


# Post-Discharge Transitional Care Program and Patient Compliance With Follow-Up Activities

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## Abstract

We explore whether the frequency of post-hospital discharge transitional care calls affects patients' adherence to their discharge plans. We reviewed 1,000 call records of a post-discharge transitional care program run by a large U.S. tertiary care hospital in 2018–2019 and generated binary outcomes capturing patient self-reports of (1) scheduling or completing follow-up appointments, procedures, or prescription fills, (2) missing a scheduled event, and (3) reporting a new adverse clinical event. Our predictor variables captured callers' success in completing the first and each subsequent call with discharged patients. We ran linear probability models (LPM) for each binary outcome after controlling for sociodemographic and clinical characteristics. Results indicate successful completion of the first two calls was associated with the increased probability of scheduling or completing follow-up appointment (15.5% points,  $p < 0.01$ ) and follow-up procedure (13.5% points,  $p < 0.01$ ), and reporting new adverse event (5.9% points,  $p < 0.05$ ). Our findings suggest that making the first phone call to patients, while crucial, may not be sufficient for effective care transition; making two to three phone calls seems to be more optimal, while further calls may have limited value.

## Keywords

transitional care, discharge planning

## Introduction

One of the potential consequences of the passage of the 2010 Affordable Care Act is loss of Medicare payments to hospitals due to readmissions (1). The reimbursement penalty has incentivized hospitals to explore different strategies to reduce readmission rates and improve care transitions. One of the widely accepted strategies is the implementation of transitional care management (2–5), often taking the form of using post-discharge phone calls to follow-up on patient compliance with discharge recommendations (2,3,6). Studies to assess the effectiveness of this strategy include examining hospital discharge (3,7) and emergency department (ED) follow-ups (6). A significant number of studies found that follow-up phone calls were associated with reduced readmissions (8,9), while others showed mixed findings regarding ED visits (8,10–14).

A few studies have explored the impact of post-discharge calls on adherence to follow-up physician appointments. One study reported that patients who experienced either full-scripted encounters (actual phone calls) or message-scripted encounters (voice messages) were more likely to complete

follow-up appointments compared to patients with missed encounters (missed phone calls) (15). Another study compared primary care physician (PCP) follow-up between an intervention (patients who after a pediatric ED visit had a staff help the guardian call the PCP's office while in the ED or help them call from home when the ED calls were unsuccessful) and a control group (instructed to follow-up with their PCP within 3–5 days). The study found that the intervention group had a significantly higher rate of PCP follow-up compared to the control group (16). Other studies also reported improved follow-up physician visits by patients who received post-discharge calls (8,14).

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Most post-discharge transitional care plans target the 30-day period immediately following the discharge and many incorporate multiple calls with weekly calling frequencies to avoid missing key patient follow-up activities required by the discharge plans (7,9,17–21). The implicit, often unstated assumption behind this strategy is that a fuller assessment of compliance with discharge plans will be aided by the patient's willingness to complete multiple follow-up calls, although this assumption is rarely stated. We, therefore, hypothesize that the patient's ability and willingness to complete a higher number of planned transitional care calls will be predictive of their completion of key follow-up activities such as physician visits, prescription fills, and post-discharge care procedures. To our knowledge, no study has explored whether transitional care call frequency impacts the probability of patients adhering to their discharge plans. Given the mixed evidence on the impact of post-discharge calls on follow-up activities of discharged patients, knowing whether the frequency of this low-cost strategy matters could help policy makers and hospital leadership better design transitional care phone call programs.

## Methods

### Setting, Study Population, and Intervention

In 2017, a tertiary care 498-bed facility located in the Southwest United States contracted with a patient follow-up call center (PFCC), to provide post-discharge transitional care phone call services to patients discharged starting in 2017. PFCC callers were former nurses with substantial experience of working in intensive care units of hospitals and close knowledge of electronic medical record (EMR) systems. At the eve of discharge, hospital discharge personnel routed discharge plans, face sheets, and medication reconciliation information to PFCC callers who also had temporary "read only" access to the hospital EMR to guide their interaction with patients. Discharged patients whose records lacked a forwarding contact number were excluded from the program. Using scripted queries and notating answers on handwritten charts, callers attempted to complete four weekly calls starting within 48 h of discharge. The scripts held rough generic questionnaires to guide the conversation and were supplemented by files received daily from the hospital that contained the discharges for the previous day. Callers would access the EHR and create face sheets for discharged patients, which were used to direct their conversations and dictate what would be discussed with the patient. Callers made at least three attempts to reach patients/caregivers on each weekly calls before giving up, leaving voice messages for those who could not be reached. At the end of each completed call, callers notified patients of their intent to reach them next week to check in on them and ensure they were still following all orders outlined in the discharge packet. In case a patient requested not to be called further, callers would honor the patient's request and inform them that if they needed anything, they could reach out to the caller. The

