $p=0.015$ ). Nurses agreed there was a decrease in inappropriate medication removal (through the inventory function compared to the remove function [appropriate] due to education and timelier order verification) from the AMD (60% vs. 53%), however this was not statistically significant. The EM nurses

indicated that many of the challenges they encounter on a daily basis regarding equipment and space continued to occur throughout the study period. The exception to this was an improvement in challenges with medication bar-code scanning. Dissatisfaction from medications not available in the bar-code scanning medication library decreased from 68% to 31% in the pre- and post-intervention groups, respectively,  $p=0.018$ .

In the final section of the survey which focused on EM clinical pharmacy services, the results remained consistent

across both study periods (Table 3). Before EM clinical pharmacy services were implemented, the majority of nurses indicated that having an EM pharmacist would be beneficial with respect to patient safety and quality of care. These results were relatively unchanged in the post-intervention survey when evaluating overall satisfaction. The greatest improvements seen between the two study periods were with respect to medication and patient safety. More nurses agreed that an EM pharmacist prevented medication errors (74% vs. 89%) and enhanced the nurse's ability to deliver safe and quality care to patients during medical and trauma resuscitations (79% vs. 93%). More nurses also indicated that they felt safer when an EM pharmacist checked orders prior to administration (79% vs. 93%). Conversely, there was lower agreement with statements related to making use of the pharmacist located in the ED compared to calling the main pharmacy (90% vs. 83%) and using the EM pharmacist as a drug information resource (95% vs. 90%), although not statistically significant.

## Discussion

Decentralization of pharmacists and overall pharmacist involvement in the interdisciplinary team has been shown to improve satisfaction. The results of our survey indicate that the presence of an EM clinical pharmacist improves nursing satisfaction with general pharmacy and pharmacy IT services, while fulfilling perceived expectations. The

findings from our study are consistent with previously published literature [7–11]. Chevalier et al. [7] focused on three main domains where clinical pharmacists could impact nursing satisfaction on surgical/gastrointestinal units: questions relating to central pharmacy performance, whether clinical pharmacists fulfilled their perceived responsibilities, and whether clinical pharmacists were able to enhance nursing practice. Their results demonstrated that the overall quality of pharmacy services significantly improved from 85% prior to pharmacy service implementation to 95% post pharmacy service implementation ( $p < 0.0001$ ). Similarly, all eight questions related to central pharmacy performance improved after the addition of clinical pharmacists on the units. The majority of questions from this section that related to satisfaction with central pharmacy were incorporated into our survey and we observed similar results. In both studies, timely resolution of drug related questions/issues and preparation/delivery times of medications showed the greatest improvements. Chevalier and colleagues also assessed how pharmacists can enhance and impact nursing practice, which we tried emulating and incorporating into the third section of our survey tool. Both studies found that nurses felt the presence of a clinical pharmacist improved patient safety (prevented medication errors and increased overall confidence in appropriateness of orders) and enhanced the nurses' ability to deliver safe, quality care to patients.

Matthias and colleagues created a survey that assessed nursing satisfaction with hospital pharmacy services in regards to accessibility of pharmacists, accuracy of

**Table 3** Comparison of Perceived vs. Actual Satisfaction of EM Pharmacist<sup>a</sup>

| Question  | Nurses' perceived impact of EM pharmacist at baseline agree (pre-intervention) (%) | Nurses' satisfaction with EM pharmacist at one-year (post-intervention) agree (%) <sup>b</sup> |
|---|--|--|
| 21. Having an EM pharmacist has improved quality of patient care in the ED  | 100  | 97   |
| 22. I use the EM pharmacist as a drug information resource  | 95   | 90   |
| 23. An EM pharmacist is an integral part of the ED team   | 94   | 93   |
| 24. I make more use of the pharmacist located in the ED compared to when I have to call the main pharmacy to speak with a pharmacist            | 90   | 83   |
| 25. I feel safer with an EM pharmacist checking orders before I administer the medications  | 79   | 93   |
| 26. Having an EM pharmacist prevents medication errors  | 74   | 89   |
| 27. The presence of an EM pharmacist during trauma and medical resuscitations has enhanced my ability to deliver safe, quality care to patients | 79   | 93   |
| 28. The EM pharmacist is a valuable resource as an educator for counseling patients regarding their discharge medication(s)                     | 90   | 86   |
| 29. The EM pharmacist is a valuable teaching resource for nurses regarding medication related topics  | 90   | 90   |

<sup>a</sup>Questions 21–29 reflect the wording used in the one-year survey, therefore wording was slightly different for the baseline study

