The Triple Aim of health care addresses the need to improve the quality of care, improve the health of populations, and decreasing the cost of care [1]. High hospital readmission rates are an area where the nation continues to fall short of these goals. Nationally, 1 in 5 Medicare patients is readmitted to the hospital within 30 days of discharge [2]. The cost for these readmissions is estimated at $26 billion annually, with $17 billion in preventable expenses [3].

All too often, these hospital readmissions are a product of poor care transitions in a fragmented health care system [3]. A growing body of evidence indicates that patients are especially vulnerable to negative outcomes during transitions of care. A recent article identified medication errors in 50.8% of patients who were discharged from the hospital; 22.9% of these errors were serious [4]. Additionally, 30.3% of these patients reported an adverse drug event [4].

In January 2013, the Centers for Medicare & Medicaid Services introduced transitional care management (TCM) services with the goal of reducing readmissions and improving care coordination [5]. Nationally, significant efforts are underway to reduce unnecessary readmissions by improving transitions of care. Hospitals, primary care offices, and outpatient pharmacies have all piloted projects to decrease readmissions. Interventions are diverse and utilize different members of the health care team. Results have been mixed [3-11].

In one program, a group of primary care providers (PCPs) in Oregon implemented a multicomponent intervention utilizing post-discharge calls by nurses and care managers, enhanced communication between the hospital and the clinic, and timely access to PCPs after discharge. This intervention decreased hospital readmission rates from 27% to 7.1% [6]. Another intervention utilizing post-discharge calls from care coaches also decreased readmission rates compared to a control group (12.8% versus 20.0%) [4].

Other efforts have not shown significant changes in readmission rates. A transition-of-care intervention by pharmacists in the hospital setting failed to show a reduction in 30-day readmissions. For the enhanced intervention group, pharmacists verified medication lists with the community pharmacy, made recommendations to the inpatient team, faxed a discharge plan to the PCP, and called the patient after discharge to evaluate adherence. Despite this intervention, 30-day health care utilization was similar in both groups (28.8% versus 29.6%) [7].

The current study assessed the implementation of an integrated, team-based TCM service incorporating nurse care managers (NCMs) to facilitate early patient communication, clinical pharmacists to provide medication reconciliation, and PCPs to follow up with patients soon after discharge. We assessed the impact of this intervention on 30-day hospital readmission rates.
Objective

The primary objective of this study was to compare the 30-day hospital readmission rates for patients at increased risk for readmission in the period before versus after implementation of a team-based TCM service. The secondary objective was to determine the level of patient participation with the service.

Methods

Site Description

Mountain Area Health Education Center (MAHEC) houses a large academic family medicine practice that focuses on interdisciplinary, integrated care. A team of physicians, pharmacists, behavioral medicine specialists, nurses, and care coordinators provides services for more than 15,000 patients in Western North Carolina. In addition to outpatient services, MAHEC provides inpatient family medicine at an 800-bed, tertiary-care, community teaching hospital in the region. The inpatient family medicine service team consists of a single family medicine faculty physician, 2 residents, and 1 clinical pharmacist. All of these team members are MAHEC employees with hospital privileges who provide inpatient care for all patients admitted to the hospital.

Intervention

In April 2013, MAHEC implemented a team-based approach to TCM with the goal of reducing readmission rates for patients discharged from the family medicine service to a community-based independent living situation. There were 3 main components to this intervention, designed to meet Medicare’s requirements for TCM services [5]. Each step in the TCM process is outlined in Figure 1.

Contact with a NCM. While the patient was still in the hospital, the discharging resident family physician identified eligible patients and alerted the NCM via a message in the electronic health record (EHR) of the need for TCM services. The NCM then contacted the patient by phone within 2 business days of discharge to schedule pharmacy and physician follow-ups and to obtain the patient’s self-reported health status. The NCM also maintained a patient registry to follow patient participation in the intervention and to ensure proper, timely billing. The TCM patient registry consisted of an Excel spreadsheet with information extracted from the EHR.