call intervention ceased after the patient completed four weekly calls or when a patient requested not to be called further while in the middle of the intervention. Callers assessed clinical progress, new symptoms, pending follow-up appointments, and medication compliance during calls while also assisting patients with scheduling events (appointments, procedures, or prescription fills) when needed. Callers had resources to arrange expedited access for patients who needed an appointment or needed to get connected with a PCP (e.g., call the scheduling office to confirm appointments or speak with physician staff to relay concerns from the patient).

### Data Extraction and Entry

PFCC administrators selected 1,000 call records out of nearly 6518 collected in 2018–2019. The selection process was not random but followed guidelines to ensure that the sample captured a broad mix of demographic, insurance, and geographic variation reflective of the hospital patient base (Table 1). The selection of 1,000 call notes was not based on any predetermined power calculation. We restricted our sample to 1,000 to ensure timely completion of coding and assessment, given constraints on our resources and personnel. Four trained research assistants (RA) extracted and entered information from the selected notes into an excel spreadsheet in accordance with a coding entry scheme developed by the authors. Each RA was assigned a separate set of notes and, owing to time and resource constraints, and was not asked to crosscheck information entered by others. It was felt by the team that a careful post-rating crosscheck by the main researchers for rating errors and inconsistent codes would suffice to mitigate the measurement error potentially introduced by rating inconsistencies. Excel data was imported into STATA 15 for analysis.

### Main Variables

Our outcomes are binary variables measuring patient *self-reports* of (1) scheduling or completing *each* of the three types of follow-up activities (appointments, procedures, or prescription fills), (2) completing *any* of the three types of follow-up activity, (3) completing more than one type of follow-up activity, (4) missing a scheduled event, and (5) reporting new adverse clinical symptoms. We also captured information on whether callers initiated or completed an intervention on behalf of the patients. Our predictor variables captured callers' success in completing the first and each subsequent call with discharged patients. A completed call indicated success in reaching patients either on the first attempt or a subsequent immediate recall attempt. If callers were unsuccessful in reaching the patient on a weekly call, it was considered not completed or unsuccessful.

### Analysis

We descriptively reviewed and catalogued the nature of interventions performed or planned on behalf of the patient by

**Table 1.** Summary Statistics.

Variable	N	Mean (% for binary variables)	SD
Completed or Scheduled A Follow-Up Appointment	750	75	43
Completed or Scheduled A Follow-Up Procedure	138	14	35
Completed or Scheduled A Follow-Up Prescription Fill	157	16	36
Completed or Scheduled A Follow-Up Event	798	80	40
Completed or Scheduled Two Or More Types of Follow-Up Events	228	23	28
Missed A Scheduled Follow-Up Event	85	9	29
Caller Initiated an Intervention with Regards to An Event	92	9	42
Reported A New Adverse Event	104	10	31
Completed first call	878	88	33
Completed first two calls	512	51	50
Completed first three calls	289	29	45
Completed all four calls	118	12	32
Female	500	50	50
Age Groups			
1-10	62	6	24
11-20	66	8	27
21-30	67	8	27
31-40	115	12	32
41-50	161	16	37
51-65	255	26	44
66-75	186	15	35
76-85	9	9	29
>85	18	2	13
Language Preference			
English	484	48	50
Spanish	125	13	33
Other	2	0	4
Missing	389	39	49
Major Diagnostic Category			
CNS	79	8	27
Eye	1	1	10
ENT	19	2	14
Lung	125	13	33
CVS	147	15	35
GIT	117	12	32
Liver	42	4	20
Ortho	157	16	36
Skin	57	6	23
Endocrine	53	5	22
Kidney	74	7	26
Female Reproductive system	18	2	13
Pregnancy	19	2	14
Blood	28	3	17
Infection	49	5	22
Mental	5	1	7
Alcohol	9	1	9
Injury	105	11	31
Burns	9	1	9
Other	47	5	21
HIV	5	1	7
Ungrouped	48	6	23
Insurance Carrier			
Medicaid	278	28	45
Medicare	199	20	40
Private	427	43	49
VA	32	3	18
Tricare	17	2	13
No insurance	23	2	15

