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INPATIENTS AT AN URBAN SAFETY-NET HOSPITAL

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**HEALTH LITERACY AND ENGLISH LANGUAGE
COMPREHENSION AMONG ELDERLY
INPATIENTS AT AN URBAN SAFETY-NET
HOSPITAL**

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ABSTRACT

Objective: To evaluate the relationship between health literacy and age in chronically-ill inpatients at a safety-net hospital.

Setting and Participants: We recruited 399 English- and Spanish-speaking inpatients being evaluated or treated for Congestive Heart Failure or Coronary Artery Disease at a large, urban safety-net teaching hospital in Southern California.

Design: Participants were interviewed to ascertain education, English comprehension, and in-home language use. Health literacy was assessed using The Test of Functional Health Literacy in Adults (TOFHLA). We compared by age (aged 65 or more, 51 to 64 years of age, and less than age 50) levels of health literacy, educational attainment, English comprehension, and language use.

Results: Prevalence of inadequate health literacy significantly increased with increasing age (87.2% in ≥ 65 , 48.9% for 51-64, and 26.3% in ≤ 50 , $p < 0.001$). The correlation between older age and lower health literacy persisted when controlling for educational achievement, race, ethnicity, gender, and immigration status. Additionally, older patients were more likely to have never learned to read (34.9% in ≥ 65 , 6.5% for 51-64, and 1.5% in ≤ 50 , $p < 0.001$), no formal education (27.9% in ≥ 65 , 9.0% for 51-64, and 0.8% in ≤ 50 , $p < 0.001$), have limited English comprehension (74.2% in ≥ 65 , 43.5% for 51-64, and 35.8% in ≤ 50 , $p < 0.001$), and speak a non-English language at home (82.3% in ≥ 65 , 70.2% for 51-64, and 62.2% in ≤ 50 , $p = 0.015$).

Conclusions: To prepare to meet the chronic disease needs of a growing older patient population, and ameliorate the negative health effects of associated low literacy, safety-net hospital leaders and providers need to prioritize the development and implementation of low-literacy educational materials, programs, and services.

INTRODUCTION

Although most U.S. residents aged 65 or more have Medicare, coverage is not universal (Mold, Fryer, & Thomas, 2004). To qualify for Medicare, an individual, or one's spouse, needs to have contributed to Social Security for 10 years (Center for Medicare and Medicaid Services, 2007). Immigrants who arrived late in life, or persons who worked outside of the formal economy, may not qualify. Therefore, the number of elderly persons using safety-net

hospitals is increasing and, given current demographic and immigration trends, will likely continue to increase substantially in the coming years (DeLia, 2006).

Safety-net hospitals, defined as hospitals with large proportions of uninsured patients and Medicaid recipients (Lewin & Altman, 2000), need to prepare for this projected influx of elderly patients. In contrast to younger patients, older persons are more likely to require care for chronic conditions, rather than psychiatric illness, infectious diseases, and other complications of substance use, which are more prevalent in younger safety-net users (DeLia, 2006). The cornerstones of successful chronic disease treatment, namely patient self-management and adherence to often-complicated medication regimens, are dependent on effective patient education (Mazzuca, 1982). Thus, safety-net hospitals may need to reassess and enhance their chronic disease educational resources and care-models. Understanding a patient population's health literacy, as well as educational attainment and linguistic abilities, is a crucial preface to the development of chronic disease educational materials and services.

Health literacy, defined as "the ability to read and comprehend prescription bottles, appointment slips, and other essential health-related materials" (Parker et al., 1999), has consistently been shown to strongly correlate with chronic disease-specific knowledge (Williams, Baker, Parker, & Nurss, 1998; Gazmararian, Williams, Peel, & Baker, 2003) and outcomes (Mancuso & Rincon, 2006; Schillinger et al., 2002; Baker et al., 2007; Sudore, 2006). In addition, limited health literacy may be associated with increased resource utilization and costs (Nielsen-Bohlman, Panzer, & Kindig, 2004). Although multiple studies have demonstrated an association between older age and lower levels of health literacy (Gazmararian et al., 2003; Schillinger et al., 2002; Williams et al., 1995), no data are available regarding prevalence of inadequate health literacy

specifically among the elderly safety net inpatients with chronic diseases, who may be among the most vulnerable.

