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Hospital discharge preparedness for patients with limited English proficiency: a mixed methods study of bedside interpreter-phones

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Abstract

Objective—Assess effects of a bedside interpreter-phone intervention on hospital discharge preparedness among patients with limited English proficiency (LEP).

Methods—Mixed-methods study compared patient-reported discharge preparedness and knowledge of medications and follow-up appointments among 189 Chinese- and Spanish-speakers before (n=94) and after (n=95) bedside interpreter-phone implementation, and examined nurse and resident-physician interpreter-phone utilization through focus groups.

Results—Pre-post discharge preparedness (Care Transitions Measure mean 77.2 vs. 78.5; p=0.62) and patient-reported knowledge of follow-up appointments, discharge medication administration and side effects did not differ significantly. Pre-post knowledge of medication purpose increased in bivariate (88% vs. 97%, p=0.02) and propensity score adjusted analyses [aOR (adjusted odds ratio), 4.49; 95% CI, 1.09–18.4]. Nurses and physicians reported using interpreter-phones infrequently for discharge communication, preferring in-person interpreters for complex discharges and direct communication with family for routine discharges. Post-implementation patients reported continued use of ad-hoc family interpreters (43%) or no interpretation at all (22%).

Conclusion—Implementation of a bedside interpreter-phone systems intervention did not consistently improve patient-reported measures of discharge preparedness, possibly due to limited uptake during discharges.

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Practice implications—Hospital systems must better understand clinician preferences for discharge communication to successfully increase professional interpretation and shift culture away from using family members as interpreters.

Keywords

Limited English proficiency; medical interpreters; physician-patient relations; communication barriers; language access; health literacy; patient education

1. Introduction

Effective communication and education regarding new diagnoses, medication changes, and follow-up plans through counseling is a critical component of hospital discharge [1]. Immediately after discharge, patients are at high risk of preventable adverse events and hospital readmissions, primarily due to adverse medication events [2, 3]. Additionally, early follow-up appointments for patients after hospitalization for chronic medical conditions have been associated with lower risk of hospital readmission [4, 5]. While not all adverse events are preventable, poor communication of medication changes and follow-up appointments during hospital discharge is likely to contribute to preventable readmissions.

Over 25 million people in the United States (U.S.) speak English “less than very well” and have limited English proficiency (LEP) [6]; similar language proficiency limitations also affect patients worldwide [7]. Language barriers between clinicians and patients can impede effective communication and patient comprehension of health-related information, placing patients at heightened risk of adverse events after hospital discharge [8, 9]. Previous studies demonstrated that hospitalized patients with LEP experience significant disparities in patient safety and outcomes of care. Compared to English-speakers, patients with LEP are more likely to have serious adverse events during hospitalization, particularly due to communication errors [10], and greater risk of 30-day readmission compared with English speakers [11, 12]. Patients with LEP are also less likely to understand information contained in hospital discharge instructions including medication category and purpose and follow-up appointments [13].

Our prior systematic review found that professional interpreters improved patient-clinician communication for patients with LEP including decreased communication errors, increased patient comprehension and increased patient satisfaction with communication [14]. Professional interpretation at discharge was also associated with equal adherence to emergency department discharge instructions and comparable understanding of hospital discharge instructions compared with English speakers [13, 14]. Importantly, professional interpretation, as compared to ad-hoc interpretation, resulted in significantly greater improvements in patient care, approaching the level of care of English speakers.

Regulations from the U.S. Department of Health and Human Services and Office for Civil Rights require hospitals receiving government funding to provide language access, including professional interpreters, for patients with LEP [15]. However, multiple U.S. studies have demonstrated low rates of professional interpreter utilization during hospital encounters [16–20]. Clinician-reported barriers to use of professional interpreters in the hospital include

time constraints and lack of immediate interpreter availability [21]. While best practices to overcome these barriers remain unclear, previous studies by our group demonstrated significant improvements in professional interpreter utilization [22], readmission rates [23], and understanding of informed consent [24] among patients with LEP after implementation of dual-handset phones that provided easy access to bedside professional interpretation. By improving access to professional interpreters, bedside interpreter-phones address barriers cited by clinicians and could be an effective method to increase professional interpretation during hospital discharge counseling [23]. Therefore, we investigated the implementation and impact of bedside interpreter-phones on the hospital discharge process, which we hypothesized would result in improved patient-reported preparation for discharge and medication and follow-up appointment knowledge among patients with LEP.

