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Language Barriers and Understanding of Hospital Discharge Instructions

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Abstract

Background—Effective communication at hospital discharge is necessary for an optimal transition and to avoid adverse events. We investigated the association of a language barrier with patient understanding of discharge instructions.

Methods—Spanish, Chinese and English speaking patients admitted to two urban hospitals between 2005-2008, comparing patient understanding of follow-up appointment type, and medication category and purpose between limited English proficient (LEP) and English proficient (EP) patients.

Results—Of the 308 patients, 203 were LEP. Rates of understanding were low overall for follow-up appointment type (56%) and the 3 medication outcomes (category 48%, purpose 55%, both 41%). In unadjusted analysis, LEP were less likely than EP patients to know appointment type (50% vs. 66%; p = .01), medication category (45% vs. 54%; p = .05), and medication category and purpose combined (38% vs. 47%; p = .04), but equally likely to know medication purpose alone. These results persisted in the adjusted models for medication outcomes: LEP patients had lower odds of understanding medication category (OR 0.63; 95% CI 0.42-0.95); and category/purpose (OR 0.59; 95%CI 0.39-0.89).

Conclusions—Understanding of appointment type and medications post-discharge was low, with LEP patients demonstrating worse understanding of medications. System interventions to improve communication at hospital discharge for all patients, and especially those with LEP, are needed.

Keywords

Interpretation; hospital discharge; patient-doctor communication

Introduction

Discharge from the hospital is a care transition with preventable adverse events and re-admissions occurring in the subsequent month.(1-3) Although some of these events are due to severity of the illness itself, many are thought to be due to poor communication leading to

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lack of patient knowledge of their diagnoses and medications, and how to access medical assistance (4-6), and subsequently lead to medication-related adverse events, ED visits and hospital readmissions.(7-10) Once outside of the hospital, it is patients themselves who are administering their medications, reporting adverse events to clinicians, and requesting refills; thus it is patients who must know both the kind of medications they are taking and for what purpose. Attendance at follow-up appointments after hospitalization has been shown to decrease hospital readmissions; (11, 12) however, in order to adhere to follow-up, patients must know when and where their appointments are scheduled.

Poor communication may be exacerbated for patients who have limited English proficiency (LEP), for whom discharge instructions and paperwork may be indecipherable. The growing LEP patient population in the U.S. experience significant communication barriers when they enter the healthcare system, (13-15) including a higher rate of errors leading to physical harm while in the hospital. These adverse events are likely to be related to poor communication,(16) and lead to longer lengths of hospital stay and higher readmission rates. (17, 18)

Discharge counseling focused on informing patients of major diagnoses, medication changes, follow-up appointments, self-care instructions, and whom to contact if problems develop is recommended.(19, 20) This care transition counseling responsibility is infrequently standardized and often delivered in a rushed and complex manner by multiple professionals,(21) involving English-language materials written at a high literacy level.(22, 23)

This study addressed whether a language barrier is associated with lower rates of understanding of discharge instructions, including diagnosis, type of follow-up appointments, and medication category and purpose after discharge from the acute care hospital. Among LEP patients, we also examined whether language concordance and interpretation at discharge were associated with understanding of discharge instructions.

Methods

Setting and Patient Population

Spanish and English speaking patients from one urban public hospital's combined general medical-surgical floor were recruited between 2005-2006, and again between 2007-2008. In the second recruitment time period, Chinese speakers at this hospital and Chinese and English speakers from the general medical and surgical floors of a second urban academic medical center were recruited.

The same nurses for both medical and surgical patients performed the discharge process at the public hospital. The discharge process at the academic medical center was uniform across the adult floors of the hospital. Between the first and second recruitment time periods there were changes to the discharge process at the public hospital to increase emphasis on medication reconciliation and implementation of a nurse-run discharge lounge. Thus, we defined a 3-level clinical site-time variable for use in analysis: public hospital time 1, public hospital time 2, and academic hospital time 2.

