Assessing the Impact of Nurse Post-Discharge Telephone Calls on 30-Day Hospital Readmission Rates

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BACKGROUND: Several care transition interventions propose that post-discharge phone calls can reduce adverse events and decrease costly return visits to the hospital. However, given the multi-faceted nature of most care transitions interventions, the true relationship between post-discharge phone calls and readmissions in a real world setting is uncertain.

OBJECTIVE: To determine the effect of receiving a post-discharge telephone call on all-cause 30-day readmission in a general medicine population.

DESIGN: Retrospective observational study.

PARTICIPANTS: Patients discharged home from the Medicine Service at a tertiary care academic medical center between November 2010 and May 2012.

INTERVENTION: Patients received two telephone call attempts by a nurse within 72 h of discharge. Nurses followed a standard script to address issues associated with readmission.

MAIN OUTCOME AND MEASURES: Billing data captured readmissions. We used logistic regression-adjusted patient and clinical covariates as well as a propensity score representing likelihood of being called to determine the association between call receipt and risk for readmission.

KEY RESULTS: There were 5,507 eligible patients. In unadjusted analyses, patients who received a call and completed the intervention were significantly less likely to be readmitted compared to those who did not [155 (5.8 %) vs 123 (8.6 %), $p < 0.01$]. In multivariable models adjusting for socio-demographic and clinical covariates alone, completing a post-discharge telephone call intervention was associated with lower odds for readmission (AOR 0.71; 95 % CI: 0.55–0.91). However, when models adjusted for the likelihood of receiving the phone call using the propensity score, no association between call receipt and readmission was observed (AOR 0.91; 95%CI: 0.69–1.20).

CONCLUSIONS: Effectiveness of post-discharge phone call programs may be more related to whether patients are able to answer a phone call than to the care delivered by the phone call. Programs would benefit from improving their ability to perform phone outreach while simultaneously improving on the care delivered during the calls.

INTRODUCTION

The period following hospitalization remains a particularly vulnerable time for patients. Multiple studies have shown that adverse events during the post-hospitalization period occur in approximately one in five patients,[1,2] and a related literature supports the idea that readmissions could be prevented by targeting the post-acute transitional period.[3–7] Hospital-based transitional care interventions aim to smooth the transition from the inpatient to the outpatient setting and prevent unnecessary readmissions. In the last two decades, there has been considerable focus on post-discharge telephone calls to address preventable readmissions.[8] Post-discharge calls aim to identify and remedy possible gaps in care that may occur after hospital discharge, while also allowing providers to reinforce key elements of the discharge instructions, medication changes, and follow-up plans.

Although many care transitions programs (e.g., Project RED, Care Transitions Intervention, Project BOOST)[4,6,9] utilize post-discharge calls as part of their intervention bundle, studies that have evaluated post-discharge calls as an independent intervention have shown inconclusive results.[8,10] Interventions targeting Medicare or those enrolled in a chronic disease management program appear to be most effective,[11,12] though two systematic reviews have cast doubt on the approach's broader efficacy.[10,13] Further, many studies that have evaluated the impact of these telephone calls have had small sample size, focused on heavily screened patient populations (e.g., excluded patients with cognitive impairment, psychiatric illness, end-stage renal disease, terminal disease or homelessness, as well as those who were unable to participate in a phone call), with limited real world applicability.[14–17]

Despite heterogeneity of the published studies, institutions continue to adopt post-discharge telephone call programs. At the University of California San Francisco Medical Center (UCSFMC), the medicine service has employed post-discharge telephone calls since October 2010. Using a large, real-world population of patients discharged from the medicine service with few exclusion criteria afforded the opportunity to better study the efficacy of post-discharge telephone phone calls. Our study aimed to determine the specific effects of receiving a post-discharge telephone call on all-cause 30-day readmission, and to describe the post-discharge issues addressed by the calls.

