Targeted delivery of clinical pharmacy services using a mixed specialist and generalist pharmacy practice model

Abstract

Purpose: Due to a reduction in pharmacists, a mixed generalist-specialist pharmacy practice model with distinct responsibilities was implemented to better optimize pharmacist skills. This required temporary reduction in pharmacy staff in the emergency department (ED) to provide clinical pharmacy services elsewhere in the hospital. The purpose of this study was to assess process improvement measures (discharge counseling, documented interventions, and pharmacy scorecard review) and patient outcome differences (30-day readmission) before and after the practice model change in hospitalized, high-risk patients and the ED.

Methods: A quasi-experimental quality improvement study was conducted in 2015 after a pharmacy practice staffing model change. Patients at high-need for clinical pharmacy services (defined as a LACE score ≥ 9) and patients admitted to the emergency department at a large academic medical center were evaluated for three months before and after the model change. Data collected included moderate-serious interventions, scorecard evaluation, discharge counseling documentation, and 30-day readmissions.

Results: Nine hundred and sixty-one patients were evaluated before (n=449) or after (n=512) the model change. Among high-risk, non-ED patients, process improvements including discharge counseling and scorecard review increased significantly during the study period and were associated with a statistically significant decrease in readmission rates. In the ED, process improvements including moderate-serious interventions and discharge counseling decreased significantly after loss of clinical pharmacy services.

Conclusion: A mixed pharmacy practice model targeting high-risk patients improved process improvement measures and patient outcomes. Reduction in clinical pharmacy services in the ED affected process improvement measures in this area of the hospital.

Introduction

Clinical pharmacy services have been shown to impact process improvement measures and patients outcomes.[1-3] Pharmacist involvement in a patient's discharge process has been shown to reduce discrepancies in medication therapy by half as well as reduce adverse drug events.[4] Medication non-compliance increases with the number of medications taken, suggesting a pharmacist's role for comprehensive discharge counseling for patients on complicated medication regimens.[5] Patients who receive discharge counseling services from a pharmacist also benefit from increased medication knowledge, improved patient satisfaction, optimization of pharmacotherapy, and reduced readmissions.[6-10] This data supports the critical role of the pharmacist to improve patient outcomes and reduce hospital readmissions. The LACE (L: length of stay of index admission; A: acuity of admission; C: co-morbidities as assessed by the Charlson Comorbidity Index; E: emergency department visits within last six months) index risk stratification tool is commonly used to identify patient risk for 30-day readmission with scores ranging from 0 – 19.[11] A score of 0 is associated with a 2% expected risk of death or urgent readmission, a score of 19 is associated with a 43.7% risk, and each point increase is associated with an 18% increase in this risk. A LACE score of 10 or greater is commonly associated with a high risk of readmission. Our institution chooses to define high risk as a LACE score of 9 or greater.

Hospital pharmacy staffing resource allocations are commonly based on productivity data driven from distributive functions which fails to account for provision of clinical services and results in directives to reduce pharmacy staff.[1] This can result in increased costs and decreased quality of care. Although the cost benefit of clinical pharmacy services has been well established[12],

