Impact of Initiating Clinical Pharmacy Services in a Non-Academic Community Medical Center Emergency Department Setting

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Abstract

Purpose
To determine the impact of implementing clinical pharmacy services in a nonacademic community medical center emergency department, evaluating the types of services established and potential cost avoidance associated with clinical pharmacist intervention data.

Methods
After initiation of clinical pharmacy services in an emergency department with one pharmacist, intervention data was collected for each shift between January 2014 and August 2014. Pharmacist intervention categories included code participation, medication reconciliation, home medication reconciliation activities, provision of drug information to medical staff, expediting medication delivery, and patient encounters. Resulting intervention data were summarized, and probability of harm and cost avoidance data were applied.

Results
Initiating clinical pharmacy services in a nonacademic community medical center emergency department can have a significant impact on patient care and demonstrates significant cost avoidance.

Conclusion
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Introduction
Over the past decade in the US health care setting, there has been an increasing utilization of the emergency department (ED) as a primary access point for care. While the reasons for increased reliance on the ED are multifactorial, one identified factor, particularly in suburban and rural areas, is a problematic lack of access to primary care. A recent publication by the National Association of Community Health Centers (2014) reports that 62 million people in the United States have “no or inadequate access to primary care given local shortages of such physicians.” Notably, ED visits continue to increase across the country, with 136 million visits reported in 2011 by the National Hospital Ambulatory Medical Care Survey (NHAMCS). Of those 136 million visits, 82% were to a nonteaching hospital. In addition to an increase in actual ED visits, and the implication that ED visits are increasingly for primary care reasons, medication prescribing continues to be a part of the vast majority of visits—80% in 2011 according to the NHAMCS. This figure is up from the 2004 NHAMCS results of 110.2 million visits, 78% of which involved medication prescribing.

Decentralized clinical pharmacy services have long been a part of medical care in hospitals around the country. Literature showing the advantage of clinical pharmacy services specifically in the ED dates back to the 1970s and continues to show the positive impact of pharmacist intervention on medication errors, medication reconciliation, cost avoidance, and other key factors in optimizing patient care. Medication reconciliation has become a particular area of interest throughout the health care landscape, with particular emphasis on transitions of care. Pharmacists in the ED have proven their impact on medication reconciliation, even in comparison to other health care providers.

Although considerable literature exists showing the positive impact of clinical pharmacy services in the ED, this literature almost exclusively describes this impact in large, typically urban, academic, or teaching medical centers. The authors identified a single report describing the implementation of clinical pharmacy services in the ED at a community hospital by Brown et al., at a setting which reported 91,000 ED admissions per year, a figure much higher than typically seen in suburban or rural community EDs. The authors propose that the value of clinical pharmacy services will extend outside the context of these types of medical centers. Further, the argument can be made that implementing services in smaller, community hospitals should produce an even greater impact due to the limitations on other resources (compared to a large academic medical center) and similar limitations on primary care access at these facilities and in their surrounding communities.

Implementation of clinical pharmacy services in the ED is increasing across the country due in large part to an increased focus on this particular service in the literature as well as a proliferation of specialty residency training programs; however, there still appears to be a need for these services to expand to smaller community medical centers. As the US continues to experience a shortage of physicians, particularly in the primary care setting, the stress on emergency medicine is certain to continue, not only in academic/teaching medical centers, but also in community medical centers. Implementing clinical pharmacy services, which have proven to reduce errors, improve patient care, and avoid unnecessary cost, offers opportunity and
the potential for tremendous benefits in these smaller, community medical centers.

The purpose of this article is to describe the implementation of clinical pharmacy services in the community medical center ED setting and report pharmacist intervention results collected during this implementation. Cost avoidance was also described using models described in prior literature.4-6

Methods

Practice Setting

This study was conducted at a suburban 200-bed, for-profit, adult and pediatric community medical center. The ED is a 32-bed unit without trauma designation at the time of the study. In 2014, just over $5,000 patient visits were recorded and admission rates for the year were between 15% and 20%.