(continued)

**Table 1.** (continued)

Variable	N	Mean (% for binary variables)	SD
Missing	87	9	28
Length of Stay (LOS) (days)	983	11.12	43.22
Support Person			
Son	56	6	23
Daughter	123	12	33
Dad	29	3	17
Mom	160	16	37
Sister	78	8	27
Brother	27	3	16
Spouse	280	28	45
Significant Other	31	3	17
Friend	64	6	24
Aunt or uncle	9	1	9
Niece	1	1	10
Grandparent	5	1	7
Grandchild	8	1	9
Other	22	2	15
No support person	1	1	10
Missing	9	9	29

callers, as well as the nature of new adverse events reported by patients. We ran linear regressions (linear probability models or LPM) for each of our binary outcomes. LPM coefficients have a more straightforward interpretation for binary outcomes than logistic regression models and yield reliable estimates if certain basic assumptions are met. We controlled for age, gender, length of stay (LOS), primary diagnosis, type of insurance, preferred language, and patient's relationship with the designated support person (e.g., spouse, son, grandparent, and friend) in all specifications. We assigned each discharge diagnosis into one of 24 major diagnostic categories using a classification developed by the Agency for Healthcare Research and Quality (AHRQ) (22). We used patient residence zip code information to assign each record to one of four quartiles based on the distribution of select demographic characteristics using Census Bureau ZIP Code Tabulation Areas (ZCTA) data derived for the American Community Survey 5-year dataset 2013–2018) (23). These characteristics included total population, percent White, Black, and Hispanic population, percent living below poverty level, percent less than high school graduate, median income, household size, percent with householder living alone, disability, unemployment, lack of health insurance, percent on public insurance, and percent having a computer and Internet at home. Records that were missing zip code information or could not be matched to the ZCTA codes from the Census data were dropped from the analysis ( $n = 53$ ), while records missing on other characteristics (i.e., preferred language, support person) were retained but assigned to a “missing” variable. Due to uneven data entry or illegible case records, some records were missing information on the year of admission and/or discharge needed to estimate the LOS. These records were either assigned a year based on information available in other parts of the record or were simply assigned 2019 as

the year of discharge/admission. Default assignment of a very few notes that had missing year information did not introduce any meaningful errors in LOS estimation and did not impact our overall results. A few cases that were missing month and/or day of discharge information were coded as missing ( $n = 14$ ) and three records that were outliers on LOS were also dropped. Our unit of analysis is a patient discharge and does not necessarily indicate a unique patient.

## Results

### Summary Statistics and Descriptive Results

Table 1 provides summary statistics on our study sample. Our sample was divided equally between male and female and most were elderly ( $>65$ ) or between 51 and 65. Nearly half had private insurance, reported English as their preferred language, and listed spouse, daughter, or mother as principal support persons. Most were admitted with disorders of lung, gastrointestinal, musculoskeletal, or the cardiovascular system, and the average length of hospital stay was 11 days.

Eighty eight percent of patients in our sample completed their first call but call completion rates dropped sharply for each subsequent call: 51% completed the first two calls, 29% completed the first three calls, and only 11% completed all four calls. Nearly 80% of patients reported either scheduling or completing at least one type of post-discharge care event, with 75% reporting scheduling or completing follow-up with a PCP or a specialist, 16% reporting scheduling or completing a post-discharge procedure, and 15% reported scheduling or completing a prescription fill. Roughly 23% reported completing more than one type of event while 9% indicated they missed completing a scheduled event. PFCC callers initiated or completed an intervention on behalf of patients in