Medication reconciliation. The clinical pharmacist then called the patient and/or caregiver to provide medication reconciliation using inpatient and outpatient electronic medical records (Cerner and Allscripts, respectively). The pharmacist worked under a North Carolina clinical pharmacist practitioner license, which allowed him to exercise prescriptive authority under the supervision of a physician [12]. During the phone encounter, the pharmacist inquired about the patient’s current health status and his or her understanding of what occurred during the hospital stay; assessed the accuracy of the patient’s current medication list compared to outpatient and inpatient records; identified and addressed any drug-related problems the patient was experiencing; inquired about the filling of any new or changed medications; updated the EHR with an accurate medication list; and confirmed the date and time of the patient’s PCP appointment. Ideally, the pharmacist completed this component of the intervention and the patient received medication reconciliation prior to seeing the physician. If the pharmacist was not able to contact the patient prior to the PCP visit, then the physician completed the medication reconciliation at the time of the visit.

Follow-up visit with the physician. Lastly, the patient completed a comprehensive follow-up visit with the physician in the outpatient setting. The amount of time from discharge to the follow-up visit was based on the patient’s risk level. MAHEC defines high-risk patients as those with 0 or more active diagnoses managed in the hospital; 10 or more medications; or a diagnosis of pneumonia, dyspnea, or shortness of breath on the hospital discharge summary. Moderate-risk patients were defined as those with 3–5 diagnoses or 5–9 medications on the hospital discharge summary. Patients identified as being at high risk for hospital readmission were seen within 7 days, and those at moderate risk were seen within 14 days. During the office visit, the physician reviewed the medication reconciliation and addressed all diagnoses mentioned in the discharge summary. All attempts are made to schedule this visit with the patient’s PCP or with another physician at MAHEC who was familiar with the patient’s hospital course.

Study Design

We conducted a retrospective study that compared readmission rates before versus after implementation of the TCM service. The Mission Hospital Institutional Review Board determined that this project was a quality improvement evaluation of a new standard of care offered in our clinics, not human subjects’ research. Patients were included in the study if they received primary care at MAHEC and were discharged from the family medicine service of Mission Hospital in Asheville, North Carolina. The before-implementation group was considered the usual care (UC) group; these patients had hospital discharges between October 2011 and September 2012, prior to implementation of the TCM service. The TCM group had hospital discharges between March 2013 and February 2014. We excluded hospital discharges that occurred from October 2012 through February 2013 because some pharmacy interventions occurred during this time.

For the UC group, we used billing records to identify 100 at-risk patients with 134 index hospital discharges during the prespecified time period. For the TCM group, we identified 164 at-risk patients with 188 index discharges using the TCM patient registry. Each patient’s first hospital discharge in the study timeframe was counted as an index discharge.
Discharges from admissions more than 30-days later were counted as a new index discharge.

**Data Extraction and Statistical Analysis**

We reviewed hospital discharge summaries in the inpatient EHR for patients in the UC group to determine the patient’s risk level (high versus moderate) at the time of the index discharge and to see whether any readmissions occurred within 30 days. To determine risk level, the number of medications and diagnoses recorded in the discharge summary were counted, and the risk level was assigned according to the intervention guidelines described previously. To determine whether a readmission occurred within 30 days, we subtracted the date of a subsequent admission from the date of the most recent prior discharge. If this number was less than or equal to 30, it was counted as a readmission within 30 days. If the subsequent admission occurred after 30 days, the discharge date for this inpatient hospitalization was used as a new index discharge date. For the TCM group, this same information was extracted from the TCM patient registry, and it was verified by review of the inpatient hospital discharge summary.

Data on patients’ participation in the intervention was extracted from the TCM patient registry and confirmed by review of the outpatient EHR. TCM patients’ participation in each of the 3 components of the intervention was recorded: NCM phone call (yes/no), medication reconciliation (yes/no; provider), and timely clinical appointment based on risk level (yes/no).