In 2013, medical center and pharmacy leadership identified an opportunity for initiation of clinical pharmacy services in the ED. Services were initiated in December 2013 with a single pharmacist working a 12:30pm–11:00pm shift, eight days on and six days off, while anticipating the approval of a second clinical pharmacist to provide seven-day a week coverage from noon to 11:30pm. Services were decentralized and no satellite pharmacy was implemented. Services provided by the clinical pharmacist in the ED included, but were not limited to, drug information consultation, pharmacokinetic consultation, emergency resuscitation team involvement, acute stroke patient care, medication order optimization, patient counseling, medication reconciliation prioritized for admitted patients, facilitation of medication delivery, nursing and provider education, and verification/clarification of medication orders on admission.

Data Collection

The clinical pharmacist responsible for initiating clinical services in the ED documented interventions accepted by providers or per hospital protocols in an electronic spreadsheet for each shift worked between January 1, 2014 and August 31, 2014. Prior to the study, it was determined that no patient-specific or patient-identifying information would be documented during the study, and only pharmacist intervention category details would be documented. As a result, medical center and pharmacy leadership determined that IRB approval was not necessary. Student pharmacists on rotation with the clinical pharmacist also contributed to the intervention numbers, particularly with respect to medication reconciliation. Intervention categories included: code participation, accepted medication recommendation or dosing recommendation, home medication reconciliation for an admitted patient, facilitation of medication delivery, and drug information provided. Code participation included clinical pharmacist involvement in advanced cardiac life support (ACLS). A home medication reconciliation was counted as one intervention for the reconciliation of a patient’s complete medication list (as opposed to one intervention counted for each medication corrected). If at least one prescription medication or dose required a correction, addition, or subtraction, then one additional intervention was included.

Analysis

Cost avoidance analysis was done for four categories of clinical pharmacist activities (code/team triage participation, accepted medication/dosing recommendations, medication reconciliation for admitted patients, and provision of drug information). For the purposes of this cost avoidance analysis, code/team triage participation was determined to be a comprehensive opportunity for the pharmacist to affect drug selection and dosing, and was analyzed accordingly. The model used for this cost avoidance analysis followed was explained by Lee and colleagues4 and also used by Lada and colleagues,5 as well as Stevens and colleagues for three of the intervention categories (code participation, medication/dosing recommendations, and home medication reconciliation). In this model, a cost avoidance dollar amount was associated with each intervention and subsequently, an average probability of harm was associated with each intervention type based on the probability that harm would have occurred, had the pharmacist not intervened.4-6 Cost avoidance estimates were adjusted to 2014 dollars according to the consumer price index (CPI) found on the US Bureau of Labor Statistics website.6-8 According to these models, cost avoidance for the three intervention categories (code participation, medication recommendation, and medication reconciliation) totaled $1563 in cost avoidance dollars with an average probability of harm of 44%. Total cost avoidance was calculated by multiplying the number of interventions by $1563, and to factor in probability of harm, that product was multiplied by 0.44. Additionally, the home medication reconciliation cost avoidance category was further adjusted by 50% to account for the fact that not all medications reconciled are continued for the inpatient, and therefore the impact of a potential medication error is less than would have been assumed in the model described by Lee and colleagues. Cost avoidance estimates for drug information services were based on a cost avoidance model described by Ling and colleagues.7 Of note, drug information delivery to ED physicians, other ED providers (nurse practitioners and physician assistants), and ED nursing staff were considered an intervention.

Results

Pharmacist Interventions

During the study’s time period between January 1, 2014 and August 31, 2014, a total of 4889 interventions were recorded (Table 1). The average number of interventions per shift for all pharmacy service activities in the ED, including those by both the clinical pharmacist and student pharmacists, totaled 37, with a noted trend toward increasing interventions per shift through the study period, with most of these interventions falling in the category of accepted medication and dosing recommendations (Table 2). Of note, medication and dosing recommendations denote those recommendations initiated by the pharmacist and accepted by the provider and are not a record of all recommendations given. All intervention categories in Table 2 were based on pharmacist judgment with the exception of “accepted therapeutic recommendations,” as those ultimately relied on provider acceptance. Intervention categories were not all dependent on provider acceptance (home medication reconciliation, expediting medication administration, and drug information) and therefore, the average interventions per shift was actually higher than those reported in the literature.