about 5% of cases to address a patient concern regarding a follow-up appointment, procedure, prescription fill or development of a new adverse clinical event. In most cases, the intervention took the form of callers reaching out to the patient's PCP or specialist to set up appointments on patients' behalf ( $n = 20$ ). In other cases, callers collected relevant information needed to set up appointments ( $n = 17$ ), provided patients with information or resources to allow them to comply with follow-up care themselves ( $n = 7$ ), or provided resources to facilitate timely refill of medications ( $n = 10$ ). In about 9% of cases, patients reported developing new adverse clinical events after their discharge from the hospital. Most new adverse events consisted of pain ( $n = 35$ ) or general, nonspecific constitutional complaints such as weight loss and fatigue ( $n = 39$ ). However, patients also reported rash/allergies ( $n = 3$ ), respiratory symptoms ( $n = 6$ ), neurologic symptoms ( $n = 4$ ), gastrointestinal symptoms ( $n = 8$ ), withdrawal reactions ( $n = 1$ ), infections ( $n = 11$ ), nose bleeds ( $n = 2$ ), and urinary symptoms ( $n = 2$ ).

### Regression Results

The results of our LPM are shown in Table 2. LPM yield coefficients that range continuously on a scale of 0–1 (i.e., probability scale), and capture the marginal effects of predictors in terms of change in probability of outcomes (e.g., a coefficient of 0.155 is equivalent to a 15.5% point change in probability of outcome attributable to the predictor variable). Overall, we find a strong relationship between receiving post-discharge calls and (1) scheduling or completing a recommended post-discharge follow-up activity and (2) likelihood of patients reporting new adverse events. The association is more clearly evident for discharged patients who completed the first two to three calls, suggesting a positive relationship between the number of calls completed and the probability of a post-discharge follow-up activity. Successful completion of the first two calls increases the probability of reporting scheduled or completed follow-up appointment (15.5% points,  $p < 0.01$ ), of reporting at least one of the three types of post-discharge actions (10.4% points,  $p < 0.01$ ), and of reporting two or more types of actions (9.8% points,  $p < 0.01$ ). Similarly, patients were more likely to report the onset of new adverse clinical symptoms (5.9% points,  $p < 0.05$ ) if the first two were successfully completed. Completing three calls was associated with scheduling or completing post-discharge clinical procedures (13.5% points,  $p < 0.01$ ). We found no relationship between completion of transitional care calls and reports of patients missing a previously scheduled post-discharge event. The effect of completed calls on likelihood of PFCC callers initiating or completing interventions to assist patients was positive but not statistically significant (5.3% points,  $p = 0.058$ ).

We obtained interesting relationships between select demographic and clinical characteristics and probability of post-discharge follow-up events. Callers were less likely to initiate intervention on behalf of female patients (–2.9%

points,  $p < 0.05$ ). Patients admitted with lung disorders and the disorders of female reproductive system were more likely to report meeting follow-up appointments after discharge (11.0% points,  $p < 0.05$ ; 21.8% points,  $p < 0.01$ ) while those with blood and bone disorders were more likely to schedule or complete post-discharge procedures (20.1% points,  $p < 0.05$ ; 9.6% points,  $p < 0.05$ ). Patients admitted with alcohol-related problems were consistently less likely to complete all three types of post-discharge care actions (post-discharge physician follow-up –42.6% points, post-discharge procedure –11.4% points, post-discharge prescription fill –11.8% points;  $p < 0.05$ ). Living in zip code that had more people with some form of public insurance or zip codes with higher penetration of computers was associated with reduced chances of reporting follow-up actions (–9.0% points,  $p < 0.05$ ; –8.0% points,  $p < 0.05$ ). Finally, we found no relationship between patient's stated language preference and likelihood of reporting post-discharge follow-up events.

### Discussion

Hospitals are increasingly relying on transitional care nurses to call patients immediately after discharge and over the subsequent days, in an attempt to assist them to better manage their illness and comply with follow-up appointments (2–5). Evidence suggests these strategies reduce preventable readmissions (8,9). However, few studies have explored whether the number of post-discharge contacts spurs patients to schedule and keep timely appointments with their PCP/specialists. We find strong associations between completing post-discharge calls and scheduling or completing follow-up appointments and procedures. Moreover, our findings suggest the frequency of a post-discharge contact is at least as important as initiating a contact. The strongest impacts were detected for patients who completed at least two calls, with weaker and less consistent effects for the third call and no further improvements after that. While making the first call is critical, multiple contacts may help build rapport and confidence needed to convince reluctant or procrastinating patients to more seriously engage with their post-discharge care plans. Furthermore, more frequent calls may also provide transitional care nurses a fuller opportunity to assess a patient's social context to inform their recommendations. However, transitional care planners may need to be mindful of calling too frequently or too late into the post-discharge period. Later calls may yield marginal improvements while being construed as unduly intrusive, especially as patients begin returning to their busier pre-hospitalization personal or professional schedules.