2. Methods

2.1 Study Population and Procedures

We prospectively recruited hospitalized patients from the cardiovascular, general surgery and orthopedic surgery floors who were primarily Chinese (Cantonese or Mandarin) or Spanish speaking and age 40 or older. Recruitment and baseline interviews were conducted during two time periods: a 6-month period before (June-November 2012) and a 6-month period after (March-August 2013) system-wide implementation of the bedside interpreter-phone intervention, which began in December 2012. Recruitment for the post-intervention phase began 3 months after interpreter-phone implementation to allow for integration of the bedside interpreter-phones into the clinical workflow. For this analysis, we included all enrolled participants discharged (non-deceased) from the hospital who also participated in a follow-up interview 3 weeks after discharge.

Bilingual-bicultural research assistants identified eligible patients daily by reviewing the floor census lists and preferred language in the medical record. Using baseline structured interviews with patients during hospitalization, research assistants administered a screening questionnaire that included patient age, a validated LEP identification algorithm [25], and the Mini-Cog cognitive screen [26]. We excluded patients with cognitive impairment, unless they otherwise met inclusion criteria and a primary caregiver consented to participate in the study as the patient’s surrogate, in which case the surrogate was interviewed in their preferred language and answered baseline and follow-up surveys on behalf of the patient. Informed consent for patients and surrogates was obtained in their preferred language.

Outcomes were ascertained through structured follow-up telephone interviews conducted by trained bilingual research assistants after hospital discharge. We attempted up to three contacts with participants starting three weeks post-discharge. If we were unable to reach an individual in the subsequent one month, we stopped calling. If a caregiver surrogate was interviewed at baseline, then the follow-up interview was conducted with the surrogate. If a patient indicated that a non-surrogate caregiver alone was given medication or follow-up appointment instructions, we called that caregiver and used his/her responses to ascertain outcomes. The study was approved by the institutional review board for the participating hospital.

2.2 Bedside Interpreter Intervention

The bedside interpreter intervention has been previously described [24]. In brief, the intervention consisted of a dual-handset interpreter-phone installed at the bedside in every room with programmed buttons enabling 24-hour access to a professional interpreter for more than 100 languages in less than one minute. The dual-handset phones allow a medical team member to speak into one handset and the patient to speak into another handset while a third-party professional interprets the conversation from a remote location. Prior to intervention implementation, in-person staff interpreters could be scheduled during weekdays from 8am to 5pm and one to three dual-handset interpreter-phones were available per floor. The pre-implementation interpreter-phones functioned similarly to the post-implementation phones but were not located at the bedside and had to be brought to the patient's room.

2.3 Measures

Baseline patient-reported covariates included patient age, sex, primary language, educational attainment, health literacy, general health prior to hospitalization, preferred language and English proficiency. Health literacy was defined as inadequate or adequate using a published, validated screening and classification tool [27].

Post-discharge, for patients who reported receiving discharge medication instructions, we asked patients/surrogates about clinician language concordance and professional and untrained ad-hoc interpreter use during those instructions. Medication instruction discussions were categorized as concordant if the patient reported that the healthcare team member spoke their non-English language well or very well. All others were considered discordant.

The patient's principal discharge diagnosis and follow-up appointment information were collected through chart review by trained abstractors; diagnoses were categorized using Healthcare Cost and Utilization Project classifications [28]. Additional variables collected and used for propensity score estimation are listed in the Appendix.

Outcomes included patient-reported measures obtained during the post-discharge follow-up interview. First, we examined the mean score on the 15-item Care Transitions Measure (CTM), which has been validated in multi-ethnic populations and assesses discharge preparedness from the patient perspective [29]. The overall raw CTM score was linearly transformed to a 0–100 scale [30]. Second, we examined single items of the CTM ascertaining understanding of discharge medication purpose, administration and side effects. Single item CTM measures included knowledge of medication purpose, administration, and side effects and were scored in standardized fashion using 4 ordered response options (strongly agree, agree, disagree, strongly disagree). Responses were dichotomized as strongly agree/agree and strongly disagree/disagree. Finally, for patients with documented need for a follow-up appointment, we assessed awareness of that appointment need with the following (yes/no) question, "When you were preparing to leave the hospital, did the staff tell you what follow-up appointments you needed to go to?" [13].