Cost Avoidance

Overall cost avoidance estimates for the eight-month study period was $1,061,330, with the largest contribution coming from accepted medication recommendations and home medication reconciliations (Table 3). Pharmacist coverage was provided for 129 of the possible 243 shifts measured for the study period. When extrapolated for daily coverage for a full calendar year (calculated based on possible shifts), the anticipated cost avoidance estimate for those ED clinical pharmacy services covering all shifts amounts to $3,002,874.
### Table 1. Types of Pharmacist Interventions

| Intervention Type                          | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Total by Intervention |
|-------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------|
| Code Participation                        | 5   | 8   | 9   | 10  | 9   | 8   | 11  | 13  | 73                    |
| Accepted Medication Recommendation        | 62  | 83  | 115 | 104 | 103 | 101 | 132 | 134 | 834                   |
| Medication Reconciliation (Admission)      | 137 | 142 | 158 | 155 | 130 | 137 | 149 | 142 | 1150                  |
| Drug Information Provided                  | 100 | 134 | 187 | 179 | 149 | 176 | 211 | 223 | 1359                  |
| Expedite Medication Delivery              | 106 | 146 | 228 | 202 | 173 | 189 | 206 | 223 | 1473                  |

### Table 2. Pharmacist Intervention Trends

| Month | Code Participation | Medication Recommendation | Medication Reconciliation | Drug Info. | Expedite Medication Delivery | Total |
|-------|--------------------|---------------------------|----------------------------|------------|------------------------------|-------|
| Jan   | 0.4                | 4.8                       | 10.5                      | 7.7        | 8.1                          | 31.5  |
| Feb   | 0.5                | 5.3                       | 8.9                       | 8.4        | 9.1                          | 32.2  |
| Mar   | 0.5                | 6.2                       | 8.3                       | 9.8        | 12                           | 36.8  |
| Apr   | 0.6                | 6.1                       | 9.1                       | 10.5       | 11.9                         | 38.2  |
| May   | 0.6                | 6.9                       | 8.7                       | 9.9        | 11.5                         | 37.6  |
| Jun   | 0.5                | 6.7                       | 9.1                       | 11.7       | 12.6                         | 40.6  |
| Jul   | 0.7                | 7.8                       | 8.8                       | 12.4       | 12.1                         | 41.8  |
| Aug   | 0.8                | 7.9                       | 8.3                       | 13.1       | 13.1                         | 43.2  |
Discussion

Our study further contributes to the body of literature showing the positive impact on ED care from the addition of clinical pharmacy services, particularly by showing cost avoidance, and by logical extension, a decreased risk of medication errors and suboptimal therapeutic decisions. While the literature is replete with demonstrable evidence of the positive impact of clinical pharmacy services in the ED, our data shows this benefit also extends outside of the academic medical center setting and outside of high-volume, level-one trauma centers. Previous literature has a wide range of intervention numbers reported, with a range of 80 to 537 interventions per month reported in a systemic review. No prior studies included expedited medication administration so if those interventions were not considered, the authors report a total of 3416 interventions or 427 interventions per month, which falls in the range previously discussed. Additionally, Carter et al. reported a total of 637 home medication corrections documented in a 3 month study period which equates to 212 per month. Our results identified about 144 home medication corrections per month. Finally, by way of comparison, Lee et al. reported a total of 1511 total medication/dose-related interventions over a one-year period. We report 834 medication/dose-related interventions in an eight-month period.

These results are significant for community hospitals and medical centers with lower ED visit numbers than ordinarily seen in larger, higher acuity centers, as these notably smaller facilities may not yet realize there is cost and safety benefit to the implementation of these types of clinical pharmacy services. With the growing number of patients accessing the emergency department for primary as well as acute care, patient loads are affecting, and will continue to increasingly impact, EDs in local community and regional medical centers. The combination of continued increase in patient visits, matched with the demonstrated benefit of clinical pharmacy services, affords a tremendous opportunity for community medical centers to incorporate these invaluable services to reduce medication errors, improve therapeutic decision-making, and increase the focus on medication reconciliation toward both optimal patient outcomes and cost avoidance.