This paper describes, and compares by age, the health literacy, educational attainment, English language comprehension, and home language use in a sample of hospitalized patients being treated or evaluated for congestive heart failure (CHF) or coronary artery disease (CAD) at an urban safety-net hospital in Southern California. CHF and CAD were targeted because patient self-management and adherence are especially important in these conditions and are strongly linked with both disease and health utilization outcomes (Stroupe et al., 2004; Hope, 2004; Horwitz et al., 1990).

METHODS

Setting and Participants

Between January 8th and June 29th, 2007, research assistants receiving 40 hours of training in the patient screening, recruitment, survey administration, and the instrument for health literacy assessment, recruited inpatients being evaluated or treated for CHF or CAD and admitted to the cardiology, internal medicine and renal services at Los Angeles County Hospital, an urban safety-net hospital in California.¹ Patients were eligible if they were 18 years of age or more, spoke and understood Spanish or English, and available for recruitment between the hours of nine o'clock a.m. and six o'clock p.m., Monday through Friday, and 11 o'clock a.m. and 3 o'clock p.m., Saturdays. Patients were considered unavailable if they were away from the nursing unit for any reason, had

¹ Patients were recruited for a randomized-controlled trial evaluating the effectiveness of a low-literacy educational tool for teaching patients about their medications at the time of hospital discharge, the results of which will be reported separately. This paper describes the pre-intervention observational findings from this trial.

visitors, were sleeping, or their medical condition prevented them from speaking with normal effort. Patients were excluded if they were incarcerated, had moderate or severe cognitive or psychiatric impairment, or resided in a nursing home. Eligibility was determined by chart review followed by speaking with the patient. This determination was performed by research assistants, trained and supervised by the principle investigator (KMC). As incentive for participation, each participant, upon enrollment, was given a prepaid \$10 phone card. The Institutional Review Boards of The University of California, Los Angeles, and The University of Southern California approved the study protocol.

Data Collection

A five-minute structured interview was used to ascertain age, self-identified race and ethnicity using Office of Management of Budget (OMB) standards (Office of Management and Budget, 1997), educational attainment, self-perceived English comprehension, and languages spoken in-home. This interview was conducted in either English or Spanish (by a fully bi-lingual research assistant), per patient preference. For English language comprehension, patients were asked to report their ability to understand spoken English “very well”, “well”, “not well” or “not at all”. For in-home languages, the patients were asked to list all languages spoken at home.

In patients with adequate vision, health literacy was also assessed on the day of enrollment, via The Test of Functional Health Literacy (TOFHLA), unless the patient was feeling too tired or ill, or was interrupted for a procedure or by visitors; this assessment was then performed, if possible, at another time during the patient’s hospitalization. First, we used a hand-held Snellen card (Borm Bruckmeier Publishing LLC, Germany) to test vision, with patients being encouraged to use their

corrective lenses if needed and available. Then, in participants with corrected 20/100 vision or better, the 14-point font English or Spanish TOFHLA, per patient preference, was administered. The TOFHLA, developed using hospital materials and consisting of numeracy and reading comprehension sections, has been shown to be a valid and reliable indicator of ability to read health-related materials (Parker, Baker, Williams, & Nurss, 1995). The numeracy section, for which the patient is allowed 10 minutes to complete, requires responses to 17 questions regarding 10 sample prescription labels and other materials that a patient may be given in the course of negotiating the healthcare system. Following the numeracy section, patients are allowed 12 minutes to complete the reading comprehension section, which consists of three passages of written instructions commonly given to patients. Throughout the passages, blank lines indicate where words are missing. For each of the 50 missing words, the patient chooses from a list of four words the one that would be most appropriately inserted. Any items not completed at the end of 12 minutes are scored as incorrect. The scores of the numeracy and reading comprehension sections are combined in equal weight for a total score, which is then used to classify the patient's health literacy as "adequate", "marginal", or "inadequate". It has been shown that patients with "inadequate" health literacy have difficulty reading medication dosing instructions, appointment slips, and patient directions.¹⁸ To ensure consistent administration standards, research assistants were given 8 hours of training specific to TOFHLA administration followed by in-field observation by the principle investigator (KMC).