2.4 Statistical Analysis

We compared unadjusted bivariate outcomes for the pre- and post-implementation cohorts using $\chi 2$ tests for categorical outcomes and t-tests for continuous outcomes, and adjusted analyses using propensity scores. To control for non-random assignment of patients to the pre- and post-implementation groups, we estimated propensity scores representing the probability of being in the pre- vs. post-implementation group. The propensity score model included as potential confounding variables all previously described demographic and clinical variables (see Appendix for complete list of variables included in propensity score estimation). We compared outcomes for the pre- and post- groups adjusted for propensity score quintiles using linear regression models for the CTM outcome and logistic regression models for the medication and appointment knowledge outcomes. We conducted all statistical analyses using Stata 11.2 (College Station, TX).

2.5 Post-Implementation Qualitative Analysis

To help with interpretation of quantitative results, we analyzed data from four pre-planned semi-structured 60-minute focus groups, two with nurses and two with resident-physicians, conducted after completion of the 6-month implementation period [31]. Three study investigators independently coded focus group transcripts using a deductive approach and compared results to develop a consensus coding structure. Emerging themes were identified through an iterative process conducted through in-person meetings until consensus was reached on the findings.

3 Results

3.1 Patient Characteristics

A total of 214 patients participated in the baseline interview (107 pre- and 107 post-implementation). Of these, 94 (88%) in the pre- and 95 (89%) in the post-group completed follow-up interviews and were included in the sample for these analyses (pre: 8 died, 5 unable to contact; post: 4 died, 2 declined, 6 unable to contact). The entire sample had a mean age of 69.2 years (range 41–95), 57.1% were women, 65.1% spoke Chinese and 34.9% spoke Spanish, and 80% had inadequate health literacy. The most common reasons for hospitalization were diseases of the circulatory and digestive systems, and injury. The pre- and post-implementation groups were similar in demographic characteristics, educational attainment and English proficiency (Table 1).

3.2 Unadjusted and Adjusted Patient Outcomes

As shown in Table 2, unadjusted CTM scores assessing overall discharge preparedness did not differ significantly before and after interpreter-phone implementation (p=0.62). Propensity-adjusted analyses demonstrated a non-significant 1.59 point increase in CTM score in the post-implementation group. The overall proportions of patients reporting knowledge of discharge medications pre-implementation was high for medication purpose (88%) and administration (91%) and lower for side effects (70%). Only knowledge of discharge medication purpose increased significantly between the pre- and post-implementation groups in both bivariate analyses (p=0.02) and multivariable analyses

adjusted for propensity score quintile. Of 145 patients with documented follow-up appointment needs, 125 (86%) were aware of these appointments, with no significant difference in awareness between groups on bivariate (p=0.75) or adjusted analyses.

3.3 Patient/Caregiver-Reported Interpreter Use at Discharge

As shown in Table 3, there was no statistical difference in pre- and post-implementation patient-reported interpretation for medication instructions at discharge. While overall utilization of professional telephone interpreters increased by 14% throughout the medical center during the intervention period, patients on the study floors continued to report their own family members as the most common type of interpreter for discharge medication instructions (ad-hoc family interpretation, pre 37% vs. post 43%) with almost a quarter reporting no interpreter presence.

3.4 Nurse and Resident Qualitative Focus Groups

Overall, 14 nurses and 20 resident physicians participated in a total of four focus group discussions of the bedside interpreter-phones. Of the 14 nurses, 13 (93%) were women, 7 (50%) were White, 6 (43%) were Asian and none reported speaking a non-English language very well. Of the 20 residents, 9 (45%) were women, 8 (40%) were White, 10 (50%) were Asian, 12 (60%) were in their second or third years of residency, and 2 (10%) reported speaking a non-English language very well.

3.4.1 Convenient access for pain management and decision-making—Both nurses and physicians found professional interpretation much easier to access via the bedside interpreter-phone than prior to implementation. This convenient access allowed for better communication in many clinical encounters. In the words of one nurse, “[The phones were] long overdue. Now they’re in every room, whereas there used to only be one or two on a unit and always hard to find.” Similarly, a resident physician commented, “And the thing with this is, literally at your fingertips, you have an interpreter within one minute versus maybe an hour for an in-person interpreter. And that's just – it's invaluable.”

