Acute Myocardial Infarction Length of Stay and Hospital Mortality Are Not Associated with Language Preference

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BACKGROUND: Language barriers between patients and providers may influence the process and quality of care.

OBJECTIVE: To examine the association of language preference with length of stay (LOS) and in-hospital mortality for patients admitted for acute myocardial infarction (AMI).

DESIGN, SETTING, AND PARTICIPANTS: Electronic administrative hospital discharge data for all non-disabled Medicaid beneficiaries age 35 years and older admitted to all acute care California hospitals with a diagnosis of AMI between 1994 and 1998.

METHODS: We used multivariate regression to explore whether observed differences in the hospital LOS and in-hospital mortality between non-English preference (NEP) and English preference (EP) individuals could be explained by individual and/or hospital level factors. We adjusted for patient level characteristics using 24 covariates from a previously validated prediction model of mortality after hospitalization for AMI.

RESULTS: Of 12,609 Medicaid patients across 401 California hospitals, 2,757 (22%) had NEP. NEP was associated with a 3.9% increased LOS (95% CI 0.7, 7.1; $p=0.02$) in unadjusted analysis and a 3.8% increased LOS (95% CI 0.3, 7.3; $p=0.03$) after controlling for patient level characteristics. Differences in LOS were no longer significant after adjusting receipt of cardiac procedure/ surgery (2.8%; 95% CI -0.6, 6.2; $p=0.1$) or after adjusting for hospital (0.9%; 95% CI -2.5, 4.3; $p=0.6$). Non-English language preference was associated with lower in-hospital mortality in unadjusted analysis (odds ratio [OR]=0.80; 95% CI 0.69, 0.94; $p=0.005$), but was not significant after adjusting for patient level characteristics (adjusted OR [AOR] 0.95; 95% CI 0.78, 1.27; $p=0.6$). Adjusting for receipt of cardiac procedure/ surgery (AOR 0.97; 95% CI 0.79, 1.18; $p=0.7$) and hospital (AOR 0.97; 95% CI 0.78, 1.21; $p=0.8$) did not alter this finding.

CONCLUSIONS: Language preference is not associated with AMI mortality, and the small increase in length of stay associated with non-English preference is accounted for by hospital level factors. Our results suggest that system level differences are important to consider in studies of the effect of language barriers in the health care setting.

KEY WORDS: language preference; communication; limited English proficient; language barrier.

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BACKGROUND

Effective communication is becoming increasingly challenging in the US health system as the population becomes increasingly diverse. According to the 2000 Census, more than 21 million Americans (8%) speak English less than “very well”—a 30% increase since the 1990 Census.¹ Language barriers in the health care setting can impose a threat to quality care for individuals who do not speak English fluently. Several studies have shown that language barriers result in poorer quality of care, worse outcomes, and decreased satisfaction in the outpatient and emergency settings.^{2–11}

In psychiatric settings, patients with limited English proficiency are less likely to have an adequate evaluation and diagnosis.^{12,13} Similarly, patients with limited English proficiency in palliative care settings are less likely to have adequate symptom control;¹⁴ and NEP patients are more likely to have nonsterile deliveries in obstetrical settings.¹⁵ The effect of language barriers among medical and surgical inpatients is less well understood. A study¹⁶ in 3 Canadian hospitals found that a non-English preference was associated with a longer length of stay (LOS) in several of 23 conditions examined. Although language barriers were not associated with differences in hospital mortality, they may have impeded communication, thus delaying processes of care. The increases in LOS associated with language barriers were observed for acute coronary syndromes, but not for acute myocardial infarction (AMI). The small sample size in this study may have limited power to detect differences in AMI.

We sought to investigate whether language preference is associated with differences in LOS and in-hospital mortality among a much larger group of patients hospitalized for AMI in

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401 California acute care hospitals. We hypothesized that among patients with AMI a non-English language preference (NEP) would be associated with a longer length of stay and greater in-hospital mortality than English preference (EP) because language barriers may impede communication and, therefore, management as has been shown in other settings.

METHODS

Subjects and Setting. This is a retrospective cohort study using administrative data of all non-disabled Medicaid beneficiaries age 35 years and older discharged from all acute care California hospitals with a diagnosis of AMI from 1994 to 1998. These older data were chosen to allow for comparison with findings in the aforementioned Canadian study. Data from individuals under 35 years of age were excluded from the analysis in an effort to isolate AMI secondary to coronary artery disease rather than other causes such as congenital disorders.

Data Sources. The data for this study come from two main sources: (1) the annual California hospital discharge data available from the California Office of Statewide Health Planning and Development (OSHPD), and (2) the California Department of Health Services (DHS) Medicaid monthly eligibility file. The California hospital discharge record includes, among other things, information on admission date, discharge date, patient demographics, and diagnosis codes. OSHPD applies several hundred audit rules to ensure the validity of their data before making them available. Data elements are not released if they exceed an error tolerance level of 0.1%.¹⁷ OSHPD does not, however, require reporting of individual language preference. Therefore, we used a special research file that linked hospital discharge data from OSHPD with the DHS Medicaid eligibility file for the period 1994–1998; language preference is routinely collected by Medicaid.

Primary Predictor. Language preference was entered into the DHS Medicaid eligibility file at the time of enrollment. Individuals with English entered in the language field were considered to have an English preference (EP). All other languages were considered to be a non-English preference (NEP).

Outcome Variables. We examined 2 outcomes in our analyses: length of stay (LOS) and in-hospital mortality. LOS was logarithmically transformed to normalize the distribution. Data from hospital LOS of 0 were excluded from analysis as these records were thought to represent events of early death or transfer to another facility, rather than effects of language preference. Among these excluded records, there was no difference in hospital mortality by language preference.

