Implementation and Effect of a Pharmacist-to-Pharmacist Transitions of Care Initiative on Ambulatory Care Sensitive Conditions

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ABSTRACT

BACKGROUND: One of the most vulnerable times in a patient's encounter with a health care system is during transitions of care (TOC), defined by the Joint Commission as the movement of a patient from one health care provider or setting to another. The use of a clinical pharmacist as a member of the care transitions team has received focused attention and shown improved benefit.

OBJECTIVE: To determine the effect of a large-scale pharmacist-to-pharmacist TOC model where inpatient clinical pharmacists identify patients during a hospital stay, provide evidence-based care and education, and then coordinate follow-up with an outpatient clinical pharmacist who provided comprehensive medication management (CMM) under a scope of practice.

METHODS: This was a multisite, single health care system, quasi-experimental, matched interrupted time series design study conducted at an integrated Veterans Affairs (VA) health care system. Patients admitted with a primary or secondary diagnosis of diabetes, hypertension, chronic obstructive pulmonary disease (COPD) and heart failure (HF) were included for enrollment. Clinical pharmacists rounding on inpatient medical teams provided evidence-based recommendations to optimize medications while coordinating follow-up by an outpatient clinical pharmacy specialist within 10 days of discharge for CMM. The primary endpoint of this study was to determine the effect on the composite all-cause 30-day acute care utilization rate (emergency department [ED] visit or hospital readmission) for patients discharged with a primary or secondary diagnosis of diabetes, hypertension, COPD, and HF compared with a comparator group of patients with similar discharge diagnosis before implementation of the TOC program.

RESULTS: 484 patients (242 in each group, with 366 heart failure, 66 COPD, 10 hypertension, and 42 diabetes) were included for analysis. For the primary outcome of composite 30-day, all-cause acute care utilization rates, no statistically significant difference was identified, with 26.9% of patients in the intervention group and 28.9% in the historical group readmitted or seen in the ED within 30 days of discharge ($P=0.6852$). Outcomes for the HF index acute care utilization rate (i.e., admission for the same disease state discharged with), including 30-day index readmissions ($P=0.0014$), 30-day index ED visits ($P=0.0047$), and 90-day index readmissions for HF ($P<0.0001$) were significantly reduced.

CONCLUSIONS: Our study is one of the first to identify at-risk patients using rounding clinical pharmacists in the acute care arena and coordination of care systematically with a clinical pharmacy specialist practicing under a scope of practice targeted for CMM. Although the overall primary endpoint was not met, a reduction in acute care utilization rates for HF at 30 and 90 days can be achieved.

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What is already known about this subject

- One of the most vulnerable times in a patient's encounter with a health care system is during transitions of care.
- The use of a clinical pharmacist as a member of the care transitions team has received focused attention and shown improved benefit.
- Clinical pharmacists in the outpatient and inpatient clinical arenas can practice comprehensive medication management with a focus on decreasing readmissions for patients with such chronic diseases as diabetes, hypertension, chronic obstructive pulmonary disease, and heart failure.

What this study adds

- Implementation of a standard process in a large health care system using inpatient and outpatient clinical pharmacists decreased readmission rates for veterans with heart failure.
- Clinical pharmacists practicing comprehensive medication management can improve the transitions of care process.

One of the most vulnerable times in a patient's encounter with a health care system is during transitions of care (TOC), defined by the Joint Commission as the movement of a patient from one health care provider or setting to another.[1] During a care transition, patients are particularly prone to medical errors as the new provider or team assumes responsibility for the patient's care. Accordingly, facilitating TOC has become a high priority with the Centers for Medicare & Medicaid Services (CMS), beginning with the Hospital Readmissions Reduction Program (HRRP) in 2012, with a focus on reducing unwanted admissions, since approximately 27% of readmissions are potentially avoidable.[2,3] Readmission rates have declined for targeted HRRP disease states, with 17.8% of Medicare fee-for-service beneficiaries readmitted within 30 days for at least one of CMS's HRRP targeted conditions, compared with 21.5% in 2007.[4]