It is important to note the lack of relationship between transitional care calls and filling a prescription, especially since prior studies found that a significant number of patients have issues related to filling prescriptions after their hospital discharge (10). This may be due to several reasons. First, we may have underestimated the number of patients who were

**Table 2.** Results of Regression Analysis.

	Completed or Scheduled A Follow-Up Appointment	Completed or Scheduled A Follow-Up Procedure	Completed or Scheduled A Follow-Up Prescription Fill	Completed or Scheduled A Follow-Up Event	Completed or Scheduled Two Or More Types of Follow-Up Events	Missed A Scheduled Follow-Up Event	Caller Initiated an Intervention with Regards to An Event	Reported a new adverse event
Completed first call	0.016	0.032	0.012	0.008	0.042	-0.011	0.011	0.024
Completed first two calls	<b>0.155***</b>	0.041	0.014	<b>0.104***</b>	<b>0.098***</b>	0.000	-0.002	<b>0.059**</b>
Completed first three calls	0.064	<b>0.135***</b>	-0.016	<b>0.077**</b>	0.072	0.061	0.053	0.039
Completed all four calls	-0.022	-0.043	0.020	-0.053	0.016	-0.025	-0.011	0.002
Female	0.011	-0.012	-0.013	0.015	-0.024	-0.018	<b>-0.029**</b>	0.011
Age Groups	Reference							
1-10	Reference							
11-20	0.095	-0.004	-0.065	0.114	-0.097	-0.068	-0.077	-0.068
21-30	0.136	-0.005	-0.026	0.075	0.039	0.009	-0.058	0.040
31-40	0.068	-0.035	-0.078	0.059	-0.110	-0.020	-0.030	0.035
41-50	0.031	-0.007	-0.021	-0.001	-0.032	-0.067	-0.052	-0.004
51-65	0.081	0.043	-0.026	0.094	-0.015	-0.002	-0.071	-0.020
66-75	0.103	-0.014	-0.028	0.062	-0.004	-0.057	-0.040	0.002
76-85	0.034	0.016	-0.002	0.082	-0.084	-0.085	-0.074	-0.016
>85	-0.006	-0.105	-0.064	-0.089	-0.091	-0.068	<b>-0.090**</b>	0.007
Language Preference	Reference							
English	Reference							
Spanish	0.026	0.019	-0.058	-0.006	-0.008	0.018	0.028	-0.024
Other	-0.128	0.476	-0.023	-0.118	0.460	-0.007	0.015	-0.091
Missing	0.039	0.006	-0.043	0.005	-0.012	0.006	-0.002	0.014
Major Diagnostic Category								
CNS	-0.004	0.022	-0.047	-0.018	0.001	0.007	0.012	0.050
Eye	-0.138	0.014	0.134	-0.171	0.186	-0.046	0.057	0.048
ENT	-0.112	0.007	-0.043	-0.085	-0.126	0.087	-0.035	0.074
Lung	<b>0.110**</b>	0.059	-0.028	<b>0.091**</b>	0.036	0.011	0.006	0.000
CVS	0.052	0.033	0.001	0.046	0.015	0.027	0.009	-0.018
GIT	0.006	0.084	-0.076	0.011	-0.002	0.062	0.016	0.026
Liver	0.008	0.117	0.001	-0.008	0.090	-0.011	0.047	0.046
Ortho	0.070	<b>0.096**</b>	-0.007	0.080	0.083	-0.028	0.027	-0.036
Skin	0.001	0.046	0.060	0.035	0.041	-0.041	-0.016	0.003
Endocrine	-0.086	-0.016	-0.055	-0.061	-0.092	<b>0.112**</b>	0.052	0.038
Kidney	-0.077	0.066	-0.037	-0.038	-0.024	0.000	-0.011	-0.021
Female	<b>0.218***</b>	0.144	-0.083	<b>0.236***</b>	0.063	-0.017	0.005	0.153
Reproductive system								
Pregnancy	-0.093	0.076	-0.090	-0.085	-0.049	<b>-0.100**</b>	-0.028	-0.075
Blood	-0.076	<b>0.201**</b>	0.027	-0.002	0.163	-0.008	-0.035	-0.032
Infection	-0.027	-0.017	0.004	-0.033	-0.042	0.043	-0.032	0.000
Mental	-0.033	-0.054	-0.135	0.020	<b>-0.243**</b>	-0.099	0.211	-0.086
Alcohol	<b>-0.426**</b>	<b>-0.114**</b>	<b>-0.118**</b>	<b>-0.420**</b>	<b>-0.219***</b>	0.164	<b>-0.088**</b>	<b>-0.136**</b>
Injury	-0.051	0.086	-0.087	-0.018	-0.033	<b>0.080**</b>	-0.024	0.015
Burns	0.045	0.010	0.176	0.098	0.125	0.025	-0.041	-0.065
Other	0.020	0.096	<b>-0.142**</b>	-0.009	-0.023	0.034	<b>-0.053**</b>	-0.005
HIV	-0.050	-0.142	0.032	-0.025	-0.091	<b>-0.105**</b>	0.053	-0.106