<sup>b</sup>No statistical differences in any endpoint

ED emergency department

medication delivery, quality of drug information services, and nurses' perceptions of pharmacists' value [8]. The original survey was conducted in 2000 and a modified survey was repeated in 2004 after expansion of several pharmacy programs. Many questions used in this survey were incorporated into the second section of our survey tool (Pharmacy IT). Matthias and colleagues found that nurses were most satisfied with drug information accuracy and benefits of decentralized pharmacists on units, while being least satisfied with medication accessibility and pharmacy telephone services. Their study actually showed a small but significant decrease in nursing satisfaction with AMD systems (3.6 vs. 3.3,  $p < 0.001$ ) whereas our results indicated significant increases in satisfaction with medication inventory. Our improvement in satisfaction is likely attributed to a dedicated pharmacist physically working in the ED and recognizing gaps in medication procurement process efficiencies. For example, changes in the electronic medical record (EMR) configuration of commonly used medications led to more efficient dispensing of products from the AMD systems and the creation of numerous adult and pediatric order sets provided clinical decision support to the most appropriate medication therapy which was readily available in ED AMD systems. Furthermore, AMD system inventories were proactively evaluated by the EM clinical pharmacist and numerous changes to products and par levels were implemented to prevent stockouts. Also, with EM pharmacist recommendation, the pharmacy department began to batch commonly used medications for the ED to facilitate faster turnaround times and ultimately more timely medication administration. The EM pharmacist served as an important liaison between nursing and pharmacy for medication-related issues.

Although our study only included nurses, other studies have assessed provider attitude and satisfaction of inpatient clinical pharmacy services as well [9–14]. In countries outside of the United States, where clinical pharmacy services have only recently been established, providers appear to be receptive to the presence of a clinical pharmacist, though their expected scope of a pharmacists' practice varies [12–14]. Many indicated that pharmacists significantly contribute to patient care through education, participation in rounds, and discussing/implementing therapeutic plans with the healthcare team. However, various providers stated they were not comfortable with pharmacists performing more advanced clinical pharmacy activities such as modifying treatment regimens, prescribing medications, and treating minor illnesses [13, 14]. To our knowledge there are three studies available in the United States describing staff satisfaction with EM clinical pharmacy services specifically [9–11]. One of the first studies evaluating this was conducted by Elenbaas and colleagues [9]. They found that all responding providers and nurses felt the EM pharmacist was a vital component to the ED

team and provided benefits to patient care and educational programs. The majority of providers also stated that the pharmacist is capable of offering primary care to select patients once the diagnosis has been made by a physician. Similarly, Fairbanks et al. [10] also conducted a survey to capture the impact of pharmacists in the ED. The majority of participants (providers and nurses) felt that EM pharmacists improved the quality of patient care, were an integral part of the team, and were highly utilized throughout their shifts. Coralic et al. [11] surveyed providers and nurses to assess general perceptions of a newly implemented EM clinical pharmacy service. Respondents indicated that having an EM pharmacist available for consultation and to attend codes/resuscitations was most important in maximizing the EM pharmacist's contribution to medication safety, and that they were more likely to consult the EM pharmacist as opposed to a pharmacist not physically located in the ED. The major difference between our study and these previously published surveys is that we were able to capture the change in nursing satisfaction with pharmacy services before and after the implementation of EM clinical pharmacist services, whereas other studies measured the perceived impact of an EM pharmacist at one point in time after implementation.

In our study, the EM pharmacist was overall able to deliver the service the nurses expected prior to service implementation. Although we did see a slight decrease in agreement to a few questions, none were statistically significant. In evaluating this occurrence, we discovered that this was mostly influenced by the overnight nursing staff that do not work directly with the EM pharmacist. We did include this group of nurses since many system changes/optimizations implemented by the EM pharmacist would impact nursing practice outside of EM pharmacist hours. However, the questions specifically related to utilization of the EM pharmacist at the bedside may have been confounded.

There are limitations with our study. Nursing participation rate was low and there was nursing turnover during the study period, therefore the same nurses may not have completed both surveys. Response bias could have influenced our results as nurses may have felt obligated to participate in the survey or answer socially desirable responses due to professional relationships with the EM pharmacist. However, to minimize the potential impact of this, survey responses remained anonymous. Another limitation of our study was that we did not validate our survey prior to dissemination. The survey tool was initially developed as a performance improvement project to identify areas where pharmacy services could be advanced, however the scope expanded after the baseline survey was conducted. Even though we did not validate the survey at our institution a large proportion of our survey was compiled of questions from previously validated studies.

## Conclusion

Emergency medicine clinical pharmacist services led to improved nursing satisfaction in respects to general pharmacy and pharmacy IT services when comparing baseline and one-year satisfactions scores following service implementation. The EM clinical pharmacist was able to maintain the nurses' perceived expected role of the clinical pharmacist.

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**Conflicts of interest** The authors declare that they have no conflict of interest.

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