Two situations in which the interpreter phones were viewed as particularly useful were when physicians and nurses assessed pain management or patient preferences in the treatment decision making process. For example, a nurse commented, “I mean I think they’re [interpreter phones] really helpful for pain management, because that's such a big emphasis. And that really is a conversation. So, it's, ‘How is your pain? What makes it better? What makes it worse? Okay, here's what we can do.’" As evidenced by the following comment from a resident physician, the phones were indispensable for patient involvement in treatment decision making, “But if it's anything about deciding care, and the patient has autonomy and is driving the decisions, I'll usually try to use the phone or an [in-person] interpreter.”

3.4.2 Preference for in-person professional interpreters for complex discharges—Compared to situations that involved assessment of patients’ pain levels or involvement in treatment decision making, the interpreter-phones were perceived to be less useful for discharge counseling, and in-person professional interpretation or interpretation

by an ad-hoc family member were generally preferred. When patients were viewed as having complicated medication regimens that required complex instructions, nurses and physicians described a preference for in-person interpreters. For example, a nurse commented, “I find when – because we have a lot of transplant patients, and education is long, especially discharge education, and pharmacy's going through the whole long list of transplant medication, it takes a while. And when you're trying to interpret to the Russian [speaking] person or the Spanish [speaking] person how to look after yourself, and the list of medications that you're now going home with, it's kind of tedious, because now it's like – it's a three-way conversation. And I find it's much easier if there is a person on-site. And so, we can look at the face, and we can interpret and say, "Did they really understood [sic] what we say?" Similarly, a resident physician commented, “I think in-person is also helpful…if you have a complicated medication regimen to explain or something, where it just is hard to do – you know, you want to make sure somebody's interpreting directly for you and not going through family members and it's hard to do over the phone…”

Nurses also highlighted a preference for in-person interpreters for patients being discharged with any medical device requiring patient or family teaching to perform physical tasks. One nurse commented, “I usually just use the interpreter phone for simple discharges. But then if they…have little drains that they’re going home with, or feeding tubes, that's involved, usually an in-person interpreter.” Another nurse felt similarly: “A new colostomy bag. You can't do that over the phone. That one's really hard. So, a lot of physical tasks for teaching purposes…[are] the kind of thing where I'll schedule an [in-person] interpreter.”

3.4.3 Preference for in-person professional interpreters in presence of multiple family members—The focus group discussion revealed a clear preference for an in-person interpreter when multiple family members were present during discharge counseling. In the words of a nurse, “Usually [I use] the handset [for discharge teaching], but sometimes, especially if there’s a lot of family members that have a lot of questions about how to take care of the family member. And then it’s not just teaching one person; it’s teaching everybody. Then it’s so much easier to have someone in person, because otherwise, you have people asking questions, and the interpreter [over the phone’s speaker] doesn’t even know who they’re talking to, ‘cause there’s three or four different voices. And it’s – then people are like – all sort of talking, and they just interrupt, and nobody knows what’s going on.”

3.4.4 Preference for ad-hoc interpretation by family caregivers for routine discharges—Many nurses also described a preference for using family members as ad-hoc non-professional interpreters for routine discharge counseling, particularly when family members were caregivers and they were English-speakers since printed discharge instructions were provided only in English. For example, one nurse said, “Usually there's – if it's discharge time, there's probably a family member in there. I'm gonna talk through the family member…. discharges are pretty time intensive. It's a lot of information, and we don't provide them with materials in their language …We need somebody who can understand English.” Involvement of the caregiver in the discharge education process was viewed as critical. For example, another nurse stated, “…because again, you're talking to the person

who's gonna be with them when they go home with that English language paperwork…So, I really want to make sure that you, who are the person who's bringing them back for a follow-up appointment and are living with them, or going to be checking in with them every day, I really want to make sure that this English document that I'm giving you, that you understand it."