Both hospitals employed Chinese and Spanish speaking staff professional interpreters available by appointment or on-call weekdays 8AM-5PM. They also had available on the floor a few speaker or dual-handset telephones which could be used to access either in-house or vendor interpreters 24 hours per day. The public hospital had two nurse-employees who had the dual-role of working as Spanish interpreters when they were on the medical-surgical floor. This study did not attempt to influence use or mode of interpretation. Nurses were

aware that the study was evaluating patients' experience with communication during hospitalization.

Eligibility, Recruitment, Study Procedures

Eligibility criteria included: 1) hospitalized on the general medical or surgical floor, 2) age ≥18 years, 3) speak Chinese, Spanish or English, and 4) pass a cognitive screener.(24) We sent a letter to physicians who were scheduled to attend on these services requesting permission to contact their inpatients; none declined.

Potential participants were recruited by bilingual-bicultural research assistants who went to the wards, reviewed the documented primary language of newly admitted patients, checked with the appropriate nurse to confirm that it would be acceptable to enter a patient's room, and then approached available Spanish and Chinese speaking patients for potential participation. A comparison group of English speaking patients was recruited in parallel from the same floors with the goal of enrolling one EP patient for every two LEP patients.

Participants consented and responded to the survey verbally, in their preferred language in-person in the hospital. A follow-up interview was completed over the telephone two weeks after hospital discharge. Clinical data were abstracted from the patient's chart after discharge. The institutional review boards at both hospitals approved study procedures.

Baseline Interview: English Proficiency and Demographic Factors

We derived the main predictor of interest, LEP status (EP versus LEP), based on a previously validated, two-question algorithm,(25) using the U.S. Census English proficiency question: “How well do you speak English?” and an additional question “In what language do you prefer to receive medical care?” We categorized as LEP those participants who answered the U.S. Census question ‘not well’ or ‘not at all’ and those who answered ‘well’ but preferred their medical care in Spanish or Chinese. To determine educational attainment, we asked participants “What is the highest grade or year of school you completed?”Additional demographic and health factors collected during the baseline interview included sex, age, insurance, usual source of medical care, and the presence of other medical conditions.(26)

Follow-up Interview: Communication at Discharge, Post-Discharge Medical Care

For LEP patients, we derived a variable that represented the patient's perceived language concordance with the person providing the discharge information, and asked about patient recall of provision of language assistance at the time of discharge. For LEP patients reporting discharge instruction communication in Spanish or Chinese, we also asked how well the participant thought the person communicating the instructions spoke that language; if they responded ‘well’ or ‘very well’ we considered that to be concordant non-English communication, but if they responded ‘not well’ or ‘not at all’ we considered that to be language-discordant communication. For discordant communications, we then asked about the presence of a professional hospital interpreter or a family member or friend. We then defined a 5-level variable for communication of discharge instructions as: 1) concordant, English; 2) concordant, Spanish or Chinese; 3) discordant, hospital interpreter present; 4) discordant, family/friend present; and 5) discordant, no interpreter present.

We asked all participants about their medication history and classified each participant according to whether s/he was taking medications prior to hospitalization only, whether new medications were prescribed at discharge only, or s/he both had prior medications continued and new medications started after discharge. Patients were asked to bring out their medication bottles during the interview and report on each discharge medication name and

purpose. Questions about timing and type and location of post-discharge follow-up appointments, receipt of instructions about when to seek medical care after discharge, and utilization of emergency department visits or hospital readmission were also included.

Chart Review: Discharge Diagnosis, Medications, Appointments

Medical records were obtained and reviewed using a standardized form to record the admitting service and the principal discharge diagnosis listed. For descriptive purposes, the diagnosis codes were collapsed into 10 standard categories adapted from the Healthcare Cost and Utilization Project of the Agency for Healthcare Research and Quality.(27)

Medications documented in the chart were identified from the discharge papers as was information about follow-up appointments. Since the majority (71%) of patients had only one appointment scheduled, we categorized the number of appointments as 0, 1, or ≥2.

