Hospital Readmission Among Participants in a Transitional Case Management Program

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Objective: To examine the relationship between participation in a large wellness and care management company's transitional case management (TCM) program and hospital readmission.

Study Design: Retrospective cohort study.

Methods: A total of 10,258 members were identified as either participants or nonparticipants in TCM from data archives of a large healthcare company. Engagement and claims data were analyzed using multivariable logistic regression. Readmission predictors that were studied included TCM engagement, the major diagnostic categories of "musculoskeletal" and "digestive," length of stay for the initial hospitalization, cost of initial inpatient stay, risk score, age, and sex.

Results: Readmission rates were lower among individuals who were engaged in TCM compared with those who were not engaged. Within 30 days, 12.66% of individuals participating in TCM were readmitted to the hospital compared with 35.85% of those not participating (*P* <.0001). In the first 30 days, individuals who did not participate in TCM were almost 4 times more likely to have a hospital readmission than those who did participate. The most important predictor of hospital readmission was engagement in TCM. Individuals who were engaged in the program were less likely to be readmitted than those not engaged in the program (*P* <.0001).

Conclusion: Implementation of a telephonic TCM program was associated with lower rates of readmission within 30 days. Timely engagement in TCM was associated with a lower likelihood of readmission.

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Interest in reducing healthcare costs continues to grow in the national debate on healthcare reform. An important element in this debate is the impact of hospital readmissions on overall healthcare costs. Appropriate discharge planning and transitional case management (TCM) programs are frequently touted in health service literature as potentially successful interventions to improve care and curb cost by reducing or preventing unnecessary readmissions. These programs facilitate care transition from acute care to the home setting, and strive to reduce or prevent unplanned readmissions. Additionally, it has been suggested that program interventions are associated with increased patient satisfaction and overall well-being.[1]

Despite tremendous efforts by healthcare providers and hospitals, readmissions are a common occurrence, as many patients experience difficulties in the first few days and weeks after discharge from an acute care facility. Communications among healthcare providers and between providers and patients/caregivers remain inadequate or lacking.[2] These difficulties commonly result in readmissions to acute care facilities that could have been avoided. Depending on diagnosis, between 5% and 30% of adult medical–surgical patients are readmitted to the hospital within a month.[3-5]

Transitional case management programs are expected to reduce preventable hospitalizations by providing a framework for assessing patients' and caregivers' understanding of their condition(s) and increasing adherence to their management plan after discharge.[6] Patients may have problems understanding discharge instructions or adherence to medications. They also may ignore their follow-up appointments with doctors and other healthcare providers. Almost all of these care gaps and barriers are frequently addressed by most TCM programs. It is imperative that healthcare programs engage individuals in their care during this critical time of their illness. Engaging patients or caregivers can occur in many ways, including face-to-face discussions and via telephone or mail.

This study illustrates the impact of a TCM program offered and operated by a national healthcare company. The program proactively monitored and managed hospitalized patients immediately after their discharge to ensure a safe transition to home. Patients identified for this activity were considered high risk for readmission due to their underlying illness, length of hospitalization, or other complex discharge plans.

PROGRAM DESCRIPTION

The TCM program being studied in this analysis was a

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postdischarge, telephonic, patient-centric program that aimed to close gaps in care for patients after leaving the hospital and returning home. Many patients leave acute care facilities without adequate discharge planning, resulting in unnecessary readmissions. Premature and unnecessary rehospitalizations may result from patients' failure to schedule outpatient follow-up visits; lack

Take-Away Points

A telephonic transitional case management (TCM) program for patients discharged from an acute care facility was effective in reducing readmissions within 30 days.

■ The readmission rate for participants in TCM was 12.66% compared with 35.85% for nonparticipants.

■ Patients who did not participate in TCM were almost 4 times more likely to be readmitted compared with those who did participate in the program.

■ The most important predictor of hospital readmission was participation in TCM.

of follow-up plans with other providers; lack of scheduled necessary laboratory, radiologic, and specialized testing; and absent or inappropriate therapeutic pharmaceutical interventions (such as missing evidence-based therapy, drug duplications, or severe adverse drug reactions).