The use of a clinical pharmacist as a member of the care transitions team has received focused attention.[5] The extensive education of clinical pharmacists in the evidence-based use of medicine and skills in clinical counseling position them as an integral member of the care transitions team. A landmark

evaluation of readmission-reduction efforts using clinical pharmacists is included in the Reengineered Hospital Discharge Program to Decrease Readmission, or "project RED."[6] Patients in the RED intervention received appropriate counseling as an inpatient, left with an "after-hospital care plan," and received a phone call from a pharmacist 2-4 days after discharge. The intervention resulted in a 33% statistically significant reduction in unplanned hospitalizations in the cohort of patients who received the RED intervention versus those who did not.

In addition to transitional care interventions made by telephone, models that include face-to-face visits with a clinical pharmacist after discharge have begun to emerge. Cavanaugh et al. (2015) evaluated 7-day postdischarge follow-up with a physician only compared with a multidisciplinary team that included a pharmacist.[7] Readmission rates among the patients who followed up with the multidisciplinary team were reduced by half compared with physician-only follow-up (14.3% vs. 34.3%). In addition, a group of clinical pharmacy practitioners from the University of North Carolina Health Care conducted a pilot study that evaluated the effect of a face-to-face clinical pharmacist follow-up visit 72 hours after discharge before patients visited their primary care providers.[8] Readmissions and emergency department (ED) visits were significantly reduced for patients who saw a pharmacist after discharge relative to standard care follow-up with only the primary care provider. There were no recorded readmissions or ED visits for those seeing a clinical pharmacist in conjunction with their primary care providers. Conversely, 40% of patients were either readmitted or visited the ED within 30 days of discharge in the standard care cohort. Ploenzke et al. (2016) demonstrated the capacity of outpatient clinical pharmacists operating with a scope of practice to optimize the pharmacotherapy of recently discharged patients using the Care Assessment Need score.[9] These interventions included initiating, modifying, discontinuing, and monitoring medications under the clinical pharmacist scope of practice.

Despite the growing body of evidence for TOC models incorporating a clinical pharmacist, there is limited data on the effect of a structured collaboration between inpatient and outpatient clinical pharmacists working together to reduce readmission rates for patients transitioning out of the hospital. This study aimed to determine the effect of a large-scale pharmacist-to-pharmacist TOC model, where inpatient clinical pharmacists would identify patients during a hospital stay, provide evidence-based care and education, and then coordinate follow-up with an outpatient clinical pharmacist who provided comprehensive medication management (CMM) under a scope of practice. This model was evaluated in the context of composite 30-day acute care utilization rates (ED visits after discharge or hospital readmission) for patients with a subset of diagnoses after discharge.

Methods

Study Design and Setting

This was a multisite, single health care system, quasi-experimental, matched interrupted time series design study conducted at an integrated Veterans Affairs (VA) health care system. The VA Tennessee Valley Healthcare System (VA-TVHS) is an integrated health care system that comprises 2 medical centers located in Nashville and Murfreesboro, as well as 18 community-based outpatient clinics located off-site from the main facilities in contiguous areas around middle Tennessee. VA-TVHS provides care for over 82,000 veterans in the acute care inpatient and outpatient settings. For fiscal year 2017, VA-TVHS had 12,455 admissions among 7,387 patients. After institutional review board submission, this study was determined to be a quality improvement activity.

VA-TVHS provides collaborative inpatient internal medicine services using a multidisciplinary team rounding approach that encompasses medicine, nursing, pharmacy, and social work. Clinical pharmacists rotate and round with inpatient medicine teams at both acute care facilities and provide evidenced-based pharmacotherapy recommendations, education, and medication reconciliation to an average of 20 discharged patients per day. At the time of this initiative, 32 clinical pharmacists were involved in providing inpatient clinical pharmacy services across the 2 medical centers.