Outcomes: Patient Understanding of Discharge Instructions

We defined patient understanding of discharge instruction outcomes: principal discharge diagnosis, three medication outcomes (category, purpose, combined category and purpose), and follow-up appointment type. For all outcomes, we compared participant report in the follow-up interview with the chart discharge record. Outcomes were coded and reconciled by two physicians blinded to patient language status.

For principal diagnosis, we compared participant report of the main reasons for hospitalization to the principal diagnosis documented in the chart using a previously established method (28) and assigned a status for patient understanding of principal diagnosis (yes/no).

For those participants who had scheduled appointments documented and were aware of this appointment, we compared patient report of the type of appointment with the chart data. We considered the participant to have understanding of follow-up appointment type if they reported any of the following as was stated in the chart: the same location (clinic name), type of practice, or physician name. We then classified participant understanding of follow-up appointment type (yes/no) for each appointment listed in the chart.

For medications, we compared participant report of discharge medication name and perceived purpose to those documented in the chart. We categorized each medication into one of 40 categories (e.g. antibiotics) and classified participant understanding of medication category (yes/no) for each. Similarly, we categorized each medication into one of 40 purposes (e.g. infection) and classified participant understanding of medication purpose (yes/no) for each.

Data Analysis

Descriptive data are shown as proportions for categorical variables, and means with standard deviations for continuous variables. Bivariate comparisons were made by LEP status; all p-values are two-sided. Because most participants knew their principal diagnosis (83%) and were aware of their follow-up appointment(s) (85%), we did not model the association of a language barrier with these outcomes.

We modeled the association of LEP status with the understanding of follow-up appointment type and with the understanding of the three post-discharge medication outcomes (category, purpose, and both). Because any given patient could have multiple appointments and multiple medications, all models were appointment or medication level analyses, clustered on the patient using generalized estimating equations. Models adjusted for sex, age,

educational attainment, insurance, co-morbidities, number of appointments or medications documented in the chart, admitting service, clinical site-time, and days from discharge to follow-up interview. In addition, the appointment type model adjusted for participant report of receiving information at time of discharge about when to seek care, and medication models adjusted for medication history.

We conducted a secondary analysis modeling the association of language concordance and use of an interpreter for communication of discharge instructions with the appointment type, and combined medication purpose and category outcomes. We also modeled the association of a three-level educational attainment variable (grade school or less, less than high school completion, high school graduate or more) on the same outcomes for the subset of LEP participants.

Finally, we conducted a sensitivity analysis for all models, in which we re-categorized as English proficient all participants who reported speaking English ‘well’ regardless of their preferred language for medical care.

Results

Of the 614 patients approached to participate, 116 (19%) declined, 76 (12%) were too ill to be interviewed, 48 (8%) were cognitively impaired, and 374 (61%) enrolled and completed the baseline interview. Of these 374 patients, 61 (29 LEP and 32 EP) did not complete a follow-up interview within 8 weeks of discharge and five (2 LEP and 3 EP) had incomplete chart data. These analyses include the 308 participants with complete follow-up and chart data.

Most (87%) participants were recruited from the public hospital. Two-hundred-three participants were categorized as LEP (30 Chinese and 173 Spanish speakers); 93 spoke English ‘not at all’, 98 spoke ‘not well’, and 12 spoke ‘well’ but preferred to receive their medical care in either Spanish or Chinese. Among the EP group 41% were African American, 29% Latino, 19% White and 11% Asian. On average, follow-up interviews took place 21 days post-discharge (range 6-59).

Respondents were relatively young and there were more LEP participants under age 40 and over age 60 compared with the EP group (Table 1). The LEP group had less educational attainment, lacked both health insurance and a usual source of health care, and reported less co-morbidity than the EP group. Overall, 60% were surgical patients, and the three most common principal diagnoses were gastrointestinal (e.g. appendicitis), infections (e.g. cellulitis), and injury (e.g. fracture).