Case managers used specific tools and assessments to find and then close gaps in care. They discussed with patients their discharge/follow-up plans, including their medications, and assessed their level of functioning (including activities of daily living and cognitive status). Moreover, they conducted a depression screen, safety risk assessment, and caregiver status assessment (if applicable), and identified economic barriers to care such as lack of transportation, caregivers, or personal funds. Case managers educated patients and/or caregivers to increase their understanding of the disease process and facilitated adherence to treatment plans including self-care and other home-based care such as dressing changes and infusions. Lastly, case managers conducted a condition-specific assessment relative to the primary discharge diagnosis (eg, coronary artery disease, cancer, stroke, asthma).

Because it was critical to address potential care gaps in a timely manner to prevent readmission, this TCM process started with 2 attempts by the case manager to contact the patient by telephone within 3 business days of discharge. If the first call failed to contact the patient, the case manager left a toll-free number and requested a call back. If the case manager did not receive a call back within 2 business days of the first attempt, a second call was attempted. If that failed, the case manager sent an "unable to reach" letter to those who could not be reached. In this letter, the patient was urged to contact the case manager at the toll-free number provided in the letter. The case was left open on the case manager's list for 15 business days. If the patient was readmitted to the hospital (resulting in an inability to reach the patient), the process was started again after discharge. If the patient did not respond to the letter and did not initiate a contact with the case manager, a third and final call attempt was made. If there was no answer, the case manager left a final message to let the patient know that calls would no longer be forthcoming. The case manager provided a contact number again for future use and then closed the case.

At all times, TCM staff encouraged patients to participate in the program. Case managers used their critical thinking and clinical judgment to identify gaps in care relevant to the disease, current patient condition, discharge instructions, and adherence to care plans. If the patient was not well versed in his or her discharge instructions, the case manager contacted the physician to better understand the discharge instructions and then educated and supported the patient to boost compliance with discharge instructions. For example, after assessing barriers to follow-up care (as mentioned above), the case manager might educate the patient about available options or solutions such as community resources (for financial barriers), the need for making or keeping follow-up appointments with providers, medications gaps, or referrals to other internal or external specialized programs (eg, behavioral health referrals for depression management, cancer or transplant management programs, mail order programs).

Case managers had full access to a physician medical director whom they could ask for guidance on all clinical and nonclinical gaps in care. This communication was encouraged and could occur via instant messaging, e-mail, telephone, or in person. The medical director contacted the physician primarily responsible for out-of-hospital care, as necessary, to produce an appropriate readmission prevention plan. In addition to their clinical judgment, case managers could use specific job aids that guided them in determining which cases needed to be referred to the medical director. Afterward, those activities were recorded in real time and stored on a proprietary computer platform. This computer system enabled tracking of all activities and documentations, and linked them to other desired data on process or outcome of care. At their discretion, TCM staff could use 1 or more calls to close outstanding care gaps and prevent unnecessary and costly readmissions.

In patients under the age of 18 years or those unable or unwilling to talk, case managers conducted the above assessments by talking to the legal guardian or a known caregiver. Legal permission may have been required and was obtained prior to discussing patients' care issues, including gaps and interventions.

The purpose of this study was to examine the relationship between participation in a TCM program and hospital readmission.

■ Figure 1. Major Inclusion and Exclusion Criteria

> **Initial data pull to include:**
>
> - Inpatient hospital stay between April 1, 2007, and June 30, 2008
> - Only confinement types that were "MED" or "SURG"
>
> **Initial data pull to exclude:**
>
> - Patient aged <1 or >100 years
> - Behavioral health-related admissions
> - Pregnancy-related admissions
> - Medicare or Medicaid as the primary payer
>
> **n = 609,919**

> **Qualified initial admission to home plus the following exclusions:**
>
> - First diagnosis was missing
> - Fewer than 4 months' continuous enrollment postdischarge
> - Patient was coded deceased
>
> **n = 258,968**

> Excluded patients who were engaged in complex condition, case management, or disease management programs within 3 months prior to initial inpatient stay
>
> **n = 247,802**

> Identified for transitional case management, met program eligibility, were not on the "do not call" list, and were not included in other interventional studies/programs
>
> **n = 10,258**

METHODS

Study Design

This was a retrospective cohort study. Patients were identified as eligible for this study if they had an initial hospitalization between April 1, 2007, and June 30, 2008. (Additional inclusion/exclusion criteria are detailed in **Figure 1.**) Individuals with an initial hospitalization were then followed for 30 days to determine whether a readmission occurred.