quantifying the benefit of pharmacist-provided services can be difficult due to the multi-specialty care provided to hospitalized patients. This problem can be heightened during times of staffing reductions or hiring freezes. The ASHP Pharmacy Practice Model Initiative advocates that all pharmacists should be involved in clinical duties.[13, 14] However, how to best utilize the diverse skill set of pharmacists to optimize care in an era of limited resources is controversial. Over two years, reductions in full-time pharmacist equivalents (FTEs) at our institution resulted in a requirement to stretch the pharmacy practice model in order to accommodate FTE pharmacy losses. We had previously undergone a pharmacy practice change to optimize the use of technicians in order to provide increased clinical pharmacy services.[15] Due to the need to provide patient care services with fewer pharmacists, delineation of pharmacists' roles and services that must be provided to every patient became poorly defined as responsibilities stretched beyond the capacity of the pharmacist resources available. Pharmacists staffing in patient care units were often limited to order verification and often did not meet departmental clinical service goals. Clinical service goals include the provision of medication discharge counseling for all high-risk patients (LACE score ≥ 9) and the completion of pharmacy scorecard reviews, a quality measure that provides guidance for renally dosed medications, anti-infectives, anticoagulants, narrow therapeutic index medications, consults, TPNs, Beers List medications, and pharmacokinetic monitoring. Ideally, all medications on the scorecard should be reviewed by a clinical pharmacist every 48 hours during hospitalization, and all high-risk patients should receive medication discharge counseling. During quality improvement audits, it was noticed that most high-risk patient did not have a scorecard completed or receive discharge counseling due to order verification duties. Due to this, the decision was made to switch to a more distinctly defined mixed specialist-generalist pharmacy practice model. This necessitated temporary

removal of full time clinical pharmacy services in the ED in order to ensure adequate coverage of patients in the remainder of the hospital. The purpose of this study was to assess process improvement measures (discharge counseling, documented interventions, and pharmacy scorecard review) and patient outcome differences (30-day readmission) before and after the practice model change in hospitalized, high-risk patients. Process measures were also assessed for ED patients during the same time period.

Methods

This study was conducted at Baylor St. Luke's Medical Center, an 850 bed, non-profit, quaternary teaching hospital in the Texas Medical Center, Houston, Texas. The pharmacy practice model prior to change implementation included centralized and de-centralized pharmacists. Central pharmacists managed order verification, verified accuracy of first dose dispensing, and other distributive functions. De-centralized pharmacists were responsible for clinical consults in their service area, scorecard review, discharge counseling, drug information requests, as well as distributive functions including order verification. Although not explicitly stated, order verification was a priority function due to the need to maintain the safe and accurate delivery of medications to patients. The new model better delineated the role of central vs. de-centralized pharmacists. The mixed generalist-specialist model subdivided pharmacists into two distinct clinical service roles: Clinical Order Review and Evaluation (CORE) and Patient-Focused Services (PFS) with distinct functions and roles (Table 1). A group of eight pharmacy managers, supervisors, and peers independently evaluated each pharmacist for service placement based on one-on-one discussions, aptitudes, interests, and training. At the end of the interview process, each person's placement into CORE or PFS function was compared and conflicts

decided by group decision. Final decisions were made after further one-on-one discussions with pharmacy staff affected by the change. In order to have an adequate number of PFS pharmacists for hospitalized patients, the emergency department eliminated de-centralized pharmacists, leaving one specialist who was only able to provide weekday coverage.

Process improvements and patient outcomes between the two models were compared using a single-center, quasi-experimental study design. The model was implemented in August 2015 with the new pharmacy practice model fully incorporated by September 2015 although additions to pharmacist staff were still being made. All patients included in the study were hospitalized between 5/1/2015 and 7/31/2015 (pre-implementation) and between 9/1/2015 and 11/30/2015 (post-implementation). Patients evaluated included those at a high risk for readmission (defined as a LACE score ≥ 9) or had received care in the emergency department during these time periods. Patients at high risk for readmission were evaluated for process improvement measures (discharge counseling, number of moderate and serious interventions, and pharmacy scorecard review) and patient outcomes (30-day readmissions and hospitalization days within 30 days following initial discharge). Data were collected via the Epic electronic health record (EHR) and Epic iVents. Fisher's exact or Pearson Chi-square tests were utilized to identify differences in discharge counseling and readmissions. T-tests were used to assess differences in number of moderate/serious interventions, pharmacy scorecard review, and total hospitalized days within 30 days following initial discharge. All data were de-identified and managed in Microsoft Excel® (Microsoft Corp, Redmond WA) and analyzed using GraphPad® (GraphPad Software, San Diego CA) or SAS version 9.3 (SAS Institute, Cary NC).