Most participants (90%) were prescribed at least one new medication at discharge, with a mean of four medications documented in the chart (range 0-18); LEP participants had on average fewer discharge medications than EP participants (3.6 vs. 4.6; p=.01). The majority (71%) of participants had only one follow-up appointment documented, and most appointments (76%) were scheduled by the time of discharge. Two-thirds of participants reported receiving discharge instructions from a nurse, and most (84%) reported being given instructions about when to seek medical care after discharge. There was no significant difference by language group in follow-up appointment number, scheduling, or report of instructions.

One third (N=64) of LEP participants reported that they received their instructions from someone who spoke their language well or very well (concordant); one in seven (N=29) LEP participants reported having a hospital interpreter at discharge, one in four (N=54) LEP

participants reported having a family member or friend interpret, and an equal number reported no one present to interpret (N=54).

Overall, 15% of participants reported having an emergency department (ED) visit or being re-hospitalized between the index hospitalization and the follow-up interview. LEP participants were less likely than their EP counterparts to have post-discharge ED visits or re-hospitalization (9% vs. 27%; $p < .001$).

LEP status and appointment type and medication outcomes

Rates of understanding were low overall for follow-up appointment type (56%) and the 3 medication outcomes (category 48%, purpose 55%, both 41%). In unadjusted analysis, LEP were less likely than EP participants to know appointment type (50% vs. 66%; $p = .01$), medication category (45% vs. 54%; $p = .05$), and both category and purpose combined (38% vs. 47%; $p = .04$), but equally likely to know medication purpose alone (55% vs. 54%; p=. 82).

LEP status remained associated with lower odds of understanding the type of follow-up appointment (OR 0.56), but was not statistically significant (Table 2). Reporting having been given instructions about when to seek medical care after discharge was significantly associated with higher odds of understanding follow-up appointment type.

LEP status remained significantly associated with lower odds of understanding of medication category (OR 0.63) and of the combined outcome of medication category and purpose (OR 0.59) in adjusted analyses. There was also a trend toward an association for medication purpose alone (OR 0.89). For the three medication outcomes, the number of medications was inversely associated with the odds of understanding, such that with each additional medication, there was a 10-15% decrease in the odds of understanding for any medication. Analysis re-categorizing as EP participants who spoke ‘well’ but preferred their medical care in Spanish or Chinese strengthened, but did not substantially change the results in Table 2.

Effect of language concordance at discharge, educational attainment in LEP patients

Table 3 demonstrates results of modeling the association of language concordance at discharge with the appointment type and combined medication category and purpose outcomes. Notably, those LEP participants who reported that the person communicating discharge instructions was language concordant had lower odds of understanding than the EP group for both outcomes. In addition, those reporting a family/friend interpreter at discharge had lower odds of understanding their medications. Those reporting a hospital interpreter and those reporting no interpretation were no different from their EP counterparts. On further examination of the distribution of English proficiency among the LEP participants, all but one of the participants who reported that they spoke ‘well’ but preferred their medical care in a non-English language were in the group with no interpretation at discharge. However, re-categorization of these participants as EP in sensitivity analysis did not substantially change these results.

Among the sub-group of 203 LEP participants, those with the lowest educational attainment -elementary school or less -had significantly lower odds of appointment type (OR 0.37, 95% CI 0.15-0.95) and combined medication category and purpose (OR 0.50; 95% CI 0.26-0.94) understanding compared with those with high school or more education, regardless of perceived language concordance at discharge.

Discussion

This is the first study to report on LEP patients' understanding of information given to them at the time of hospital discharge. We found that most patients were aware of their diagnosis and of a follow-up appointment. However, understanding of medications and of the type of follow-up appointment was low. Although understanding of the purpose of the medications was similar between LEP and EP groups, LEP patients were less likely to know either the category alone or both the category and purpose of their medications. Given the high rate of medication errors in the immediate post-hospitalization period,(29) this finding highlights the importance of adequate communication at hospital discharge with LEP patients. Among the LEP participants, those with the lowest educational attainment were the least likely to know information about their follow-up appointments and medications. The combination of low educational attainment with a language barrier places many LEP patients in ‘double jeopardy’ of not understanding critical information, and increasing risks at discharge.