METHODS

Setting, Population & Purpose

Our study took place on the Medicine Service at the UCSFMC, a 600-bed academic medical center. The service, which participates in project BOOST,[18] admits approximately 4,000 patients per year, of which 15.85 % were readmitted within 30-days in the academic year preceding the study (July 2009–June 2010). This study was reviewed by the UCSF Committee on Human Research and determined to be exempt from further review.

Subjects

Patients in our study were admitted between November 2010 and May 2012. We included all patients discharged home from the home from the Medicine Service, regardless of housing, language or cognitive status. No patients were intentionally excluded from the calls.

Phone Call Program

The purpose of the post-discharge phone call program was to identify and remedy possible issues with symptoms, medications and follow-up care that may arise early in the post-discharge period, and to reinforce key elements of the discharge instructions, medication changes, and follow-up plans. Thus, we targeted our intervention only to those going home, rather than those who were transferred to a medical facility for ongoing supportive care, such as a post-acute care or acute care medical facility. November 2010 was the first complete month of operation of the telephone call program. Four nurses performed all the calls during the study period, sharing a 0.5 full time equivalent (FTE)—20 h a week, and making calls three times weekly. The nurses received an administrative list of all patients discharged home from the medicine service during the preceding 2–3 days, which guided their calls. Patients received a minimum of two phone call attempts 72 h after leaving the hospital. Non-English speaking patients

were called by the nurse, using the hospital's commercial vendor for telephonic interpreting services. Some patients were unable to be called due to errors in the administrative discharge list (incorrect discharging service, incorrect discharge location, observation status), high census and nursing sick leave. Nurses recorded the outcome of the call [Patient/caregiver answered the survey, Message left with answering machine (after two call attempts), no answer after two call attempts, wrong number or disconnected phone line]. Nurses were instructed to review the hospital discharge summary and follow a standard script using open-ended questions to address issues commonly associated with hospital readmission with the patient or their caregiver [Appendix 1 available online]. The script was based on the post-discharge phone call script used in Project RED, and included items about the patient's discharge instruction and medications, their ability to fill prescriptions, knowledge of their follow-up plan, who to contact with questions about recovery and homecare services or durable medical equipment needs.[4] Nurses documented both their findings and the interventions used to address post-discharge issues in a note template in the electronic medical record (EMR). A triage algorithm guided nurses to involve the discharging hospitalist, unit pharmacist, case manager, social worker or physician champion as needed [Appendix 2 available online]. For example, if a patient reported difficulties obtaining a medication due to insurance, nurses were instructed to connect the patient with the Medicine staff pharmacist who would work with the pharmacy to obtain authorization or contact the physician for an alternative. Nurses built strong relationship with local primary care provider (PCP) clinics to schedule urgent patient appointments as needed. If a patient was unable to be reached, nurses left a message with a reminder about upcoming appointments and their phone number for the patient to call back with any questions or concerns. In the first three months, the nurses met with physician champions weekly to review challenging cases to hone the triage algorithm and improve problem-solving skills.

Data Collection

We extracted all phone call notes from the EMR to a database, and used it to determine whether a call attempt had been made, if a patient or caregiver had answered the call, and the results of the call intervention. We used retrospective billing data to capture all inpatient admissions and readmissions to the Medicine Service during the study time-period. Patients were excluded if (1) they were readmitted from a service other than Medicine, thus would have had no call on their index admission; (2) they were readmitted within 72 h of discharge, as they may not have yet received a call. For patients with two or more readmissions within a 30-day period, we included only the index encounter and first readmission, as we felt patients with multiple readmissions within 30 days were a

potentially different population than those with unique readmissions.[19]