VA-TVHS delivers primary care services using the principles of the patient-centered medical home model under the VA term "patient-aligned care team" (PACT). PACT teams are made up of a primary care provider (physician or associate provider), a registered nurse care manager, a licensed practical nurse, and a medical support assistant (i.e., scheduler). Clinical pharmacy specialists support PACT teams by providing CMM to the patients on the primary care provider's team. Each clinical pharmacy specialist in the PACT operates under a global scope of practice to carry out functions in an advanced practice role, which include, but are not limited to, execution of therapeutic plans; prescribing medications to include initiation, discontinuation, or modification; ordering appropriate laboratory tests and other diagnostic tests to monitor medications; and ordering consults as needed (e.g., referral to a cardiologist).

VA-TVHS has 76 PACT teams that provide primary care to assigned veterans. During this initiative, 18 PACT clinical pharmacy specialists—8 at the 2 main facilities and 10 located at community-based outpatient clinics—provided CMM within the PACT model. Additional clinical pharmacy specialists worked in specialty areas, and specific to this program, 1 clinical pharmacy specialist provided outpatient cardiology CMM services in the primary care setting.

Patient Selection

Ambulatory care sensitive condition (ACSC) hospitalizations within the VA are defined as those admissions that are

preventable if ambulatory care is provided in a timely and effective manner. ACSC conditions include diabetes, hypertension, chronic obstructive pulmonary disease (COPD) and heart failure (HF). All patients admitted and discharged with primary or secondary diagnoses for an ACSC were considered for enrollment. Patients were included for evaluation if they were either seen in clinic or reached via telephone by a PACT clinical pharmacy specialist or the cardiology clinical pharmacy specialist after discharge (i.e., per protocol).

Exclusion criteria included patients who were discharged to hospice, skilled nursing facilities, long-term care facilities, or to home-based primary care (i.e., PACT teams provide care to patients in their own homes). Patients were also excluded if they were discharged with a scheduled initial follow-up at a specialty clinic, such as the hypertension clinic, endocrine clinic, pulmonary clinic, and the advanced HF clinic. Patients who did not have a primary care provider assignment within VA-TVHS were also excluded. Specific to discharged HF patients, additional exclusions were applied in order to ensure that appropriate patients were followed by the pharmacist after discharge. Patients with end-stage renal disease, any cirrhosis or decompensated liver disease, any previous solid organ transplant, and any stage C or D valvular heart disease were excluded for clinical pharmacy specialist follow-up and were, instead, scheduled for follow-up with the cardiology clinic.

Description of Intervention

The initial pharmacist intervention occurred during inpatient admission for an ACSC. As part of routine clinical care, clinical pharmacists rounding on inpatient medical teams provided evidence-based recommendations to optimize medications related to the corresponding ACSC to the medical team. Before discharge, the inpatient clinical pharmacist recommended that the identified patients follow up with a clinical pharmacy specialist in PACT after discharge or the clinical pharmacy specialist in cardiology if an HF diagnosis was noted. If accepted by the team and the patient, the clinical pharmacy specialist supporting the patient's primary care provider was contacted to coordinate follow-up within 10 days of discharge.

On or before the day of discharge, patients were provided with pertinent education for medications related to the ACSC disease state, along with any devices (e.g., blood pressure cuff, glucose monitor, or inhaler) deemed necessary for further coordination of care. Educational series were held with clinical pharmacy staff before implementation of the initiative in a group setting in order to standardize discharge education and the required documentation. Additional competency-based educational information was provided for self study as needed. Educational material provided was standardized for each disease state and approved by the study investigators.

The second pharmacist intervention occurred in the outpatient setting after discharge. For all conditions, the postdischarge appointment was arranged within 10 days and occurred face to face with the clinical pharmacy specialist instead of another care provider (i.e., physician or nurse practitioner). During the face-to-face appointment, the clinical pharmacy specialist focused on clinical management of the relevant ACSC, which included reinforcing disease-state education and/or optimizing medications in the context of performing CMM. Although the clinical pharmacy specialist evaluated the disease state that the patient was discharged with, the clinical pharmacy specialist also evaluated the patient's medications and concurrent conditions as a whole and may have treated other conditions not related to the discharge diagnosis as clinically relevant.