Although we were not able to examine the direct connection between patient understanding and actual medication errors, this has been observed in other studies(10). In this respect, both the overall low rate of medication understanding in our study and the disparity in understanding for our LEP participants, particularly for those with the least education, demonstrate the need for improved communication with efforts such as the teach-back technique to confirm understanding (30-33). Our findings support that increasing patients' medication understanding in their preferred language is an important component of interventions to prevent medication errors and reduce re-hospitalizations.

Our analysis of language concordance demonstrated that working with professional interpreters to communicate discharge information results in similar understanding for LEP patients as for English speakers. This is consistent with prior studies which have shown that communication via a professional interpreter results in equivalent communication and care as for English speakers (14). However, LEP patients communicating in their own language at discharge had less understanding about appointments and outcomes. Given that in ambulatory settings, language concordance has led to improved outcomes,(34, 35) our result may reflect patients overestimating the staff's language ability leading to lack of true concordance. Equally surprising was that those reporting no interpretation at discharge had similar outcomes to the English-speaking group; this held true even when those who spoke English ‘well’ were removed from the LEP group. These counter-intuitive findings suggest that decisions about how to bridge a language barrier at the time of discharge are complex and deserve further study. Those with family and friends present to interpret had less understanding of medications and this emphasizes the need to have professional interpreters whenever possible.(36, 37)

In our study, reporting receipt of specific instructions at discharge did improve rates of discharge information understanding regardless of language. This supports expert recommendations for focused discharge counseling on medication changes and contact information in case problems develop.(19, 38) However, the low rates of understanding overall suggest that there is substantial room for improvement in the use of focused discharge counseling, and in its effectiveness for patients with low educational attainment. Conversely, number of medications was associated with lower rates of medication understanding regardless of other factors and each additional medication was associated with a 10-15% reduction in rate of any kind of medication understanding. This finding again points to the need for improved, focused discharge communication specifically about medication regimens.

The limitations in this study include the use of only two hospital sites in a single geographic area limiting generalizability. Most LEP patients in our study were relatively young, admitted for trauma or acute abdominal surgery, recovered quickly, and had a lower readmission rate compared to the English speakers, limiting our power to model post-discharge acute care as an outcome. Although many of these participants admitted for surgery were likely not as ill as those on a medical service, this would bias the results toward finding no difference by LEP status given that a straightforward disease course would make it easier for patients to understand their discharge information. For the more ill and elderly participants in our study, we do not have data on their caregiver involvement in their post-hospital care, and for this population caregivers may be the guardians of discharge information. Additionally, we did not survey or directly observe the clinicians taking care of these patients to measure the content of information given during hospitalization or at discharge. Lastly, the observational nature of this study may introduce selection bias and disallows the drawing of causal inference regarding language barriers and our outcomes.

A pre-condition to improve communication is that hospitals should commit to systematic identification of LEP patients and the provision of language assistance when patients are admitted.(39) A second implication is that development of discharge materials and processes that are accessible to most patients as well as asking patients to repeat back discharge instructions to ensure comprehension is imperative. Lastly physicians must be conscious of poly-pharmacy and weigh the risks and benefits of adding medications when each addition may contribute to decreased patient understanding and possibly more medication errors. While we found that most patients are aware of their principal diagnosis as well as the fact that they have a follow-up appointment scheduled, our results support the need for more intensive efforts to improve the discharge planning process, especially when medication instructions are involved. Such attention could improve patient outcomes for all patients, including those faced with language and educational barriers to communication.