Statistical Analysis

We categorized patients into one of two groups: those who did not receive a post-discharge call attempt due to incomplete call lists, nursing leave and high patient census, and those who received a call attempt. We compared the characteristics of patients in these groups using t-and-chi-square tests. The call attempt group was further subdivided into those who completed the telephone intervention and those who did not complete the telephone intervention (not home, disconnect line, refused, etc.) (Fig. 1). We compared demographic and clinical characteristics of these three groups using ANOVA, chi-square or Fishers exact tests, and used multivariate logistic regression to assess the relationship between patients completing the telephone intervention and readmission. In this regression model, a range of a priori patient and clinical covariates were also included, given the potential association with the outcome of interest (i.e., readmission), including age, gender, monthly census, race, insurance status, severity of illness and expected mortality. We set the significance level for the analysis at $p \leq 0.05$. We included an additional variable, a propensity score, in this regression model to account for the probability of receiving a call attempt. The propensity score was based on demographic and clinical variables that exhibited $p \leq 0.20$ in bivariate analysis between call attempt and no call attempt groups. We conducted additional regression models to assess the relationship between completing the telephone intervention and readmission for specific subgroups of patients (white, non-white, non-English speakers, single, moderate and major severity of illness). We catalogued issues identified by the nurse in the

telephone calls and compared the proportion of patients reporting these issues by readmission status using chi-square tests. Statistical analysis was carried out using SAS 9.2 (Cary, NC).

RESULTS

In all, 5,848 patients were discharged home, home under the care of an organized home health service or home hospice. The overall 30-day readmission rate for the population was 12.61 %. Of these, we excluded 341 encounters (Fig. 1). Five thousand, five hundred and seven patients were included in the final sample, with an overall all-cause 30-day readmission rate of 7.20 %.

Post-Discharge Call Intervention

Of the patients, 4,115 (75 %) had a call attempt by a nurse, while the remaining 1,392 patients (25 %) had no call attempt. Of the 4,115 patients who had a call attempt, 2,680 (65 %) were reached by the nurse and completed the post-discharge telephone call intervention and 1,435 (35 %) were not reached or did not complete the intervention. Comparison by call and intervention status is shown in Table 1. Patients who completed the telephone intervention with the nurse were significantly more likely to have private health insurance and to be diagnosed with pneumonia (all $p < 0.01$). In contrast, patients who had no call attempt were significantly more likely to be male, identify as Asian, be insured by Medicare, be classified as having 'major' or 'extreme' severity of illness, and be diagnosed with chronic heart failure (all $p < 0.01$).

Patients who completed the nurse intervention were significantly less likely to be readmitted compared to those who did not, with 115 readmissions (5.8 %) of those completing the intervention, compared to 123 (8.6 %) readmissions of those who were called but did not answer the survey and 116 (8.3 %)
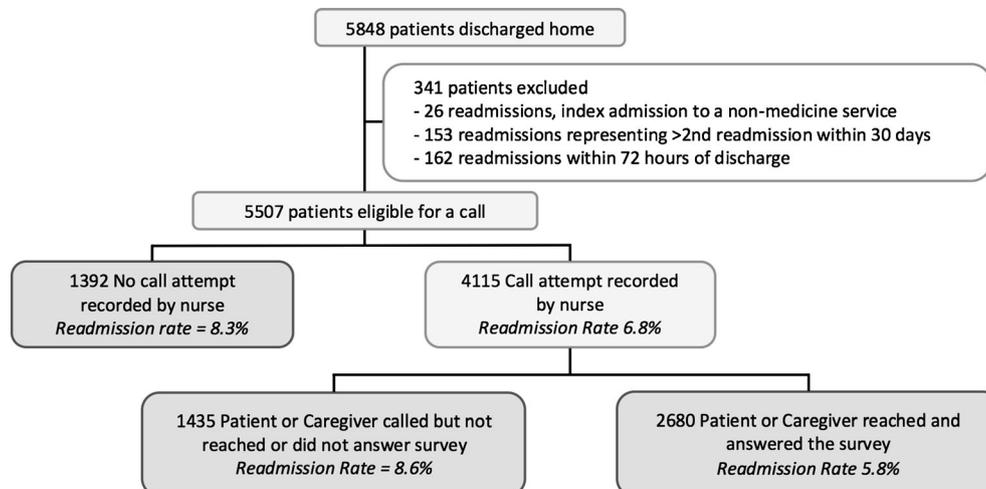

Figure 1. Study flow diagram of excluded and enrolled patients.