(continued)

Table 2. (continued)

	Completed or Scheduled A Follow-Up Appointment	Completed or Scheduled A Follow-Up Procedure	Completed or Scheduled A Follow-Up Prescription Fill	Completed or Scheduled A Follow-Up Event	Completed or Scheduled Two Or More Types of Follow-Up Events	Missed A Scheduled Follow-Up Event	Caller Initiated an Intervention with Regards to An Event	Reported a new adverse event
<i>Ungrouped</i>	0.038	<b>0.158**</b>	0.030	0.046	<b>0.182**</b>	0.019	0.057	0.076
<i>Insurance Carrier</i>								
<i>Medicaid</i>	-0.052	-0.016	0.081	-0.015	0.060	0.017	0.025	-0.013
<i>Medicare</i>	-0.016	0.049	0.052	0.052	0.036	-0.018	-0.002	0.031
<i>Private</i>	-0.006	0.023	0.119	0.035	0.105	-0.021	0.015	0.033
<i>VA</i>	0.044	0.014	0.039	0.059	0.037	-0.081	0.036	0.023
<i>Tricare</i>	0.048	0.185	-0.022	0.067	0.180	-0.012	-0.040	-0.017
<i>No insurance</i>	-0.104	-0.028	0.030	-0.054	-0.040	0.109	-0.025	-0.042
<i>Missing</i>	-0.087	-0.012	0.039	-0.056	0.020	0.044	-0.015	0.010
<i>LOS (days)</i>	-0.0002	0.000	0.000	0.000	0.000	0.000	<b>0.000**</b>	<b>0.001**</b>
<i>Support Person</i>								
<i>Son</i>	-0.065	-0.002	0.064	-0.048	0.047	<b>-0.110**</b>	0.024	-0.096
<i>Daughter</i>	-0.068	-0.004	0.104	0.003	0.059	-0.057	0.029	-0.036
<i>Dad</i>	0.046	-0.034	0.048	0.045	0.061	-0.098	0.027	0.047
<i>Mom</i>	-0.052	0.028	-0.046	-0.040	-0.011	-0.082	0.056	-0.082
<i>Sister</i>	-0.041	0.006	0.005	-0.065	0.060	-0.089	0.012	0.006
<i>Brother</i>	0.013	0.052	0.054	0.001	0.118	-0.009	0.096	0.008
<i>Spouse</i>	-0.038	-0.001	0.005	-0.043	0.037	<b>-0.096**</b>	0.012	-0.061
<i>Significant Other</i>	-0.210	-0.035	0.004	-0.224	0.010	-0.011	0.117	-0.072
<i>Friend</i>	0.060	0.018	-0.040	0.036	0.044	-0.068	0.030	-0.083
<i>Aunt or uncle</i>	-0.093	-0.021	-0.062	-0.092	-0.051	<b>-0.165**</b>	0.084	-0.006
<i>Niece</i>	-0.093	0.058	-0.033	-0.132	0.008	-0.071	0.003	0.052
<i>Grandparent</i>	<b>0.287**</b>	0.140	-0.124	<b>0.234**</b>	0.104	0.076	-0.124	<b>-0.167**</b>
<i>Grandchild</i>	<b>-0.479***</b>	0.146	-0.026	-0.223	-0.087	<b>-0.132**</b>	-0.014	-0.046
<i>Other</i>	-0.223	-0.037	0.153	-0.214	0.146	-0.093	0.146	-0.094
<i>No support person</i>	-0.026	0.112	<b>-0.158**</b>	-0.083	0.049	-0.094	0.094	-0.101
<i>Missing</i>	-0.070	0.098	-0.012	-0.011	0.039	-0.067	0.043	-0.069
<i>Zip Code</i>								
<i>Quartiles</i>								
<i>Total Population</i>	-0.042	0.046	0.014	-0.023	0.031	0.002	0.040	-0.014
<i>Median Age</i>	0.028	0.000	-0.035	0.007	0.000	-0.006	-0.010	-0.001
<i>White</i>	0.017	0.011	-0.005	0.014	0.017	-0.033	-0.031	0.018
<i>Black</i>	0.076	-0.008	0.000	0.033	0.028	-0.066	-0.028	0.016
<i>Hispanic</i>	0.006	0.006	-0.139	0.004	-0.127	-0.030	0.065	0.015
<i>Spoken English</i>	0.011	-0.065	0.078	0.072	-0.048	-0.062	<b>-0.157**</b>	0.131
<i>Good</i>								
<i>Spoken English</i>	-0.026	0.025	0.051	0.039	0.002	0.073	-0.022	0.018
<i>Poor</i>								
<i>Speak Other Language</i>	0.034	0.001	-0.050	-0.021	0.029	0.020	0.048	-0.127
<i>Married</i>	-0.001	0.018	0.007	0.058	-0.013	-0.003	0.008	<b>0.056**</b>
<i>No High School Graduate</i>	0.007	-0.006	0.029	0.002	0.023	-0.012	0.004	-0.004
<i>Median Income</i>	-0.023	-0.018	0.014	-0.032	-0.014	0.025	0.013	-0.028
<i>Poor</i>	-0.070	-0.009	-0.028	-0.025	<b>-0.097**</b>	-0.002	-0.018	-0.005
<i>Household Size</i>	-0.070	0.026	-0.018	-0.028	-0.028	-0.011	0.008	-0.010
<i>Householder</i>	0.032	0.017	-0.037	0.008	0.008	0.032	0.007	0.022
<i>Living Alone</i>	0.030	-0.017	-0.015	0.025	-0.007	0.003	0.017	<b>0.043**</b>
<i>Disability</i>	0.027	0.031	0.038	0.010	<b>0.064**</b>	0.038	0.014	-0.029