To accurately reflect the impact of a TCM program, readmission rates were calculated for those participating and not participating during the same time periods: within 7 days, within 15 days, and within 30 days. These time periods were chosen to clearly establish the temporal relationship between the case manager intervention and readmissions. The intervention (case manager call and patient participation in the program) had to precede the readmission. For example, if program participation occurred 2 to 6 days after discharge and a readmission was avert-

ed within 7 days after discharge, that was considered an intervention success and counted in the study. On the contrary, if the intervention occurred 10 to 14 days after discharge and the averted readmission occurred only 7 days after discharge, that case was not counted (ie, the intervention was not within the time frame for the outcome of interest; therefore, there was no association between outcome and intervention).

The participant group was identified as patients who had an initial hospitalization during the selected time period (April 2007-June 2008), who were identified for the TCM program within a certain time period of initial discharge date (within 7 days, within 15 days, and within 30 days), and who participated in TCM during the same category time period. Patients were considered participants in the program if they met at least 1 of the following criteria: they had an assessment done, an intervention such as a scheduled follow-up visit to their doctor was completed by their TCM nurse, or an indicated therapeutic intervention was arranged.

The nonparticipant group was identified as patients who had an initial hospitalization during the selected time period (April 2007-June 2008), who were identified for the TCM program within a certain time period of initial discharge date (within 7 days, within 15 days, and within 30 days), and who did not participate in TCM during the same category time period.

Data Sources

Data for this study were extracted from 2 data sources that were merged to form a single data set. The first step was identifying and then extracting admission data from a large healthcare company's data files. Information on contacts, enrollment, and participation in TCM was obtained from a data set specially designed to house intervention and engagement efforts in our study population. After linking these secondary data to the original admission cohort (see Study Design), the following information was collected: identification for TCM participation, actual participation (or nonparticipation) in TCM, date of participation, and time (in days) from discharge to participation.

Analysis

Univariate analyses were conducted using χ^2 tests or t tests as appropriate. Odds ratios (ORs) were calculated when applicable. All analyses were performed with SAS version 9.1.3, executed on an AIX 5.3 platform (SAS Institute Inc, Cary, NC).

A backward elimination multivariate logistic regression analysis was conducted to further study the relative impact

of various independent variables on readmission (dependent variable) and to produce a predictive model for evaluating the program intervention. Independent variables included TCM participation, major diagnostic categories, length of stay for the initial hospitalization, age of patient, sex of patient, and cost of initial hospitalization.

RESULTS

Cohort Identification

Several criteria were applied to create the initial data pull and to produce a final study data set of 10,258 individuals, as noted in the Data Sources section. Figure 1 shows the number of initial and final TCM program cohorts (or patient cohorts) after application of appropriate program inclusion/exclusion criteria.

Population Description

Among the study population, 49% were female and 51% were male. The average age of participants was 50 years, and the average length of the initial hospitalization was 5.2 days. The most common major diagnostic categories were musculoskeletal, circulatory, digestive, and respiratory. The average reimbursed charges for each admission were approximately $20,000. The average severity score, as measured by Symmetry Episode Risk Groups (ERGs), was 16.[7] Episode Risk Groups predict current and future healthcare use for individuals by creating risk measures that incorporate episodes-of-care methodology, medical and pharmacy claims information, and demographic variables.

In the 30-day time period, 88% of individuals participated in the TCM program and 12% did not participate. Among the nonparticipants, 60% (771) could not be reached by the case manager using the previously described outreach protocol. Possible reasons for inability to reach those identified for the TCM program include incorrect telephone numbers, not being at home at the time of contact, and inaccurate mailing addresses. Another 30% (388) of the nonparticipant group was composed of individuals who were contacted by a case manager but after assessment were determined to need no further intervention. This may have been because the patient was adherent to, or adequately progressing through, the post-hospitalization treatment plan. The remaining 10% (127) refused to participate in the TCM program or had disenrolled from the insurance plan.