Table 1. Comparisons of Patient Characteristics by Intervention Status[*]

	Phone intervention and call status			p value
	Call attempt/intervention completed (n=2680)	Call attempt/intervention not completed (n=1435)	No call attempt (n=1392)	
	n (%)	n (%)	n (%)	
Age years (s.d)	58.1 (19.3)	53.6 (18.8)	60.5 (20.6)	< 0.01[†]
Gender				
Male	1,392 (51.9)	685 (47.7)	773 (55.5)	< 0.01[‡]
Race				
Asian	311 (11.6)	132 (9.2)	192 (13.8)	
Black	375 (14.0)	260 (18.1)	218 (15.7)	
White	1,280 (47.8)	677 (47.2)	632 (45.4)	
Other	712 (26.6)	364 (25.4)	350 (25.1)	< 0.01[‡]
Marital status[§]				
Married	1,197 (44.6)	458 (31.9)	488 (35.1)	
Single	1,475 (55.0)	971 (67.7)	902 (64.8)	< 0.01[‡]
Language[§]				
English	2,153 (80.3)	1,184 (82.5)	1,070 (76.9)	
Spanish	111 (4.1)	57 (4.0)	62 (4.4)	
Chinese	227 (8.5)	104 (7.2)	157 (11.3)	
Other	186 (6.9)	88 (6.1)	103 (7.4)	< 0.01[‡]
Insurance				
Medicare	1,049 (39.1)	466 (32.5)	638 (45.8)	
Medicaid	699 (26.1)	440 (30.7)	405 (29.1)	
Private	809 (30.2)	359 (25.0)	276 (19.8)	
Self pay	78 (2.9)	154 (10.7)	60 (4.3)	
Other state/federal	45 (1.7)	16 (1.1)	13 (0.9)	< 0.01[‡]
Severity of illness				
Minor	299 (11.2)	200 (13.9)	155 (11.1)	
Moderate	1,057 (39.4)	565 (39.4)	452 (32.5)	
Major	1,111 (41.5)	567 (39.5)	644 (46.3)	
Extreme	213 (7.9)	103 (7.2)	141 (10.1)	< 0.01[‡]
Expected mortality				
Well below/Below	2,115 (78.9)	1,160 (80.8)	1,065 (76.5)	
Equal to	9 (0.3)	7 (0.5)	7 (0.5)	
Above/Well above	556 (20.7)	268 (18.7)	320 (23.0)	0.07[‡]
Diagnosis				
Pneumonia	219 (8.2)	86 (6.0)	91 (6.5)	
COPD	84 (3.1)	44 (3.1)	49 (3.5)	
Acute MI	1 (<0.1)	1 (0.1)	1 (0.1)	
CHF	11 (0.4)	9 (0.6)	36 (2.6)	
Sickle cell	26 (1.0)	9 (0.6)	8 (0.6)	
Other	2,339 (87.3)	1,286 (89.6)	1,207 (86.6)	< 0.01[‖]

[*]Where proportions do not equal 100 %, this is due to rounding
[†]ANOVA test
[‡]Chi-Square test
[§]Data does not equal 100 % as data is missing
[‖]Fishers exact test

readmissions of those who were never called); $X^2_2 = 15.13$, $p < 0.01$) (Fig. 1). After adjusting for patient and clinical covariates but not the propensity score in logistic regression (Table 2), patients who completed the post-discharge telephone call intervention were 29 % less likely to be readmitted (AOR 0.71; 95%CI: 0.55–0.91). However, once a propensity score was included accounting for the likelihood of receiving a telephone call, no

association between completing the telephone intervention and readmission was observed (AOR 0.91 (95%CI: 0.69–1.20). Sub-group analysis did not find a significant relationship between intervention completion and readmission, except for non-white patients (Table 2). These patients remained 33 % less likely to be readmitted following inclusion of propensity score in the model (AOR 0.67; 95%CI 0.48–0.94).