Results

A total of 961 high-risk patients aged 62±16.49 (mean ± standard deviation) were evaluated during the pre-intervention (n=449) and post-intervention (n=512) time periods. Age and sex were similar between groups, but average LACE scores differed between the pre-intervention (12.57±1.94) and post-intervention (13.99±3) groups, with the post-implementation group representing a higher risk of readmission. Demographic differences between the two groups are shown in Table 2. In the emergency department, 14,342 patients were evaluated for pharmacy interventions in the pre-interventions (n=7,362) and post-intervention (n=6,980) time periods, and 6,278 were evaluated for discharge counseling documentation in the pre-intervention (n=3,098) and post-intervention (n=3,180) time periods.

For high-risk patients, discharge counseling documentation increased from 10% of patients (n=45) during the pre-intervention time period to 20% of patients (n=116) during the post-intervention time period (Table 3; $p< 0.0001$). Average number of pharmacy scorecard reviews increased from 1.8±2.3 reviews per patient to 4.4±6.7 reviews per patient ($p< 0.0001$). Thirty-day readmission rates decreased from 63% in the pre-intervention time period (n=284) to 55% in the post-intervention time period (n=282; $p=0.0105$). Documentation of moderate and serious interventions increased non-significantly from 5.0±7.8 per patient in the pre-intervention time period to 5.5±7.6 in the post-intervention time period ($p=0.244$).

In the emergency department, moderate and serious interventions decreased from 0.23±2.41per patient in the pre-intervention time period to 0.01±0.14 in the post-intervention time period

($p<0.0001$). Discharge counseling occurred in 0.36% of patients in the pre-intervention time period and 0% in the post-intervention time period ($p=0.0004$).

Discussion

The pharmacy practice model initiative advocates that every pharmacist should provide clinical pharmacist activities.[14] However, how to use available pharmacist resources to best provide clinical pharmacy services is not fully defined. This can be especially difficult during times of staffing shortages or hiring freezes. In this study, we documented process improvement and patient outcome improvements after a change to a well-defined pharmacist generalist-specialist model that targeted patients at high risk for hospital readmissions. In order to fully staff this model, a reduction in pharmacist involvement in the ED was required which resulted in an associated reduction in clinical pharmacy service provisions. Strengths of this study include a real world evaluation of benefits and drawbacks of clinical pharmacy staffing changes and methodology to improve patient pharmacy services in hospitalized patients. The change management required to successfully switch our practice model was quite significant and our methodology could hopefully be used by other healthcare centers considering a similar change. This study also adds to the body of literature on the value of clinical pharmacists during the discharge process to reduce the likelihood of re-admissions.

Incorporation of the new pharmacy practice model was associated with a significant reduction of 30-day readmissions in high-risk patients (8% decrease). This builds on the body of literature demonstrating that pharmacists are able to reduce the likelihood of hospital readmissions.[16-19] Patient education along with free inhalers, telephone contact after hospitalization by pharmacists,

and facilitation during the discharge planning process have all been shown to reduce hospital readmissions. A systematic review and meta-analysis determined a 19% reduction in readmissions by pharmacy intervention.[20] Taken together along with our results, it can be concluded that hospital-based clinical pharmacy services should include interventions to decrease hospital re-admissions. Pharmacists appear to be effective at decreasing the rate of this important occurrence. By targeting interventions at groups at high-risk for re-admission (for example, using patients with high LACE scores), the likelihood of significant interventions and good clinical outcomes increases.

Clinical pharmacy services have also been shown to be important in the hospital Emergency Department.[21-23] With our staffing model change and temporary reduction in workforce, we made the difficult decision to temporarily withdraw full time around the clock pharmacy coverage in the emergency department. This was associated with a dramatic decrease in pharmacy productivity metrics in this area of the hospital. Other areas such as antimicrobial stewardship programs and heart failure patients have shown detrimental changes when pharmacy personnel were not present to perform clinical duties.[24, 25] The temporary discontinuation of emergency department pharmacist services clearly worked to the detriment of patients in that service area as evidenced by significantly reduced medication interventions and eliminated discharge counseling. This serves as evidence of the importance of pharmacist-provided services and shows that adequate resources are needed in order to provide the clinical services expected in all areas of the hospital. This may be especially important for long-standing services in which the memory of the clinical benefit observed due to the increased pharmacy productivity may

have faded over time. This study provides an important example of the consequence of clinical pharmacy service discontinuation.