Moreover, an added benefit of clinical pharmacy services in the ED which the authors attempted to capture with this study was the opportunity for the ED pharmacist to expedite medication administration as part of an attempt to manage patient throughput in the ED, an increasingly stressed patient care setting. While there were no cost avoidance benefits yet demonstrated with this activity, there is implicit benefit to having a pharmacist in a fast-paced patient care setting where opportunities exist to expedite medication delivery to the bedside, provide bedside checks of medications, and troubleshoot with automated dispensing units. Not only does this service help with patient throughput and optimizing patient care time, it also provides a drug information resource at the bedside for nursing to rely on for drug dilution, automated pump programming, compatibility interactions, and it ultimately elevates patient safety and care. Provision of drug information to nursing staff was collected in this study’s data collection.

Medication reconciliation has been a major focus across the health care continuum as an opportunity for quality improvement because of the tremendous risk of adverse outcomes. In a study at a university hospital, Carter and colleagues reported that in comparison to physicians, pharmacist-acquired medication reconciliations were more complete and accurate. The literature is replete with such findings in both inpatient and outpatient settings. Therefore, an essential benefit of clinical

| Intervention Type          | Interventions, No. | Cost Avoidance Per Intervention (USD) | Average Probability of Harm | Cost Avoidance (USD) |
|---------------------------|--------------------|---------------------------------------|-----------------------------|----------------------|
| Code/Team Triage Participation | 73                 | 1563                                  | 0.44                        | 50.204               |
| Accepted Medication Recommendation | 834               | 1563                                  | 0.44                        | 573.568              |
| Medication Reconciliation | 1150              | 1563                                  | 0.44                        | 395.439              |
| Drug Information Provided | 1359              | 31.72                                 | n/a                         | 43.107               |
| Total                     | 3416              | -                                     | -                           | 1,061,330            |
pharmacy services in the ED is optimizing the medication reconciliation process, irrespective of the size of the ED or patient visit statistics. The study’s intervention results demonstrated this specific impact.

According to the US Bureau of Labor Statistics, pharmacists have an annual salary of $124,170, which is on par with estimates from leading online salary source websites for clinical pharmacists’ salaries. However, an employer’s total cost to add a full-time employee is higher than salary alone. When calculating total cost, the time needed to train an employee, along with other employee benefits (eg, health insurance, 401k match) and anticipated payroll taxes and Medicare taxes, all must be taken into account. As of December 2017, the Bureau of Labor Statistics reported that nonwage compensation represents about 30% of the total cost of an employee; therefore, the total employer cost for a full-time pharmacist would be $161,421.22. With the anticipated cost avoidance estimates of $3,002,874 annually, the study clearly demonstrates the financial value of adding full-time clinical pharmacist coverage in the ED.

Overall, the results of this study further contribute to the strong evidence showing the benefit of initiating clinical pharmacy services in the ED. The authors were able to demonstrate that this benefit extends to smaller, community medical centers, which is significant given the increasing number of patient visits seen in these settings. These results suggest that even in such settings, cost avoidance more than justifies the addition of one to two clinical pharmacist positions and leaves open the opportunity for expansion of services to include more full coverage, as well as potential for pharmacy technician-driven services such as medication reconciliation and satellite pharmacy services.

Limitations

The authors acknowledge several limitations in the present study, primarily that intervention data was self-reported by a single pharmacist establishing clinical pharmacy services de novo. Since documentation was self-reported, there is an inherent inability to compare documentation of interventions between multiple reporting pharmacists to gauge underreporting or overreporting. There is possibility of underreporting interventions since the ED practice setting requires multitasking, and the pharmacist is not always in front of a computer to document in real time. There may also be differences in reporting of medication reconciliation, as some literature considers a full and complete medication reconciliation as equal to one single intervention. However, the authors believe that any optimization of a patient’s medication list should justifiably be counted as a meaningful intervention. Additionally, these results included student pharmacist interventions under supervision of the clinical pharmacist; however, student pharmacist participation was variable and inconsistent during data collection, making extrapolation difficult. Outside of the authors of this study, there were no external reviewers to evaluate the data collected. The authors also chose fewer categories for data collection, which allowed for less discrimination about types of interventions within categories.

Conclusion

The benefit of implementing clinical pharmacy services in the ED, well documented in the large, academic medical center setting, is demonstrated with this study to also extend to community hospitals. Intervention data indicates that the largest impact for clinical pharmacy services is in the area of therapeutic recommendations and medication reconciliation. Cost avoidance estimates combined with optimization of patient outcomes can be used to justify the creation of clinical pharmacist positions within the ED, even in community hospital settings.

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