Table 2. Summary of Multivariate Model of Significant Predictors of Readmission

| Model | n | Adjusted–no propensity score | | Adjusted–with propensity score | |
| | | Call attempt–no intervention | Completed the call intervention | Call attempt–no intervention | Completed the call intervention |
		AOR (95 % CI)	AOR (95 % CI)	AOR (95 % CI)	AOR (95 % CI)
Entire sample	5507	1.11 (0.85–1.46)	0.71 (0.55–0.91)*	1.30 (0.97–1.74)	0.91 (0.69–1.20)
White	2589	1.20 (0.78–1.87)	0.89 (0.59–1.33)	1.48 (0.94–2.35)	1.12 (0.73–1.71)
Non-white	2914	1.03 (0.73–1.46)	0.60 (0.43–0.83)*	1.18 (0.83–1.64)	0.67 (0.48–0.94)*
Non-English	1095	0.95 (0.51–1.78)	0.78 (0.46–1.33)	1.09 (0.57–2.07)	0.87 (0.50–1.50)
Single	3348	0.95 (0.68–1.33)	0.66 (0.48–0.91)*	1.11 (0.79–1.56)	0.76 (0.55–1.05)
Moderate severity of illness	2074	1.06 (0.65–1.74)	0.65 (0.41–1.04)	1.35 (0.80–2.27)	0.89 (0.54–1.46)
Major severity of illness	2302	1.24 (0.84–1.83)	0.76 (0.53–1.10)	1.48 (1.00–2.20)	0.89 (0.62–1.29)

Adjusted odds ratio is significant

Issues Identified by the Call

Issues identified in the call were grouped by nurse question (Table 3). Knowledge of and inability to schedule follow-up appointments was the most common issue addressed by the nurse, but a large proportion of patients and caregivers (39 %) received assistance with at least one question or issue. There were no significant differences in the type or number of issues addressed for readmitted versus non-readmitted patients. This was true for individual issues, as well as for any issue addressed by the call.

DISCUSSION

In this retrospective observational study of patients discharged home from the hospital, the 30-day readmission rate of patients reached for a 72-h post-discharge telephone call was significantly lower than that of patients who were called but not reached and patients for whom there was no call attempt. However, after

Table 3. Responses to Key Items of Post-Discharge Nurse Telephone Call

Post-discharge call questions	Responses (n=2680) N (%)
Patient had questions about discharge instructions (Y)	98 (3.7)
Patient was not able to fill prescription (Y)	292 (10.9)
Patient has questions reading medication instructions (Y)	271 (10.1)
Patient does not know the details of their subsequent appointments or is unable to schedule recommended follow-up (Y)	626 (23.4)
Patient does not know who to contact with any questions (Y)	74 (2.8)
Positive response to any of the above	1,047 (39.1)

(Y) Signifies a patient's positive response to the question/issue raised

adjusting for the likelihood of call attempt, there was no significant impact of the nurse telephone calls on 30-day readmission rates. This nonsignificant finding was found for the entire sample and for white patients. However, non-white patients, those of African American, Asian, and other races and ethnicities, consistently demonstrated a decrease in 30-day readmission rates associated with receiving the call intervention.

The findings of our study suggest that in a diverse real-world population of Medicine patients, post-discharge telephone calls are unlikely to play a significant role in preventing readmissions. To our knowledge, our study population is the first and the largest to include patients regardless of language, functional ability to answer the phone, insurance, or socioeconomic status. Previous studies suggesting the efficacy of post-discharge telephone call in reducing readmission required patient consent and had strict inclusion and exclusion criteria,[3–6] so our results may be affected by translating previous interventions into practice. However, our study is consistent with findings of systematic reviews, which have failed to find any convincing benefit of post-discharge telephone calls on 30-day hospital readmission.[8,9]

Subgroup analysis did suggest a population who may potentially have benefited from a post-discharge phone call: non-white patients. Because race, ethnicity and socioeconomic status in the United States are so closely linked, it is difficult to isolate disparities in race and ethnicity from those due to socioeconomic status.[20] In the United States, both race/ethnicity and lower socioeconomic status are associated with both lower overall health care use and decreased access to health care, even among those with health insurance.[21,22] Providing these patient populations with a post-discharge phone call, designed to help them better access the health care system, may have led to the differential impact of the call compared to that for white patients.