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Table 1

Participant demographics and health care factors by English proficiency status (N=308), San Francisco Bay Area, 2005-2008

	Overall N (%)	English Proficient N (%)	Limited English Proficient N (%)	p-value
Sex				
Women	153 (49.7)	59 (56.2)	94 (46.3)	.10
Men	155 (50.3)	46 (43.8)	109 (53.7)	
Age mean ± s.d. (range)	43 ±16.1 (18.3-88.3)	41.9±13.9 (18.5-84.4)	43.6±17.1 (18.3-88.3)	.36
18-29	78 (25.3)	25 (23.8)	53 (26.1)	.0006
30-39	66 (21.4)	17 (16.2)	49 (24.1)	
40-49	68 (22.1)	30 (28.6)	38 (18.7)	
50-59	50 (16.2)	26 (24.8)	24 (11.8)	
≥60	46 (14.9)	7 (6.7)	39 (19.2)	
Educational Attainment				
Grade school or less	96 (31.2)	2 (1.9)	94 (46.3)	<.0001
Middle school/some high school	88 (28.6)	25 (23.8)	63 (31.0)	
High school graduate/GED	62 (20.1)	34 (32.4)	28 (13.8)	
Some college or more	62 (20.1)	44 (41.9)	18 (8.9)	
Insurance				
None	142 (46.1)	34 (32.4)	108 (53.2)	<.0001
Medicaid	106 (34.5)	36 (34.3)	70 (34.5)	
Medicare	34 (11.0)	15 (14.3)	19 (9.4)	
Private	26 (8.4)	20 (19.1)	6 (3.0)	
Usual source of medical care				
Primary care	122 (39.6)	57 (54.3)	65 (32.0)	.0005
Other outpatient care	56 (18.2)	17 (16.2)	39 (19.2)	
No usual place	130 (42.2)	31 (29.5)	99 (48.8)	
Co-morbidities (possible range 0-15) mean ± s.d. (range)	1.9± 1.7 (0 – 8)	2.3± 1.7 (0 – 8)	1.8± 1.7 (0 - 8)	.02
Principal discharge diagnosis				
Gastrointestinal disorder	104 (33.8)	23 (21.9)	81 (39.9)	.08
Infection/fatigue NOS	43 (14.0)	19 (18.1)	24 (11.8)	
Injury/poisoning	37 (12.0)	17 (16.2)	20 (9.9)	
Musculoskeletal / connective tissue disorder	20 (6.5)	8 (7.6)	12 (5.9)	
Gynecologic disorder	19 (6.2)	4 (3.8)	15 (7.4)	
Malignancy	18 (5.8)	5 (4.8)	13 (6.4)	
Respiratory disorder	15 (4.9)	7 (6.7)	8 (3.9)	
Nervous system/brain infection	14 (4.6)	6 (5.7)	8 (3.9)	

	Overall N (%)	English Proficient N (%)	Limited English Proficient N (%)	p-value
Renal / urinary disorder	14 (4.6)	6 (5.7)	8 (3.9)	
Other	24 (7.8)	10 (9.5)	14 (6.9)	
Admitting service				
Surgery	186 (60.4)	58 (55.2)	128 (63.1)	.18
Medicine	122 (39.6)	47 (44.8)	75 (37.0)	

* for English and Spanish speakers only

Table 2

English proficiency and adjusted odds of post-discharge understanding of type of scheduled follow-up appointment, medication category, medication purpose, and medication category and purpose,* San Francisco Bay Area, 2005-2008