4 Discussion and Conclusion

4.1 Discussion

In this prospective study of hospitalized patients with LEP, we found improvement in knowledge of medication purpose, but no significant improvements in overall measures of discharge preparedness or other areas of discharge medication and follow-up appointment knowledge after implementation of a bedside interpreter-phone intervention designed to increase rapid access to professional interpreters throughout hospitalization. In focus groups, nurses and physicians reported positively on rapid access to interpreter-phones and their utility for improving clinical communication in some areas. However, they also reported using the interpreter-phones infrequently for discharge counseling, instead preferring in-person interpreters for complex discharges and direct communication with family members for routine discharge counseling or those situations in which family caregivers were involved in patient follow-up care. Patients confirmed frequent continued use of family members to interpret for discharge medication instructions and reported little use of professional interpreters despite nurse and physician professed preferences. Together, these findings suggest that, consistent with our prior study [22], the interpreter-phone intervention was well received for many types of clinical communication. However, it was less well received for discharge communication and did not substantially alter healthcare team preferences and practices regarding interpretation at discharge for patients with LEP.

To our knowledge, this is the first study to investigate the effects of a systems intervention to increase rapid access to professional interpreters on discharge preparedness for patients with LEP. However, previous studies of discharge preparedness in varying populations provide context for our results. The mean CTM score increased from 77.2 to 78.5 in our study; this post-implementation score is very similar to scores from a predominantly White cohort of patients hospitalized for cardiovascular diagnoses (median 77.8) [32] and a more diverse, but still predominantly English-speaking cohort of patients discharged from a safety net hospital (mean 79) [33]. Similarly, we found that patient-reported understanding of medication administration and follow-up appointments was already quite high in the pre-implementation period, thus possibly requiring more power to detect differences post-implementation than we had in this study. The high rates of patient-reported understanding are similar to a previous study of elderly, predominately White patients, where 73% comprehended medication instructions and 95% comprehended follow-up appointment instructions when assessed using self-reported understanding [34]. However, our own prior study of a largely younger, safety-net population with LEP found that comprehension of medication purpose (55%) and category (48%) and follow-up appointment type (56%) was low when assessed using knowledge-based questions, and lower than that of English-speakers [13]. The differences between these two studies may be related to a difference in patient population,

including age and socio-economic status; it may also be due to an increased clinical focus on the discharge process over the intervening decade.

The healthcare team preference for in-person professional and ad-hoc family member interpretation at discharge highlights the need for continuing education on the important roles that professional interpreters play and the evidence that they improve patient outcomes of care. While clinicians reported preferring some type of in-person interpreter (professional or ad-hoc), patients reported no interpretation of any kind in nearly one-quarter, and only ad-hoc interpretation in more than one-third, of discharge medication instruction discussions. These un-interpreted and non-professionally interpreted encounters represent low-hanging fruit when telephone interpreters could have been used to improve communication and clinical care for patients with LEP. While nurses noted the important role of family caregivers at discharge as a reason for not using professional interpreters, it would be possible to engage these caregivers in discharge teaching in the same way as are caregivers for English-speaking patients without imposing the additional expectation that they act as an interpreter for their loved-one. There are multiple drawbacks of using ad-hoc family interpreters. First, ad-hoc interpreters commit more clinically significant errors in interpretation compared to professional interpreters [35, 36]; accordingly, studies have demonstrated that professional interpreters are superior to ad-hoc interpreters in improving patient comprehension, clinical outcomes and satisfaction [14]. Similarly, the English proficiency of ad-hoc family interpreters is not formally assessed and poor proficiency is likely to contribute to interpretation errors. Second, use of ad-hoc family interpreters may reduce active patient participation in discharge counseling since the family interpreter may not relay discussion details to the patient at the time of the encounter.

While in-person interpretation is often considered to be the gold standard for medical interpretation, multiple studies have documented limited use of in-person interpreters in the hospital [16, 20, 37]. Remote interpretation (via telephone or video-conferencing) increases efficiency in interpreter access [38], and the telephone has the advantage of using ubiquitous, easy to use technology. Patients prefer telephonic interpreting over ad-hoc or no professional interpretation [39], and in a prior study by our group, professional interpreters reported telephonic interpretation to be equal to in-person and video-conferencing for simple information exchange [40]. However, they did note the difficulty of interpreting over the telephone for complex teaching and indicated that interpreting via video-conferencing is preferable [40]. It is possible that remote interpretation via video-conferencing could help improve both interpreter access and discharge teaching communication by addressing some of the limitations of interpreter-phones such as the ability to communicate simultaneously with the patient and multiple family members or caregivers and better capability for “show-and-tell” teaching for physical tasks.