(continued)

Table 2. (continued)

	Completed or Scheduled A Follow-Up Appointment	Completed or Scheduled A Follow-Up Procedure	Completed or Scheduled A Follow-Up Prescription Fill	Completed or Scheduled A Follow-Up Event	Completed or Scheduled Two Or More Types of Follow-Up Events	Missed A Scheduled Follow-Up Event	Caller Initiated an Intervention with Regards to An Event	Reported a new adverse event
<i>Unemployment</i>	-0.055	-0.041	-0.016	-0.035	-0.066	0.025	0.002	0.002
<i>Lack of Health Insurance</i>	-0.039	-0.052	-0.001	-0.025	-0.072	0.030	0.009	0.030
<i>Public Insurance</i>	-0.050	-0.044	-0.015	-0.029	<b>-0.090**</b>	-0.023	<b>-0.052**</b>	0.013
<i>Having Computer</i>	<b>-0.080**</b>	0.019	-0.024	-0.052	-0.038	-0.005	0.000	0.028
<i>Having Internet</i>	0.062	-0.048	0.027	0.047	0.010	0.003	0.007	0.015

Abbreviation: LOS=length of stay.

\*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

asked to fill prescriptions. Roughly 15% of our patients reported scheduling or completing a prescription fill, but we are unable to say how many more were asked to fill a prescription since the authors did not have access to the discharge plans or EMR. Second, it is also possible that current post-discharge contact strategies are geared more toward aiding patients in follow-up appointments than assisting them in filling timely prescriptions. For instance, PFCC callers reported helping patients fill their prescriptions in only about 10 cases, which is significantly less than the number of patients who were assisted with appointments (44). Callers should have more resources to streamline patients' access to pharmacists and be able to troubleshoot problems in real time.