Follow-up with patients was determined based on the clinical condition of the patient. For HF, patients were scheduled for subsequent face-to-face visits based on clinical stability as determined by the cardiology clinical pharmacy specialist at least weekly for the first month after discharge. Other follow-ups for ACSC disease states were based on the clinical presentation of the patients and the evaluation of the clinical pharmacy specialists. Once patients were determined clinically stable by the cardiology clinical pharmacy specialist, transition occurred to PACT clinical pharmacy specialists, PACT providers, and/or appropriate cardiology providers for continued optimization of medications and long-term management when warranted.

Outcomes

The primary endpoint of this study was to determine the effect on the composite all-cause, 30-day VA hospital acute care utilization rates (i.e., ED visit or hospital readmission) for patients discharged with an ACSC, compared with a comparator group of patients with similar ACSC discharge diagnoses before implementation of the TOC program.

Secondary endpoints included the composite index 30-day acute care utilization rates (i.e., ED visit or readmission for the same disease state that the patient was discharged with), individual all-cause and index 90-day acute care utilization rates, and outcome analysis for the individual disease states, including all-cause and index readmission rates at 30 and 90 days, as well as all-cause and index 30- and 90-day ED visits. All-cause acute care utilization rates were defined as any reappearance for readmission (ED visit or hospital readmission). Index acute care utilization was defined as reappearance for readmission (ED visit or hospital readmission) for the same ACSC disease state that the patient was discharged with. Mortality at 30 and 90 days was also evaluated.

Data Collection and Statistical Analysis

A list of all patients discharged 1 year before TOC intervention was generated. Using manual data extraction, a comparator

TABLE 1 Baseline Characteristics

	Comparator Group (n = 242)			Intervention Group (n = 242)			*P* Value
Gender, % (n)	Male	97.5	(236)	Male	97.1	(235)	0.7786
	Female	2.5	(6)				0.7786
Race, % (n)	White	74.4	(180)	White	80.2	(194)	0.1585
	Black	21.5	(52)	Black	15.7	(38)	0.1288
	Native American	1.2	(3)	Native American	0.0	(0)	0.2467
	Unknown	2.9	(7)	Unknown	4.1	(10)	0.5419
Average age	68.0 years			69.7 years			0.0697
Average days to follow-up with CPS	N/A			4.31 days			

CPS = clinical pharmacy specialist; N/A = not applicable.

cohort was determined by a random evaluation of individual electronic medical records. The comparator group was matched to ensure that the number of disease-specific discharge diagnoses was equivalent to the intervention group. Sample size was estimated assuming an estimated 25% current composite hospital reappearance rate. We estimated that 438 patients (219 in each group) would be required to detect a 20% relative reduction in the primary outcome, with a power of 80% and two-tailed alpha of 0.05. Baseline demographics were assessed as follows: continuous data were described using mean and standard deviation.

Regarding statistical analysis of primary and secondary endpoints, for continuous data the t-test was used to compare continuous variables between the control and the intervention group. Chi-square with Yates correction was used for dichotomous variables. SAS version 9.2 (SAS Institute, Cary, NC) was used for the analysis.

Results

The analysis included 484 patients (242 in each group). There were no significant differences between groups at baseline (Table 1). Cohorts were evenly matched with an equal representation of ACSC discharge diagnoses between the 2 groups (Table 2).

For the primary outcome of a composite 30-day all-cause acute care utilization rate, no statistically significant difference was identified, with 26.9% of patients in the intervention group, and 28.9% of the historical group readmitted or seen in the ED within 30 days of discharge ($P = 0.6852$; Table 3). However, the secondary outcome of a composite 90-day all-cause acute care utilization rate was significantly reduced, with 62.4% of patients readmitted in the intervention group compared with 74.4% in the comparator group ($P = 0.0062$).

For the secondary outcome of a composite 30-day index acute care utilization rate, the intervention cohort displayed a significant reduction, with 4.1% of patients readmitted in the intervention group compared with 16.9% in the comparator group ($P < 0.0001$). In addition, the composite 90-day index acute care utilization rate was also significantly reduced, with 16.1% in the intervention group versus 37.6% in the comparator group ($P < 0.0001$).