Administrative data were reviewed by the principle investigator (KMC) to estimate the presence of diagnosed chronic medical conditions and to ascertain insurance status at the time of discharge. Patients whose application for

Medicaid was pending were classified as having coverage. A chronic medical condition was defined as any condition for which standard treatment would require long-term medication use or modifications in diet or lifestyle, such as cardiac, pulmonary, renal or endocrine disease. Psychiatric illness included the diagnoses of depression, bi-polar disorder, or schizophrenia. Patients whose discharge diagnoses indicated episodic or ongoing abuse of alcohol, or use of illicit drugs, were classified as having a substance abuse disorder.

Analyses

We hypothesized that older patients, defined as aged 65 years or older, compared with younger patients, would have fewer years of education, a higher prevalence of illiteracy, a higher prevalence of inadequate or marginal health literacy, lower self-reported English language comprehension, and higher prevalence of using a non-English language in home. Similarly, we hypothesized that the middle-aged subgroup, defined as 51 to 64 years of age, would also have a higher prevalence of these characteristics than the youngest patients, those 50 years of age or less. We further hypothesized that age would predict health literacy score independent of educational attainment, race/ethnicity, gender, and immigration status. We also expected that older patients would have a higher chronic medical disease burden while younger patients would have a higher prevalence of substance abuse and psychiatric disorders.

Chi-square analyses were used to assess the statistical significance of the hypothesized associations. Sensitivity analysis was performed to assess for the effect of missing TOFHLA scores, using the assumption that all participants not completing the TOFHLA had inadequate health literacy followed by using the assumption that these participants all had adequate health literacy. Multiple

linear modeling was used to assess for independence of the associations between age, health literacy and education, race/ethnicity, gender and immigration status. All analyses were performed using STATA version 9.2 (StataCorp LP, College Station, TX).

RESULTS

During the six-month enrollment period, we identified 1436 patients having an admitting diagnosis suggesting potential cardiopulmonary disease. Of these, 301 patients left the hospital before we could evaluate their eligibility and, by chart review, 388 were determined as not being evaluated or treated for CHF or CAD. Of the remaining 746 patients, 221 were otherwise ineligible to participate; 92 did not speak either English or Spanish, 72 were incarcerated, 43 had moderate or severe dementia or psychosis, and 14 resided in a skilled nursing facility. Of the remaining 525 eligible patients, 399 agreed to participate (76%).

Of the 399 participants, 46% completed the interview in English and 54% in Spanish. As shown in table one, the sample was predominantly of minority race and ethnicity with 22% self-identifying as black and 64% as Hispanic. Males were over-represented, with only 36% of the sample being female, which is reflective of over-representation of males among uninsured persons (The Robert Wood Johnson Foundation, 2008). Overall, 63% of the patients were foreign-born. Sixty-two percent of the patients were uninsured, 29% were covered by Medicaid only, and 7% had Medicare plus Medicaid. Less than 3% of the patients had Medicare only or non-governmental, insurance.

The average age of the sample was 55.0 years with 135(34%) participants aged 50 or less (referred to hereafter

as “younger”), 202 (51%) aged 51 to 64 years (referred to hereafter as “middle-aged”), and 62(16%) aged 65 years or Table 1.