Successful completion of two calls was strongly associated with the detection of new post-discharge clinical events. Encounter scripts used by transitional care nurses should routinely incorporate questions aimed at detecting emerging clinical issues and provide patients resources to quickly triage between minor and potentially serious events. While most reported events in our study were minor, some reported serious events like bloody stools/urine, stroke, severe pain, seizures, and loss of vision. When needed, callers should be equipped to provide more direct assistance in arranging the transfer of such patients to appropriate clinical settings.

No consistent relationship was found between demographic factors (e.g., age, gender, insurance type, or preferred language) and compliance with post-discharge follow-up care activities. This contrasts with a prior study that found negative associations between the likelihood of timely follow-up among Medicare enrollees and male gender, non-White race, and having public insurance (24). The fact that our sample was relatively younger and healthier than the typical Medicare population may partially account for this difference, since these disparities may be especially acute in frail elderly patients. Alternatively, the design of contemporary interventions may have grown better at

mitigating these disparities. However, callers were less likely to initiate or complete interventions on behalf of women. It is unclear why this may be the case since women were just as likely to engage in appropriate follow-up activities or report new adverse clinical events as men. One speculative possibility is that women may have sought help from callers less often than men. This issue should be explored in further studies.

Among clinical factors, there was a consistent and strong relationship between alcohol-related disorders and poor compliance with post-discharge follow-up activities. This is consistent with prior literature (25). Patients with alcohol disorders often suffer from a host of adverse psychological and social health determinants that may limit the efficacy of traditional post-discharge call programs (26); these programs may need to adapt to these unique challenges and circumstances, perhaps by adding supplementary home visits and transport support, greater coordination with PCPs, smoother referral mechanisms to behavioral health care services, and ensuring callers have direct access to multiple contact persons besides the patient. Living in areas with high use of computers was associated with lower odds of reporting follow-up appointments and/or interventions by PFCC callers. One explanation is that greater access to the Internet may be easing pressures for scheduling in-person appointments by allowing online access to medical counseling and clinical records (27).

### Limitations

Our study has several limitations. First, our results reflect associations that may have alternative explanations and should not be used to infer causative relationships. Moreover, our study lacked a control group to serve as a counterfactual for assessing changes that would have happened in the absence of our intervention. For example, the association between more post-discharge contacts and improved follow-up activities may simply reflect more



opportunities for callers to detect compliance with follow-up actions. Alternatively, patients who were open to receiving multiple calls may differ in significant ways from those who did not, such as being more proactive in complying with recommended care. Second, some of our outcome measures should be considered underestimates since we lacked specific denominators to generate more precise estimates. For instance, while we have precise frequencies of the number of patients reporting follow-up procedures or filling prescriptions, we lacked information on how many patients at discharge were asked to comply with these follow-up actions. Third, coding entry was affected by illegible handwriting in a few cases, leading to some missing fields. Fourth, we did not perform an inter-rater reliability check for codes entered by separate raters, which may have introduced some measurement error. However, one of the authors reviewed and revised entries that reflected clear errors in interpreting coding instructions. Finally, our sample was drawn from just one hospital and may not be perfectly representative of the overall U.S. hospital discharge population.

## Conclusion

Our findings suggest that post-discharge phone calls are important for smooth and effective care transition for hospitalized patients. However, making the first phone call to patients, while crucial, may not be sufficient for effective care transition; making two to three phone calls seems to be more optimal while further calls may have limited value. Our findings support special interventions for care transition to target hospitalized patients with alcohol use disorders and the need to equip callers to quickly detect and triage new post-discharge clinical events and arrange transfer of patients to appropriate clinical settings if needed.

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## Author's Contribution

All authors (NB, JE, JR, CC, and JS) made substantial contributions to the conception or design of the work; NB, JE, JR, and JS were responsible for the acquisition, analysis, or interpretation of data for the work; NB, JE, JR, CC, and JS were responsible for drafting the work or revising it critically for important intellectual content; all authors gave final approval of the version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## Ethical Approval

The study was deemed exempt from full IRB review by the IRB at the UNLV (Approval ID: 1725620-2).

## Statement of Human and Animal Rights

All procedures in this study were conducted in accordance with the UNLV IRB (Approval Number/ID: 1725620-2) approved protocols.

## Statement of Informed Consent

Not applicable because of use of secondary, anonymized data.

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