Readmission rates were statistically different between the participant group (13%) and nonparticipant group (36%) (P < .0001). Age, sex, and cost of initial hospitalization were comparable between the 2 groups (Table 1). Risk scores were not substantially different between the 2 groups, with an average ERG score of 16 for TCM participants (meaning they were

16 times more likely than a person with a risk score of 1, or the risk of an average person in the study population, to use healthcare resources) and 17 for nonparticipants (meaning they were 17 times more likely than a person with a risk score of 1 to use healthcare services). The average length of hospital stay among participants within 30 days was 5.1 days, and the average length of stay among nonparticipants within 30 days was 5.9 days (P <.0001). The major diagnostic categories of circulatory, digestive, and musculoskeletal were different between the groups.

In summary, the 2 groups were generally similar to each other with regard to age, sex, and cost of initial admission. The differences in length of stay, which could have been because of illness severity and/or diagnosis, were not disconcerting given the above ERG risk scores. In any event, adjustment for these confounding factors was carried out in multiple regression modeling.

Regression Analysis

A backward elimination multivariate logistic regression analysis was conducted to determine the predictors of readmission while adjusting for several factors, including age, sex, length of stay, risk score, major diagnostic categories (musculoskeletal, circulatory, digestive, and respiratory), initial cost of admission, and participation in TCM. The most important predictor of hospital readmission was participation in TCM (OR, 0.334; 95% confidence interval [CI], 0.257-0.433; P <.0001). Participation was a statistically significant predictor (as a protective factor). Those who participated in the program were less likely to be readmitted than those who did not participate in the program.

Another important predictor of readmission was risk group (OR, 1.125; 95% CI, 1.092-1.159; P <.0001). Risk scores are measures of severity, and individuals with high risk scores often have longer lengths of stay, more serious conditions, or more costly initial hospital admissions. Holding the other factors constant, those with a higher risk score (as measured by ERGs) were at increased odds of a hospital readmission.

Strength of Association

To ascertain the strength of the association of TCM participation and readmission, differences in the timing of participation among participants at 7-, 15-, and 30-day intervals were analyzed. Readmissions within 30 days were lower among participants in TCM compared with nonparticipants.

The impact of program participation was more pronounced (highest) within the first 7 days and persisted throughout the first month after discharge. The relationship was found to be statistically significant for all time periods and groups (Figure 2). Odds ratios were compiled for each time period (within 7 days, within 15 days, and within 30 days) to predict readmission for participants.

■ **Table 1.** Characteristics of TCM Participants and Nonparticipants (30-Day Interval) and Primary Endpoint of Readmission

Characteristic	TCM Participant (n = 8972)	TCM Nonparticipant (n = 1286)	P
Average age (continuous)	50.1 years	49.6 years	.3097
Female (categorical yes/no)	48.8%	49.0%	.8793
Average initial LOS (continuous)	5.1 days	5.9 days	<.0001
Average initial covered amount (continuous)	$20,443	$20,642	.7893
Circulatory MDC (categorical yes/no)	21.8% yes	17.4% yes	.0003
Digestive MDC (categorical yes/no)	11.5% yes	19.1% yes	<.0001
Musculoskeletal MDC (categorical yes/no)	23.3% yes	11.9% yes	<.0001
Respiratory MDC (categorical yes/no)	11.3% yes	10.3% yes	.3294
Readmission within 30 days	12.7%	35.9%	<.0001
Prospective risk group (ERG score)	16	17	<.0001

ERG indicates Episode Risk Group; LOS, length of stay; MDC, major diagnostic category; TCM, transitional case management.

For participants in TCM, the odds of having a readmission were lowest in the 7-day group (OR, 0.15; 95% CI, 0.12-0.19; P <.0001). Within the first 7 days after discharge from an initial hospital stay, nonparticipants were almost 7 times (1/.15) more likely to be readmitted than those who were participants.

The relative protection provided by TCM participation was 0.27 for patients in the 15-day group (OR, 0.27; 95% CI, 0.23-0.30; P <.0001) and 0.26 for patients in the 30-day group (OR, 0.26; 95% CI, 0.23-0.30; P <.0001). Within 30 days, a nonparticipant in TCM was almost 4 times more likely to be readmitted (**Table 2**).