Individual outcomes listed by disease state are shown in Table 4. No individual disease state showed a statistically significant reduction in 30- and 90-day outcomes for all-cause acute care utilization rates. However, outcomes for the HF index acute care utilization rate, including 30-day index readmissions ($P = 0.0014$), 30-day index ED visits ($P = 0.0047$), and 90-day index readmissions ($P < 0.0001$) were significantly reduced.

Mortality within 30 and 90 days of discharge date was also tracked (Table 5). There was no difference in mortality at 30 days, but mortality was significantly reduced at 31-90 days in the intervention group compared with the comparator group. In the intervention group, 2 deaths occurred within 30 days of discharge—both patients had HF. Eight patients died within 90 days of discharge, with 6 patients referred for HF, and 1 patient each referred for diabetes and COPD. In the comparator group, 2 deaths occurred within 30 days of discharge—both patients had a discharge diagnosis of HF. Eighteen patients died within 90 days of discharge—16 patients had a discharge diagnosis of HF, and 2 patients had a discharge diagnosis of COPD.

Discussion

Optimal care coordination is needed to prevent readmission of patients during the care transition process. Specific to ACSC, innovative approaches using discipline-specific team members can be beneficial. Unlike previous studies of TOC programs involving pharmacists, the TOC initiative at VA-TVHS was, to our knowledge, the first to employ a method using both inpatient clinical pharmacists to provide CMM, education, and care coordination and the outpatient clinical pharmacy specialist to provide CMM within a scope of practice. This coordinated method allowed for a targeted approach in identifying patients that an outpatient clinical pharmacy specialist could see and evaluate interventions on readmission outcomes for select ACSC. Although all-cause acute care utilization rates were not decreased, a reduction in 30- and 90-day index acute care utilizations rates were seen, as well as a reduction in HF acute care utilization rates.

TABLE 2 Primary Versus Secondary Discharge Diagnoses for Intervention and Comparator Groups

Condition	Primary Discharge Diagnosis		Secondary Discharge Diagnosis		Total Patients
	Comparator	Intervention	Comparator	Intervention	
HF	144	144	39	39	366
COPD	32	32	1	1	66
HTN	3	3	2	2	10
DM	18	18	3	3	42
Total	197	197	45	45	484

COPD = chronic obstructive pulmonary disease; DM = diabetes mellitus; HF = heart failure; HTN = hypertension.

TABLE 3 Combined Outcomes

Outcomes	Comparator Group (n = 242)	Intervention Group (n = 242)	*P* Value
All-cause, % (n)			
30-day composite	28.9 (70)	26.9 (65)	0.6852
30-day readmission	12.8 (31)	12.4 (30)	0.8911
30-day ED visit	16.1 (39)	14.5 (35)	0.7048
90-day composite	74.4 (180)	62.4 (151)	0.0062
90-day readmission	35.1 (85)	30.6 (74)	0.3331
90-day ED visit[a]	39.3 (95)	31.8 (77)	0.1064
Index, % (n)			
30-day composite	16.9 (41)	4.1 (10)	0.0001
30-day readmission	11.2 (27)	2.9 (7)	0.0007
30-day ED visit	5.8 (14)	1.2 (3)	0.0135
90-day composite	37.6 (91)	16.1 (39)	0.0001
90-day readmission	27.3 (66)	11.6 (28)	0.0001
90-day ED visit	10.3 (25)	4.5 (11)	0.0243

[a]*Most common all-cause ED visit diagnosis included pain, chest pain, infection, and wound care in both groups.*
ED = emergency department.