Our study has limitations. First, it is observational and subject to potential confounding. Although we utilized propensity score adjustment to control for many potential confounders, this approach can only account for measured confounders. Second, our small study may have lacked sufficient power to detect significant post-implementation improvements in discharge preparedness given the unexpectedly high baseline levels. However, the lack of improvement in discharge preparedness may have been related to low rates of professional

interpretation at discharge as reported by patients. Third, we did not objectively assess professional interpreter use during discharge discussions and relied on patient report. Similarly, though we used a standardized assessment tool for discharge preparedness that has been validated in multilingual populations, we relied on patient-reported understanding of discharge medications and follow-up appointments, which may not correlate with objective measures of knowledge. Finally, we did not recruit an English-speaking comparison group and relied on prior studies to contextualize our results to a non-LEP population.

4.2 Conclusion

In this study of hospitalized patients with LEP, implementation of a bedside interpreter-phone systems intervention did not consistently improve patient-reported measures of discharge preparedness, despite overall positive reception of the interpreter-phones. Our findings may be due to lack of clinician adoption of phone interpretation for discharge communication, and preferences for use of family members as interpreters. These findings reflect a lack of understanding on the part of clinicians of the importance of professional interpreter use for discharge counseling and downsides of ad-hoc family interpreter use. Successful implementation and adoption of phone interpretation at discharge may require more intensive clinician engagement in the implementation process.

4.3 Practice Implications

Our findings have important implications for clinicians caring for patients with LEP and researchers and hospitals designing interventions to reduce health care disparities. First, clinician preferences for using family members as ad-hoc interpreters at discharge despite the availability of professional phone interpreters demonstrate the need for educational campaigns directed toward patients and clinicians emphasizing the benefits of professional interpretation. The high prevalence of un-interpreted encounters and the continued use of family members as interpreters may perpetuate health disparities and represent lost opportunities to improve care. Second, hospital systems designing interventions to increase professional interpretation must be aware of clinician preferences for discharge communication. Deeper understanding of the reasons nurses and physicians use family members for discharge interpretation will allow systems to design interventions that shift nurse and physician culture away from using family members as interpreters while still allowing for their engagement in discharge planning. In addition, further research should investigate tailoring of the professional interpretation modality – in-person, video-conferencing, phone – to the level of discharge complexity. Finally, addressing provider education on the content and delivery of discharge counseling in addition to increasing access to professional interpreters may be necessary to improve discharge preparedness [41, 42].

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

SD	standard deviation

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Highlights

- Bedside interpreter-phones did not improve patient-reported discharge preparedness
- Most common type of interpreter at discharge remained ad hoc family members
- Nurses wished to engage caregivers at discharge while using them to interpret
- Health systems must shift culture away from using family to interpret
- More research needed pairing optimal interpreter modality to discharge complexity

Table 1

Characteristics of pre- and post- bedside interpreter-phone implementation patients with limited English proficiency at an academic medical center, June 2012 to August 2013

	Implementation Group		
	Pre N=94	Post N=95	
Patient Characteristics	**n (%)***	**n (%)***	**P-value**
Age, years, mean (SD)	67.8 (13.4)	70.6 (12.5)	0.15
Women	54 (57.5)	54 (56.8)	0.93
Preferred language for health care			
Spanish	35 (37.2)	31 (32.6)	0.51
Chinese	59 (62.8)	64 (67.4)	
Hospital floor			
Cardiology	48 (51.1)	59 (62.1)	0.30
Orthopedics	18 (19.1)	13 (13.7)	
General surgery	28 (29.8)	23 (24.2)	
Principal diagnosis‡			0.53
Diseases of the circulatory system	22 (23.4)	33 (34.7)	
Injury	13 (13.8)	12 (12.6)	
Diseases of the digestive system	10 (10.6)	14 (14.7)	
Neoplasms	8 (8.5)	6 (6.3)	
Diseases of the musculoskeletal system	8 (8.5)	6 (6.3)	
Diseases of the genitourinary system	6 (6.4)	4 (4.2)	
Endocrine, nutrition	7 (7.5)	2 (2.1)	
Diseases of the respiratory system	4 (4.3)	5 (5.3)	
Other	16 (17.0)	13 (13.7)	
Interview participants			0.34
Patient alone	54 (57.5)	61 (64.2)	
Surrogate	40 (42.5)	34 (35.8)	
Inadequate health literacy†	76 (85.4)	65 (74.7)	0.08
Highest level of education			0.71
Elementary school or less	39 (42.4)	41 (43.6)	
Middle or some high school	24 (26.1)	29 (30.8)	
High school diploma	17 (18.5)	12 (12.8)	
Some college or more	12 (13.0)	12 (12.8)	
Self-rated health over past month			0.35
Excellent/very good/good	34 (36.2)	28 (29.8)	
Fair/poor/very poor	60 (63.8)	66 (70.2)	
English Proficiency			
How well do you speak English?			0.16
Not at all	39 (41.5)	47 (49.5)	
Not well	40 (42.5)	41 (43.2)	