Sociodemographic Characteristics, Health Insurance & Co-Morbidities by Age

	Younger (50 Or Less) n=135	Middle- Aged (51-64) n=202	Elderly (65 & Older) n=62	p
Female[‡]	44 (33.3%)	66 (33.2%)	29 (46.7%)	0.123
Married[‡]	53 (39.3%)	83 (41.3%)	19 (30.2%)	0.108
Race/Ethnicity[‡]				
Hispanic [*]	77 (57.0%)	125(62.2%)	48 (76.2%)	0.034
Black	35 (25.9%)	43 (21.2%)	7 (11.1%)	0.058
White	11 (8.2%)	16 (8.0%)	3 (4.8%)	0.663
Asian/Pacific Islander	5 (3.7%)	9 (4.5%)	1 (1.6%)	0.574
Other	9 (6.7%)	11 (5.5%)	3 (4.8%)	0.897
Interview Language				
Spanish ^{***}	57 (42.2%)	112 (55.7%)	46 (73.0%)	<0.00 1
Foreign Born [‡]	81 (60.0%)	123 (60.9%)	47 (75.8%)	0.072
Health Insurance				
Uninsured ^{***}	96 (71.1%)	136 (67.3%)	14 (22.6%)	<0.00 1
Medicaid only [*]	35 (25.9%)	54 (26.7%)	27 (43.6%)	0.024
Medicare & Medicaid ^{***}	2 (1.5%)	7 (3.5%)	18 (29.0%)	<0.00 1
Medicare only [*]	0	3 (1.5%)	3 (4.8%)	0.035
Other Insurance	2 (1.5%)	2 (1.0%)	0	0.628

Table 1, continued

Number of Documented Chronic Medical Conditions				
0-1*	31(23.0%)	30 (14.8%)	5 (8.1%)	0.038
2-3	74 (54.8%)	106 (52.5%)	31 (50.0%)	0.685
4 or more**	30 (22.2%)	66 (32.7%)	26 (41.9%)	0.008
Psychiatric/ Substance Abuse Disorder	42 (31.1%)	64 (31.8%)	9 (14.5%)	0.025

Ψ Self- Reported *p<0.05 ** p<0.01 *** p<0.001

more (referred to hereafter as “elderly patients”). Older patients were more likely to complete the interview in Spanish (73% of elderly patients versus 56% of middle-aged versus 42% of younger patients, $p<0.001$) and self-identify as Hispanic (76% of elderly, 62% of middle-aged, and 57% of younger patients, $p=0.034$). Seventy-six percent of the elderly patients reported being foreign-born, compared with 60% of both the middle and younger age groups ($p=0.072$). Although less likely than younger patients to be uninsured, 23% of the patients 65 years of age or more lacked health insurance and 45% had Medicaid coverage only. Twenty-nine percent of the elderly patients had Medicare coverage in addition to Medicaid with the remaining 5% having Medicare only. No elderly patients had non-governmental health insurance.

Although the chronic medical disease burden was high in all participants, it was higher among older patients ($p=0.014$). Among elderly patients, 90% had two or more chronic diseases, compared with 83% of middle-aged and 76% of younger patients. Forty-two percent of elderly patients had four or more chronic diseases, compared with 32% of middle-aged and 21% of younger patients. Conversely, psychiatric disease and substance abuse were

common in younger patients, with 31% of both younger and middle-aged patients having such a diagnosis, in contrast to 16% of elderly patients ($p=0.042$).

As seen in table two, older patients had fewer years of education than younger patients, with 27% of elderly patients reporting no formal education, compared with 9% of middle-aged patients and less than 1% of younger patients ($p<0.001$). An additional 43% of elderly patients had less than eight years of education, compared with 33% of middle-aged patients and 24% of younger patients ($p=0.02$). Only 22% of elderly patients had 12 or more years of education, a significantly smaller proportion than the 46% of middle-aged and 50% of younger patients ($p<0.001$). Consistent with these educational differences, 35% of elderly patients reported having never learned to read, in contrast to 7% of middle-aged and 1.5% of younger participants ($p<0.001$).