DISCUSSION

Hospital care is one of the major drivers of healthcare costs in the United States, and interest in reducing readmissions is gaining more momentum in the current national debate on healthcare.
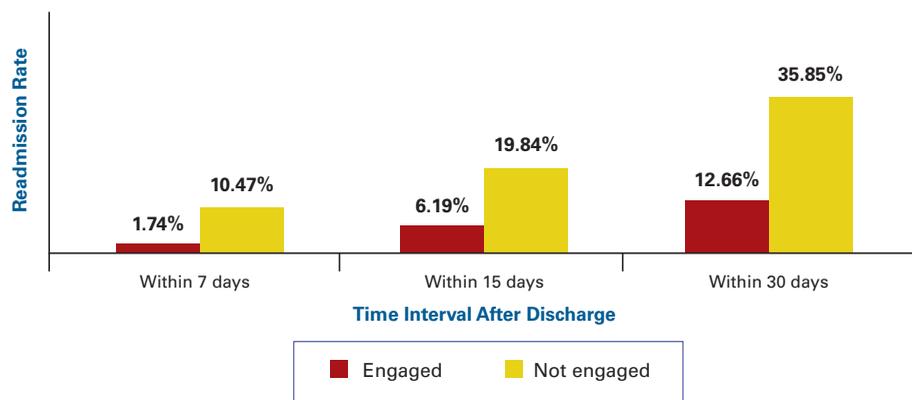
This study highlights the impact of a TCM program on readmission prevention. Within 30 days, approximately 13% of participating individuals were readmitted to the hospital, compared with 36% of nonparticipants (P <.0001). This effect persisted after controlling for other factors such as age, sex, severity, and condition. Telephonic case manager interactions with patients during their transition from hospital to home were associated with significant reduction in 30-day readmission rates. Results of other studies showing the impact of discharge planning on readmissions have been mixed. Although some have shown no impact on readmissions,[8,9] others were associated with lower readmissions among patients receiving comprehensive discharge planning services, especially among the elderly and other high-risk populations.[2,10-13]

Results of studies evaluating the impact of telephone follow-up interventions on hospital readmissions also have been mixed. Some studies demonstrated a positive impact of telephone follow-up, whereas others have shown no differences between the telephone follow-up (intervention) and no telephone follow-up (control) groups.[1,14,15]

This study, however, has shown benefits of nurse-led telephone follow-up among a large-size insured population. Participation (or nonparticipation) in TCM was by far the

■ **Figure 2.** Readmission by Engagement in Transitional Case Management[a]

[a]Differences between the engaged and nonengaged groups were significant (P <.0001) for each time period.

most important predictor of hospital-readmission. Participation in TCM had a "protective" effect on 30-day readmission to acute care facilities. Individuals who did not participate in TCM were almost 4 times more likely to be readmitted within 30 days than those who did participate. The most important predictor of hospital readmission was participation in TCM—individuals who participated in the program were less likely to be readmitted than those not participating in the program (*P* <.0001).

This study also suggests that the greatest benefit is obtained when patients participate in TCM programs as quickly as possible after discharge from their initial inpatient stay. The odds of readmission were lower (ie, a higher protective effect) for patients who participated in TCM within 7 days compared with those who participated in a later time period. Some of the difficulties in engaging patients so quickly after discharge included lack of timely enrollment in the TCM program as a result of insufficient or inaccurate contact information (ie, inability to contact patients via telephone). Improvements in these areas alone could result in more timely participation among patients, resulting in even fewer hospital readmissions.

Strengths and Limitations

One limitation of this study is that it used a large administrative data set. Administrative data may have incomplete or missing information, suboptimal reporting, and inaccurate coding. Although randomized controlled clinical trials are considered the gold standard for establishing causality, they often are not feasible in real-world, uncontrolled environments.

Further studies are needed to examine differences in participation and readmission rates relative to surgical and medical diagnoses, to understand how diagnosis-related groups are related to risk and readmission, to evaluate and develop more sophisticated methodology for studying administrative healthcare data to improve readmission prediction, and to establish a new chapter in the science of healthcare delivery outcomes.

■ Table 2. Odds Ratios of Engaged Participants Having a Readmission

Time Period for Engagement	Odds Ratio (95% CI)	*P*
Within 7 days	0.15 (0.12-0.19)	<.0001
Within 15 days	0.27 (0.23-0.30)	<.0001
Within 30 days	0.26 (0.23-0.30)	<.0001

CI indicates confidence interval.

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