Patient Characteristics	Implementation Group Pre N=94 n (%)*	Post N=95 n (%)*	P-value
Well	15 (16.0)	7 (7.4)	
How well can you discuss your symptoms with your doctors in English?			0.11
Not at all	56 (59.6)	54 (58.2)	
Not well	28 (29.8)	26 (27.4)	
Well	7 (7.5)	15 (15.8)	
Very well	3 (3.2)	0	
How well can you understand your doctors' recommendations in English?			0.67
Not at all	56 (59.6)	50 (52.6)	
Not well	24 (25.5)	28 (29.5)	
Well	12 (12.8)	16 (16.8)	
Very well	2 (2.1)	1 (1.1)	

*Column percentages displayed based on the 189 patients who completed follow-up except for health literacy, educational achievement and self-rated health where data were available for 176 (93%), 186 (98%), and 188 (99%) patients, respectively.

‡Principal diagnosis categorized based on Healthcare Cost and Utilization Project classifications

†Inadequate health literacy defined as an answer of somewhat/a little/not at all to the question, "How confident are you filling out medical forms by yourself?"

Table 2

Care Transitions Measure and discharge medication and follow-up appointment knowledge outcomes pre- and post-bedside interpreter-phone implementation in patients with limited English proficiency

	Pre	Post	P-value	Adjusted Results (95% CI)
Discharge Preparedness Outcome *				
Care Transitions Measure Score (mean; SD)	77.2 (19.0)	78.5 (15.6)	0.62	1.59 (−3.91 to 7.09)
Medication Knowledge Statement (n; %)≠				
I clearly understood the purpose for taking each of my medicines	78 (88)	91 (97)	0.02	4.49 (1.09 to 18.4)
I clearly understood how to take each of my medicines	81 (91)	90 (96)	0.20	2.27 (0.61 to 8.48)
I clearly understood the possible side effects of each of my medicines	62 (70)	65 (70)	0.97	1.01 (0.50 to 2.06)
Follow-up Appointment Knowledge (n; %)≠	61 (87)	64 (85)	0.75	0.78 (0.26 to 2.36)

Abbreviations: CI, confidence interval; SD, standard deviation.

*Adjusted point difference for the Care Transitions Measure score was calculated using multivariable linear regression adjusted for propensity score quintile comparing post- vs pre- bedside interpreter-phone implementation groups. Denominators were 93 pre and 95 post.

≠Adjusted odds ratios for medication and follow-up appointment knowledge were calculated using multivariable logistic regression adjusted for propensity score quintile comparing post- vs pre- bedside interpreter-phone implementation groups. Denominators were 89 pre and 93 post for the medication knowledge statements and 70 pre and 75 post for follow-up appointment knowledge **and column percentages are displayed.**

Table 3

Language concordance and professional and ad-hoc interpreter use during discussion of medication instructions at discharge for patients with limited English proficiency at an academic medical center, June 2012 to August 2013*

	Implementation Group	
	Pre N=83	**Post N=82**
Language concordance and interpreter use†	**n (%)**	**n (%)**
Concordant	13 (16)	12 (15)
Discordant, no interpreter used	20 (24)	18 (22)
Discordant, ad-hoc family interpreter used	31 (37)	35 (43)
Discordant, professional interpreter used‡	15 (18)	6 (7)
Unknown	4 (5)	11 (13)

*Data on language concordance and interpreter use were based on patient report for patients who reported receiving discharge medication instructions (n=165) **and column percentages are displayed.** Overall chi-squared p-value=0.11.

†Encounters were categorized as concordant if the patient reported that the team member explaining discharge medications (nurse, resident physician, medical student, hospital pharmacist) spoke their non-English language (Chinese or Spanish) well or very well. All others were considered discordant encounters.

‡20/21 reported professional telephone interpretation; one pre-implementation participant reported professional in-person interpretation.