Of the 399 patients recruited, 275 persons (69%) completed the TOFHLA. TOFHLA non-completers were more likely to be female, Spanish-speaking, and report less than 8 years education. Age was not a significant predictor of TOFHLA completion. Reasons for not completing the TOFHLA included visual acuity less than 20/100 which was either not correctable or the patient's corrective lenses were unavailable (71%), feeling too ill or tired (13%), and refusal (16%). Reasons for non-completion did not differ between groups at a level that was statistically significant, but there was a trend towards elderly patients being more likely to have not completed it because of poor vision, with 83% of the elderly group having this reason compared with 68% of those in the middle-aged and younger groups ($p=0.17$).

Table 2.
Education, Illiteracy, Health Literacy & English Comprehension/Use by Age (Unadjusted)

	Younger (50 Or Less) n=135	Middle- Aged (51-64) n=202	Elderly (65 & Older) n=62	p
Years of Education ^Ψ				
None ^{***}	1 (0.8%)	18 (9.0%)	17 (27.9%)	<0.001
1-8 years ^{**}	33 (24.4%)	69 (34.5%)	28 (45.9%)	0.010
9-12 years	16 (11.9%)	12 (6.0%)	4 (4.9%)	0.097
12 + years ^{***}	77 (57.0%)	92 (46.0%)	14 (23.0%)	<0.001
Illiterate ^{Ψ ***}	2 (1.5%)	13 (6.5%)	22 (34.9%)	<0.001
Health Literacy				
Completed TOFHLA	95 (70.4%)	141 (70.2%)	39 (61.9%)	0.423
Inadequate ^{Φ ***}	25 (26.3%)	69 (48.9%)	34 (87.2%)	<0.001
Marginal ^Φ	14 (14.7%)	22 (15.6%)	2 (5.1%)	0.233
Adequate ^{Φ ***}	56 (59.0%)	50 (35.5%)	3 (7.7%)	<0.001
English Comprehension and Use In Home ^Ψ				
Comprehends English "not well"/"not at all" ^{Ψ ***}	48 (35.8%)	87 (43.5%)	46 (74.2%)	<0.001
Uses Other Language In Home ^{Ψ *}	84 (62.2%)	141 (70.2%)	52 (82.3%)	0.015
Uses Other Language In Home Exclusively ^{Ψ **}	56 (41.5%)	109 (54.5%)	42 (67.7%)	0.002

Φ Percentages based on subsample that completed the TOFHLA

Ψ Self- Reported *p<0.05 ** p<0.01 *** p<0.001

The prevalence of inadequate health literacy was significantly different between age groups. Among the elderly patients who completed the TOFHLA, 87% had inadequate health literacy. In comparison, 49% of middle-

aged TOFHLA-completers and 26% of younger TOFHLA-completers had inadequate health literacy ($p < 0.001$). The differences between groups were insensitive to assumptions made about the scores of those participants who did not complete the TOFHLA. In multiple linear regression modeling, the negative correlation of age and health literacy remained after controlling for number of years of education, race/ethnicity, gender, and immigration status. In this adjusted analysis, TOFHLA total score declined, on average, by 0.6% for every one year increase in age ($p < 0.001$).

Older patients reported lower levels of English language comprehension. Among elderly patients, 74% reported understanding spoken English "not well" or "not at all". Forty-four percent of middle-aged patients reported poor comprehension and 36% of younger patients ($p < 0.001$). Additionally, use of a non-English language in home, both exclusively and in combination with English, was common among patients of all ages, but more prevalent among older patients. Table two shows that 83% of elderly patients, 70% of middle-aged patients, and 62% of younger patients spoke at least one non-English language in home ($p = 0.015$). Furthermore, 68% of elderly patients, 55% of middle-aged patients, and 36% of younger patients spoke a non-English language exclusively in home ($p = 0.002$).

DISCUSSION

Among inpatients with cardiac-related complaints at this Southern California urban safety-net hospital, older patients had fewer years of formal education and lower levels of health literacy, and were more likely to have never learned to read. Additionally, older patients more often reported limited English comprehension and were more likely to speak a non-English language at home.