Current literature provides support for the inclusion of clinical pharmacists in the TOC process. A recent systematic review and meta-analysis evaluated TOC interventions supported by clinical pharmacists for 30-day readmissions.[10] Fifty-six articles were evaluated and demonstrated a statistically significant 32% reduction in the odds of observed 30-day readmissions (odds ratio [OR] = 0.68; 95% confidence interval [CI] = 0.61-0.75) for clinical pharmacy-supported interventions compared with usual care. Milfred-LaForest et al. (2017) evaluated a pharmacist-led, multidisciplinary HF transitional care clinic with 135 patients who were diagnosed with HF. Pharmacist intervention demonstrated a 30-day all-cause readmission rate of 9%.[11] Medication discrepancies were identified in 53% of patients. Further, Hale et al. (2017) compared a pharmacist-managed transitional care HF bridge clinic to usual care and found a trend toward decrease in 90-day all-cause readmissions and death (adjusted hazard ratio [aHR] = 0.64; 95% CI = 0.40-1.02; $P = 0.06$). A significant time to first follow-up was shorter in the pharmacist intervention group (11 ± 6 vs. 20 ± 23 days; $P < 0.001$).[12] In this study, many of the patients were admitted for HF, which is reflective of the heavy burden of HF on health care systems. Patients recently discharged for decompensated HF may be unstable and require frequent monitoring and intervention.

Because of the delicate nature of volume management, collaboration between cardiology providers and pharmacists to identify patients appropriate for clinical pharmacy specialist management during transitions of care is prudent. Our study adds to growing evidence that pharmacist-directed medication management is a viable option to further optimize care for HF patients after discharge and improve clinical outcomes. The significant decrease in acute care use with a cardiology clinical pharmacy specialist intervention for select HF patients continues to be evaluated at VA-TVHS with an ongoing cost-effectiveness analysis.

While there was a less robust representation of patients discharged after admission for diabetes, hypertension, or COPD, it is noteworthy that readmission rates and ED appearances, especially those for index conditions, were numerically reduced. Although statistical significance was not met for the primary outcome of composite 30-day all-cause readmissions and ED visits, the clinical significance should be highlighted.

This unique clinical pharmacist-to-clinical pharmacy specialist approach to care coordination systematically redistributed workload in a health care climate currently seeking means to meet the increasing demand on primary care provider access. The ACSC identified for this initiative represent a large percentage of hospital readmissions and have therapeutic outcomes extensively driven by appropriate pharmacotherapy management, of which clinical pharmacy specialists are well suited to address. By allowing clinical pharmacy specialists to provide the 10-day postdischarge visit, primary care provider visits could be delayed thus creating supply for evaluation of other patients.

In a recent study at the same site, PACT providers were surveyed regarding the contribution of PACT clinical pharmacy specialists to the PACT team.[13] Specifically, primary care providers were asked 2 questions regarding the ability of the PACT clinical pharmacy specialists to decrease the wait time for patients to receive primary care services and if the clinical pharmacy specialists improved their job satisfaction. Physicians indicated that they had a higher perception of improved access to their clinic (4.36 on a scale of 1-5), while nurse practitioners and physicians reported an increase in job satisfaction (4.67 and 4.59, respectively).[13]