All data review was done manually; data points entered for analysis included a unique study identification number, the patient’s risk level, the number of index discharges, readmission within 30 days (yes/no), and the 3 participation variables (TCM group only). Data were analyzed using SPSS version 21.0.0.1.

Using an intent-to-treat strategy, we compared the overall rate of readmissions within 30 days before versus after implementation of TCM using a chi-square analysis with Yates correction. We repeated the comparisons separately for each patient risk level because high-risk patients are at greater risk for readmission within 30 days than are moderate-risk patients. We calculated the rate reduction in readmissions—within 30 days, overall, and separately for high-risk and moderate-risk patients—by subtracting the after-intervention rate from the before-intervention rate and dividing the difference by the before-intervention rate. The level for significance was \( P < .05 \). We present the rates of readmission within 30 days, the percent rate reduction, and descriptive statistics of TCM patients’ participation with the intervention per discharge.
Results

Overall Readmission Within 30 Days

Patients' participation in TCM was associated with a significant reduction in 30-day hospital readmissions. In the UC group, there were 19 (14.2%) hospital readmissions within 30 days compared to 10 (5.3%) hospital readmissions within 30 days in the TCM group ($P = .011$; see Figures 2a and 2b). Readmissions within 30 days were reduced by 62.6%.

Readmission Within 30 Days by Patient Risk Level

At the time of the 134 index discharges in the UC group, 29 (21.6%) patients were coded as being at moderate risk for readmission, and 105 (78.4%) patients were coded as being at high risk for readmission. At the time of the 188 index discharges in the TCM group, 62 (33%) patients were coded as being at moderate risk for readmission, and 126 (67%) patients were at high risk ($P = .0356$).

Among those at moderate risk, we saw a 77.5% reduction in readmissions in the TCM group (UC = 3 readmissions [2.2%] versus TCM = 1 readmission [0.5%]; $P = .394$). Among those at high risk, we saw a 59.7% reduction in readmissions in the TCM group (UC = 16 readmissions [12%] versus TCM = 9 readmissions [4.8%]; $P = .031$).

Patient Participation in TCM Intervention

Of the 188 index discharges in the TCM group, the majority of patients participated fully in the intervention, completing all 3 components ($n = 166$ [88.3%]; see Figure 3). The clinical pharmacist completed the medication reconciliation with just over half of the discharged patients ($n = 110$ [58.5%]; see Table 1).

Of the 10 TCM readmissions, all but 1 of the patients participated fully in the intervention. One high-risk patient who was readmitted within 30 days spoke to the NCM by phone and attended a follow-up visit with the physician but did not have documentation of medication reconciliation.

Discussion

The hospital readmission rate for patients at risk of rehospitalization was significantly lower following the implementation of a team-based TCM intervention. This reduction in hospital readmission rate, to 5.3%, is not only a significant decrease from baseline (14.2%), but is also far lower than the national average of 18.4% [3]. There are several elements that may have contributed to this substantial reduction. First, the NCM contacted the patient soon after hospital discharge. This provides an opportunity to assess the status of the patient and detect changes in health; strengthen the patient-provider relationship by engaging the patient after discharge; reduce the risk of loss to follow-up; and coordinate care between busy providers in different arenas.

Second, utilizing pharmacists in this model allowed for early detection of medication-related problems. Patients are most vulnerable to medication-related problems when transitioning between settings of care [3]. Clinical pharmacists have the skill set to identify and resolve these problems [13, 14]. Importantly, since the pharmacists worked under a collaborative practice agreement, they were able to resolve any issues identified at the time of the encounter. Also, since the pharmacists are embedded within the physician’s practice, they were able to effectively communicate any changes in medications directly to the physician through the EHR.

Third, prompt follow-up with the PCP allowed timely assessment of the patient after discharge, at which time any decline in patient status could be addressed in the outpatient setting. In addition, the provider should have more time to focus on the patient’s clinical condition at this visit, as medication-related problems had already been addressed.