	Type of Follow-up Appointment**	Medication Category‡	Medication Purpose‡	Medication Category and Purpose‡
English Proficiency				
English Proficient	Referent	Referent	Referent	Referent
Limited English Proficient	0.56 (0.31-1.02)	**0.63 (0.42-0.95)**	0.89 (0.61-1.31)	**0.59 (0.39-0.89)**
Sex				
Women	Referent	Referent	Referent	Referent
Men	**0.53 (0.31-0.89)**	0.88 (0.62-1.26)	1.00 (0.72-1.37)	0.89 (0.62-1.23)
Age (continuous)	0.99 (0.97-1.01)	0.99 (0.98-1.00)	0.99 (0.98-1.01)	0.99 (0.98-1.00)
Educational Attainment				
High school graduate or more	Referent	Referent	Referent	Referent
Less than high school	0.62 (0.34-1.13)	0.90 (0.59-1.36)	0.89 (0.62-1.30)	0.83 (0.55-1.26)
Insurance				
No	Referent	Referent	Referent	Referent
Yes	**0.47 (0.28-0.80)**	0.80 (0.54-1.20)	0.88 (0.61-1.28)	0.76 (0.51-1.14)
Co-morbidities (continuous)	0.99 (0.85-1.15)	1.04 (0.91-1.18)	1.01 (0.90-1.13)	1.02 (0.90-1.16)
Hospital Service				
Surgery	Referent	Referent	Referent	Referent
Medicine	0.65 (0.35-1.23)	1.07 (0.71-1.59)	0.82 (0.58-1.15)	0.84 (0.56-1.25)
Number of appointments documented in chart				
1	Referent	----------	----------	----------
≥ 2	0.55 (0.30-1.02)			
Given instructions about when to seek medical care after discharge				
No	Referent	----------	----------	----------
Yes	**2.59 (1.11-6.05)**			
Number of Medications documented in chart (continuous)	----------	**0.90 (0.83-0.98)**	**0.85 (0.79-0.92)**	**0.86 (0.79-0.94)**
Medication History				
Taking meds prior to hospitalization	----------	Referent	Referent	Referent
Given new meds at discharge		1.35 (0.59-3.11)	2.01 (0.93-4.34)	1.44 (0.61-3.39)
Taking meds prior *and* given new meds		1.65 (0.73-3.74)	**2.15 (1.03-4.49)**	1.78 (0.78-4.06)

*All models adjusted for clinical site and time-period of data collection, as well as time from discharge to follow-up interview;

** n=274 scheduled appointments in chart for 204 patients aware of scheduled follow-up appt; appointment level analysis clustered on patient;

‡ n=1217 medications in chart for 295 patients discharged with medications; medication level analysis clustered on patient

Table 3

Language concordance at discharge and adjusted odds of post-discharge understanding of type of scheduled follow-up appointment, and medication category and purpose,[*] San Francisco Bay Area, 2005-2008

	Type of Follow-up Appointment[**]	Medication Category and Purpose[‡]
Language concordance at discharge		
Concordant; English-English	Referent	Referent
Concordant; non-English	**0.39 (0.19-0.83)**	**0.51 (0.30-0.86)**
Discordant; hospital interpreter	0.81 (0.36-1.83)	0.79 (0.38-1.64)
Discordant; ad hoc interpreter – family/friend	0.53 (0.23-1.22)	**0.31 (0.16-0.57)**
Discordant; no interpreter	0.70 (0.30-1.63)	0.77 (0.46-1.30)
Sex		
Women	Referent	Referent
Men	**0.51 (0.30-0.87)**	0.92 (0.64-1.33)
Age (continuous)	0.99 (0.97-1.01)	0.99 (0.98-1.01)
Educational Attainment		
High school graduate or more	Referent	Referent
Less than high school	0.66 (0.35-1.23)	0.94 (0.62-1.44)
Insurance		
No	Referent	Referent
Yes	**0.45 (0.26-0.76)**	0.72 (0.48-1.09)
Co-morbidities (continuous)	0.99 (0.84-1.16)	1.04 (0.92-1.17)
Hospital Service		
Surgery	Referent	Referent
Medicine	0.70 (0.37-1.34)	0.85 (0.57-1.27)
Number of appointments documented in chart		
1	Referent	----------
≥ 2	**0.52 (0.29-0.96)**	
Given instructions about when to seek medical care after discharge		
No	Referent	----------
Yes	2.32 (0.96-5.59)	
Number of Medications documented in chart (continuous)	----------	**0.85 (0.78-0.93)**
Medication History		
Taking meds prior to hospitalization	----------	Referent
Given new meds at discharge		1.42 (0.60-3.38)
Taking meds prior *and* given new meds		1.96 (0.85-4.51)

[*] All models adjusted for clinical site and time-period of data collection, as well as time from discharge to follow-up interview;

[**] n=274 scheduled appointments in chart for 204 patients aware of scheduled follow-up appt; appointment level analysis clustered on patient;

[‡] n=1217 medications in chart for 295 patients discharged with medications; medication level analysis clustered on patient