This study has several limitations. This was a single center study at a quaternary care medical center targeting a specific high-risk patient population for our pharmacy practice clinical model. A similar model change at other types of institutions will require further study. The data acquisition from the information technology department was significant and time consuming. Although our practice model change results in significant increases in productive metrics and outcomes, comparison of different types of practice models should be undertaken. Careful attention and significant time had to be paid in order to assure the accuracy of these results. Future streamlining of IT infrastructure will be required in order to assure expansion of these metrics. Patients in the post-implementation group had a higher average LACE score than those in the pre-implementation group; this may have falsely diminished the positive impact on readmission rates. Finally, we assessed productivity metric changes in the ED. Future studies should assess outcome changes associated with discontinuation of clinical pharmacy services.

In conclusion, a mixed specialist-generalist pharmacy practice model that provided clear delineation of responsibility resulted in improved pharmacy-related metrics and patient outcomes. Reduction in clinical pharmacy services in the ED negatively affected process improvement measures in this area of the hospital

Table 1. Delineated Clinical Pharmacist Roles using a Generalist-Specialist Pharmacy Practice Model

CORE (Clinical Order Review & Evaluation - centralized	**PFS (Patient-Focused Services) - decentralized**
Order Verification	Discharge counseling/Patient Education
First dose check	Nursing discharge rounds
Formulary interchanges	Multidisciplinary rounds (certain areas)
Time scheduling issues for medications	Patient scorecard review/documentation*
Managing EPIC in-basket messages	Restricted & complex non-formulary meds
Verification of antibiotics & anticoagulants	Home medications for inpatient use
Renal dosing/frequency adjustment	Clarifications requiring visit with patient
Minor order clarifications with MDs	Chemotherapy orders
	Consults/drug information requests
	First verification of TPNs
	Education of healthcare providers
	Code attendance

*Scorecard review includes renally dosed medications, anticoagulants, anti-infectives, non-formulary, IV to PO conversions, narrow therapeutic range, consults, TPNs, and Beers List medications.

Table 2. Baseline Characteristics

Variables	**All Subjects (n=961)**	**Group A (n=449)**	**Group B (n=512)**	**P**
Age	62.03±16.49	62.76±16.69	61.25±16.5	0.16
Sex				
Male	508 (52.86%)	238 (53%)	270 (52.73%)	1.00
Female	453 (47.14%)	211 (47%)	242 (47.27%)	
LACE Score	13.33±2.65	12.57±1.94	13.99±3	<0.0001

Table 3. Process and outcomes measure changes following staffing model implementation

Process/Outcomes Measures	**Group A**	**Group B**	**P**
LACE Score ≥ 9	n=449	n=512	
Discharge counseling rate	10% (n=45)	20% (n=116)	< 0.0001
Moderate-serious interventions	5.0±7.8 / patient (n=2,226)	5.5±7.6 / patient (n=2,839)	0.24
Pharmacy scorecard review	1.8±2.3 / patient (n=807)	4.4±6.7 / patient (n=2,238)	< 0.0001
30-day readmissions	284 (63%)	282 (55%)	0.01
Hospitalized days within 30 days post-initial discharge	4.67±8.09	4.08±8.19	0.2575
Emergency Department	n=7,362	n=6,980	
Moderate-serious interventions	0.23±2.41 / patient (n=1,689)	0.01±0.14 / patient (n=74)	< 0.0001
Patients discharged directly from ED	3,098	3,180	
Discharge counseling rate	0.36% (n=11)	0% (n=0)	0.0004

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