Although the Centers for Medicare & Medicaid Services considers the additional work TCM places on the health care team, it is unclear if this higher reimbursement rate is sufficient to pay for the additional time and expenses required for this intervention. Further assessment is needed to quantify the cost of managing the registry, calling patients, utilizing clinical pharmacists for medication reconciliation, and coding audits to ensure timely and compliant billing.
Limitations

Several limitations of this study are worth noting. This model was implemented in an outpatient family medicine residency program; thus, this study cannot determine the effectiveness of this model in other clinic environments. Generalizability is also limited by other factors. Because this was a health care quality improvement evaluation project, we did not do a power analysis a priori. The post-hoc power analysis for the overall rate of readmission within 30 days indicated a power of .76 (2-tailed; \( P < .05 \)). Additionally, the retrospective pre-versus-post-implementation study design allowed us to show an association between the transition of care intervention and hospital readmission rates. However, a prospective trial would be needed to show causality.

We did not monitor the completeness of the referral process by the resident family physician, so there may have been eligible patients who did not receive the TCM service. We also did not assess the intervention from the patients’ perspectives (ie, satisfaction with services, willingness and/or ability to complete medication reconciliation over the phone, etc.).

Not all patients received the enhanced medication reconciliation by the pharmacist, although this was the study’s goal. A small number of patients had their medications reconciled by the NCM via phone when a pharmacist was not available. We did not monitor reasons why the pharmacist-led medication reconciliation did not occur prior to all PCP follow-up visits. We suspect that the most likely cause was the inability of the pharmacist to reach the patient by phone for a sustained conversation within the short window of time prior to the patient’s physician appointment. Physician follow-up visits are often scheduled 1–2 days after discharge, leaving only a few hours to reach the patient by phone.

With respect to the medication reconciliation component, there were a small number of patients for whom we did not find documentation of medication reconciliation within the EHR. Although we expect that the patient’s medications were reconciled at every office visit, the correct documentation is not always evident. Documentation omissions may limit our ability to accurately capture everything that occurred during the visit. Furthermore, we did not track medication-related problems addressed during medication reconciliation with the pharmacist; thus we are unable to describe the types of interventions typically made by the pharmacist.

There was a higher rate of high-risk patients in the UC group compared to the TCM group, which may partially explain a higher readmission rate prior to the implementation of TCM. However, both risk groups saw substantial reductions in readmission rates after implementation of the intervention. Also, while the reduction for moderate-risk
patients was not statistically significant, this reduction was actually larger than that of the high-risk group; the lack of significance was most likely due to the small sample size.

Conclusion

Implementation of a team-based TCM program substantially reduced the rate of readmissions within 30 days among patients who were at increased risk for hospital readmission. Continued assessment of this team-based TCM model is needed to determine if the impact on readmission rates can be sustained, if the intervention can be improved to ensure all patients receive medication reconciliation with a clinical pharmacist, and if the intervention is financially sustainable as designed. NCMJ

Bill Hitch, PharmD, BCPS, CPP director of pharmacotherapy, Division of Family Medicine, Mountain Area Health Education Center, Asheville, North Carolina; assistant professor of clinical education, Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Anna Beth Parlier, BS research project manager, Center for Research, Mountain Area Health Education Center, Asheville, North Carolina.

Lisa Reed, MD physician, Division of Family Medicine, Mountain Area Health Education Center, Asheville, North Carolina.

Shelley L. Galvin, MA director, Center for Research, Mountain Area Health Education Center; assistant professor, Department of Obstetrics and Gynecology, University of North Carolina School of Medicine, Asheville, North Carolina.

E. Blake Fagan, MD residency program director, Division of Family Medicine, Mountain Area Health Education Center, Asheville, North Carolina.

Courtenay Gilmore Wilson, PharmD, BCPS, BCACP, CDE, CPP associate director of pharmacotherapy, Division of Family Medicine, Mountain Area Health Education Center, Asheville, North Carolina; assistant professor of clinical education, Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

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