In contrast to other studies, our results highlight a potential reason underlying the lack of effect of our post-discharge call systems. In our unadjusted results and even after logistic regression, we did indeed observe a lower odds ratio for readmission among patients who answered the phone call. However, this initial result was attenuated by inclusion of the

propensity score. A propensity score adjusts for any selection bias in observational studies and allows for unbiased estimates of the treatment effect (i.e., the telephone call intervention).[23,24] This propensity score provided a value that summarized the probability that each patient would receive a telephone call attempt based on his or her explanatory demographic and clinical characteristics.[23,24] Then used as a covariate in regression modeling, the propensity score adjusted for any selection bias associated with receiving a call attempt, and allowed for an unbiased estimate of the impact of completing the telephone call intervention on readmission. In the context of this study, this attenuation suggests that the success of our post-discharge telephone call program was in fact more related to whether or not patients are able to answer a telephone call than to the actual call or its content, or any efforts made to deal with problems found during the call. Alternatively, it is possible that the call itself prompted more care or return to hospital—and because the call originated from UCSF, patients may have preferentially returned to UCSF for readmission.

Our results also highlight the problematic nature of readmissions reduction as the goal for transitions of care interventions. While the real goal is to improve patient safety around discharge, post-discharge adverse events remain challenging to study, and 30-day readmission have been adopted as a marker of preventable adverse events after discharge. A recent perspective piece highlights the challenges of this assumption, citing that only a small portion of readmissions at 30 days are likely preventable, and that much of what drives hospital readmission rates are patient and community level factors outside the hospitals' control.[25] Interventions unsuccessful at improving readmissions may have unmeasured effects on decreasing adverse events after discharge or improving patient compliance with after hospital care. Though our intervention failed to impact 30-day readmission rates, it does not negate all potential benefits of post-discharge phone calls. Some studies have shown that interventions aimed at improving care through improved coordination and access to follow-up care actually increased the rate of readmissions, presumably as a result of improved access to necessary care, while improving patient satisfaction and patient safety.[17] To better measure true patient safety outcomes, we could perform a more detailed analysis of all readmitted patients to determine if preventable readmissions due to adverse events were less likely in the population that received the call intervention. Given the increasing importance of patient satisfaction as an outcome of the calls, we are now including a question in our standard patient satisfaction survey to determine the perceived helpfulness of the call to patients.

Our study has several limitations. It is a single-site observational study and thus can only demonstrate associations between post-discharge telephone calls and readmissions. While we have made efforts to account for differences between the groups in factors known to be associated with a call attempt through the use of a propensity score, it is not a randomized intervention.

Successful care transitions interventions are often faulted for being very resource intensive, and to date, cost effectiveness analyses of these interventions are lacking. While our program required infrastructure costs of generating a call list, building a call template in the EMR and devising a method for call data extraction, as well as the personnel costs of training, the ultimate ongoing cost was 0.5 nursing FTE, which for a Clinical Nurse III was approximately $60,000 per year. While the cost of nursing staff and infrastructure does not appear warranted given the nonsignificant reduction in readmissions for patients receiving the intervention, we did not measure secondary outcomes such as post-discharge adverse events or patient satisfaction. Similarly, we lack data about whether patients were readmitted to sites other than UCSF; if readmissions to UCSF happened preferentially in the phone call group, this may have biased our results to produce the findings we observed. Finally, as a single site study our results may be difficult to apply to other healthcare settings.

Reducing preventable readmissions has the potential to both improve health care quality and reduce costs. Implementing evidence-based, cost-effective interventions that improve discharge safety and reduce 30-day readmissions will be critical to success. However, our results suggest that post-discharge telephone call programs have nuanced effects and benefits that may be related more to patients' ability to be reached for the call than the system itself and patients' access to health care resources. As a result, institutions may need to focus post-discharge outreach on populations who are hard to reach and who have traditionally had challenges accessing the health care system.

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