Our finding that older age is negatively and independently correlated with health literacy is consistent with previous studies done in a variety of patient populations (Williams et al., 1995; Williams et al., 1998; Baker, Gazmarian, Sudano, & Patterson, 2000). The prevalence of inadequate health literacy in our sample is higher in all age groups when compared to what has been reported in prior studies, conducted in other safety-net settings including primary care clinics, urgent care, and non-emergent patients presenting to emergency departments (Williams et al., 1995; Williams et al., 1998). One reason may be that our sample likely differs from those drawn from other sites with respect to medical, social, and healthcare utilization factors. It is also possible that some participants' scores were lower than they would have been had we administered the test once the patient had completely recovered from the acute phase of his or her illness. However, although the score we obtained may not be the patients' "best possible", they are a reflection of their state while receiving in-hospital and discharge information and instructions. Furthermore, unlike in a clinic-based sample, many of the patients in this study only interact with the health care system when they are acutely ill.

The correlation between older age and lower health literacy persisted when controlling for educational achievement, race, ethnicity, gender, and immigration status. This finding is consistent with previous investigations (Baker et al., 2000) and suggests that any future change in the composition of the safety-net population with respect to those variables will likely not eliminate the association between age and poor health literacy.

The high prevalence of limited English comprehension in older patients, and the significant additional proportions reporting good comprehension but

using a non-English language in-home, are important findings relevant to resource planning for the provision of translation services and the development of bi-lingual and culturally-sensitive medical staff. Patients with limited English comprehension are more likely to misunderstand medical directions (Crane, 1997), have less disease knowledge (DuBard, Garrett, & Gizlice, 2006), have lower levels of treatment adherence (Manson, 1988), experience worse health outcomes (Perez-Stable, Napoles-Springer, & Miramontes, 1997), and incur increased healthcare costs (Brach, 2005; Lee, Rosenberg, Sixsmith, Pang, & Abularrage, 1998). These issues are particularly important for patients admitted with life threatening conditions such as CHF exacerbations and CAD that can be improved by careful adherence to outpatient medications.

The limitations of this study leave much opportunity, and need, for future research. First, this patient sample is from a single hospital in an urban environment with a substantial concentration of minority and immigrant populations. Although these results may be applicable to other places with such concentrations, and immigrant communities are expanding in an increasing number of new locations (Reid, 2006), studies in other geographic areas with different ethnic and immigrant compositions are needed to establish generalizability and regional differences. A second substantial limitation of these data is the exclusion of patients who were unable to speak English or Spanish. Thus, many linguistic minority patients were not included and should be a focus of future attention. Thirdly, logistic restraints did not allow us to screen and approach all potential participants; it is unclear how omission of these patients may have biased our sample. Finally, 25% of our sample did not complete the health literacy evaluation. The majority of these individuals did not do so secondary to visual impairment, but over one-quarter of non-completers refused or reported

feeling too ill to complete it. Although our sensitivity analysis allows us to be confident of our overall conclusions comparing health literacy in older versus younger patients, this non-completion rate is a source of error to estimations of prevalence. It is likely that some of these individuals may have been seeking to mask their limited literacy, in which case the prevalence of inadequate health literacy may have been underestimated in this study.

Older patients are becoming, and will continue to become, an increasing proportion of safety-net users (DeLia, 2006). In our search of the literature, we were unable to find any other study that has specifically evaluated, and assessed by age, educational attainment, health literacy levels, and English use and comprehension among safety-net hospital inpatients. Previous studies have shown a strong and consistent association between low health literacy and worse disease-specific knowledge and outcomes, medication adherence, and potentially healthcare utilization and costs. Potential interventions that need further development and evaluation include providing low literacy educational materials, providing communication training for both providers and patients (Cegala, Marinelli, & Post, 2000), establishing disease management programs, and minimizing complexity in processes such as making appointments and refilling prescriptions (Schillinger, 2001). To prepare to meet the chronic disease needs of a growing older patient population, and ameliorate the negative health effects of associated low literacy, safety-net hospital leaders and providers need to prioritize the development and implementation of low-literacy educational materials, programs, and services.

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