TABLE 4 Acute Care Utilization Rates by Disease State

	Comparator Group (n = 242) % (n)	Intervention Group (n = 242) % (n)	*P* Value
30-day all-cause readmission			
HF (n = 183)	14.8 (27/183)	14.2 (26/183)	0.8819
COPD (n = 33)	6.1 (2/33)	9.1 (3/33)	0.6418
HTN (n = 5)	20.0 (1/5)	20.0 (1/5)	1.0000
DM (n = 21)	4.8 (1/21)	0.0 (0/21)	0.3115
30-day all cause ED visit			
HF (n = 183)	16.4 (30/183)	14.8 (27/183)	0.7731
COPD (n = 33)	12.1 (4/33)	12.1 (4/33)	1.0000
HTN (n = 5)	20.0 (1/5)	20.0 (1/5)	1.0000
DM (n = 21)	19 (4/21)	14.3 (3/21)	0.6788
90-day all-cause readmission			
HF (n = 183)	39.9 (73/183)	33.9 (62/183)	0.2787
COPD (n = 33)	9.1 (3/33)	27.3 (9/33)	0.1106
HTN (n = 5)	20.0 (1/5)	20.0 (1/5)	1.0000
DM (n = 21)	38.1 (8/21)	9.5 (2/21)	0.0701
90-day all-cause ED visit			
HF (n = 183)	42.6 (78/183)	33.3 (61/183)	0.0848
COPD (n = 33)	18.2 (6/33)	30.3 (10/33)	0.3889
HTN (n = 5)	20.0 (1/5)	20.0 (1/5)	1.0000
DM (n =21)	47.6 (10/21)	23.8 (5/21)	0.1977
30-day index readmission			
HF (n = 183)	12.0 (22/183)	2.7 (5/183)	0.0014
COPD (n = 33)	9.1 (3/33)	6.1 (2/33)	0.6418
HTN (n = 5)	20.0 (1/5)	0.0 (0/5)	0.2918
DM (n = 21)	4.8 (1/21)	0.0 (0/21)	0.3115
30-day index ED visit			
HF (n = 183)	6.6 (12/183)	0.5 (1/183)	0.0047
COPD (n = 33)	3.0 (1/33)	3.0 (1/33)	1.0000
HTN (n = 5)	0.0 (0/5)	20.0 (1/5)	0.2918
DM (n = 21)	4.8 (1/21)	0.0 (0/21)	0.3115
90-day index readmission			
HF (n = 183)	30.6 (56/183)	12.0 (22/183)	0.0001
COPD (n = 33)	18.2 (6/33)	18.2 (6/33)	1.0000
HTN (n = 5)	60.0 (3/5)	0.0 (0/5)	0.1675
DM (n = 21)	4.8 (1/21)	0.0 (0/21)	0.3115
90-day index ED visit			
HF (n = 183)	8.7 (16/183)	4.9 (9/183)	0.2138
COPD (n = 33)	18.2 (6/33)	3.0 (1/33)	0.1098
HTN (n = 5)	20.0 (1/5)	20.0 (1/5)	1.0000
DM (n = 21)	9.5 (2/21)	0.0 (0/21)	0.4687

COPD = chronic obstructive pulmonary disease; DM = diabetes mellitus; ED = emergency department; HF = heart failure; HTN = hypertension.

TABLE 5 Mortality Rates

Mortality	Comparator Group (n = 242) % (n)	Intervention Group (n = 242) % (n)	*P* Value
Within 30 days	0.8 (2)	0.8 (2)	1.0000
Within 31-90 days	6.6 (16)	2.5 (6)	0.0495

Limitations

There are notable limitations to this initiative. Enrollment of patients was reliant on referral by inpatient clinical pharmacists. This could be perceived as a limitation, since there were some appropriate patients who may have not been referred due to workload of the clinical pharmacist, especially during times with limited clinical pharmacist coverage, such as evening or weekend discharges. Processes using dashboard evaluation were put in place to minimize this situation, but patients could have been missed during off hours or weekends. Also, patients who declined enrollment in the TOC initiative were not accounted for in this analysis.

Another limitation of the study was the use of the VA electronic medical record, which does not capture all readmissions and ED visits that occur outside VA-TVHS and could lead to a possible bias. However, equal opportunity existed for the comparator and intervention groups, since most outside admissions and ED visits are reported for inquiry of facility transfer or billing, although some are not, which could account for an underreporting of outcomes in the comparator and intervention groups. External validity could be perceived as low, since most health care systems may not be as integrated with inpatient and outpatient clinical pharmacists. In addition, VA patients may seek or be admitted in hospitals closer to their homes versus being admitted at the parent facility.

Our study is one of the first to identify at-risk patients by using rounding clinical pharmacists in the acute care arena and coordinating care systematically with a clinical pharmacy specialist practicing under a scope of practice targeted for CMM. Our study demonstrates that when this process is considered, a reduction in acute care utilization rates for HF at 30 and 90 days can be achieved, even though the overall primary endpoint was not met.

Conclusions

Hospital admissions and ED visits for ACSC are considered largely preventable if the appropriate outpatient care is provided. With expanding clinical pharmacy involvement in inpatient and outpatient management of chronic disease states, pharmacist-to-pharmacist collaboration to coordinate CMM by clinical pharmacists did improve management for HF, hypertension, COPD, and diabetes and reduced acute care utilization rates for recently admitted patients. Clinical pharmacists hold a unique skill set and the appropriate clinical knowledge to play a vital role in providing clinically significant and timely care to patients that have recently been discharged from the hospital.

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