Covariates. We adapted demographics and health status covariates from a previously validated prediction model of 30-day mortality after hospitalization for AMI.¹⁸ Specifically, our risk adjustment model included 24 covariates: race/

ethnicity (white, black, Latino, and Asian/other), age (by quartile: 35–49, 50–64, 65–79, and 80 and older), gender, year of admission, acute renal disease, catastrophic sequelae of AMI, anterior wall infarction, congestive heart failure, high-risk malignant neoplasm, hypertension, inferior wall infarction, pulmonary edema, sepsis, shock, end stage renal disease, CNS disease, complete atrioventricular block, complicated diabetes, other cerebrovascular disease, paroxysmal ventricular tachycardia, history of prior coronary bypass surgery, prior angioplasty procedure, chronic obstructive pulmonary disease, and acute anemia. The validated prediction model also included insurance type, number of prior admissions, and resuscitation status. We did not adjust for insurance status as all individuals included in the study had 1 type of insurance (Medicaid). We did not adjust for number of prior admissions because the dataset did not include reliable unique identifiers to determine if records represented repeat admissions for a given individual. We did not adjust for resuscitation status as OSHPD did not record this variable until 1999.

Procedure codes from hospital discharge data were used to create a variable for cardiac procedure. Records were categorized as either having no cardiac procedure or surgery; a cardiac procedure (catheterization, coronary artery stent placement, or angioplasty); or cardiac surgery (coronary bypass grafting).

Analysis. We used multivariate regression step-wise modeling to explore whether observed differences between the LOS and in-hospital mortality between non-English preference (NEP) and English preference (EP) could be explained by patient demographics/health status, having a cardiac procedure/surgery, or hospital of care. We began our linear regression modeling with an unadjusted analysis of language preference as a predictor of logarithmically transformed LOS. Second, to control for the effect of patient level characteristics, we added the variables from OSHPD's validated risk adjustment model. Third, to control for the effect of treatment differences, we added variables for receipt of cardiac procedure or surgery. Finally, to control for effects specific to individual hospitals, we added an indicator variable for each hospital to the model. We calculated the regression coefficient for percentage increase in length of stay for NEP as compared to EP individuals.

We repeated this step-wise modeling for in-hospital mortality using multivariate logistic regression. We calculated odds ratios of NEP in-hospital mortality as compared to EP in-hospital mortality.

RESULTS

Among 13,820 non-disabled Medicaid AMI admissions to 401 acute care hospitals in California that met our criteria, there were 12,609 (91%) patient files with language preference data available. There was no significant difference in LOS for AMI patients who did and did not have language preference information (data not shown). Patients without language preference data were significantly older (mean age 73.6 versus 64.6 years) and more likely to die in-hospital (13.5% vs 9.8%, $p < .0005$) than those with language preference data. However, after adjusting for patient level characteristics in-hospital mortality difference was no longer significant between patients

Table 1. Non-disabled Medicaid Acute Myocardial Infarction Patient Characteristics

Characteristic	English Preference 9,852 (78%)	Non-English Preference 2,757 (22%)
Male, n (%)	5,375 (55)	1766 (64)
Mean age (years)	65.5	61.4
Spanish, n (%)	–	1,845 (67)
Cantonese/ Mandarin, n (%)	–	102 (4)
Other Asian language, n (%)	–	315 (11)
Other language, n (%)	–	495 (18)
Non-Latino White, n (%)	6,297 (64)	390 (14)
Black, n (%)	1,030 (10)	22 (1)
Latino, n (%)	1,344 (14)	1,688 (61)
Asian/Other, n (%)	1,181 (12)	657 (24)

with and without missing language preference data, so we excluded them from final analyses.

Among patients with language preference data, 2,757 (22%) had NEP. Table 1 shows characteristics of all individual records included in analysis. Patients with NEP were more likely to be male and younger than patients with EP. Most of the patients with NEP spoke Spanish (67%).

Non-English language preference was associated with a 3.9% increased LOS (95% CI 0.7, 7.1; $p=.02$) in unadjusted analysis. This association persisted after controlling for patient level characteristics captured by the risk-adjustment model (3.8% increased LOS; 95% CI 0.3, 7.3; $p=.03$). Patients with NEP were more likely to have had a cardiac procedure or surgery during admission than those with EP (19% and 8% vs 14% and 7%, respectively; $p<.0005$). LOS for those who had a cardiac procedure or surgery was 15.9% (95% CI 12.5, 19.4; $p<.0005$) and 80.4% (95% CI 75.4, 85.3; $p<.0005$) longer, respectively, than those who had neither after controlling for patient level characteristics. Consequently, NEP differences in LOS were no longer significant after controlling for receipt of a cardiac procedure (2.8%; 95% CI -0.6 , 6.2; $p=0.1$) or after

adjusting for hospital (0.9%; 95% CI -2.5 , 4.3; $p=0.6$). Figure 1 reveals the absolute differences in mean length of stay for NEP and EP patients after holding all other variables in the model constant.

Of note, race/ethnicity was also modestly associated with increased LOS after controlling for the other patient level characteristics and cardiac procedure/surgery, but did not remain so after controlling for hospital. We also tested whether the contribution of language preference to LOS was dependent on the race of the patient but found no significant interactions between language preference and race/ethnicity.

Non-English language preference was associated with lower in-hospital mortality in unadjusted analysis (odds ratio [OR]= 0.80; 95% CI 0.69, 0.94; $p=.005$), but this association was not significant after adjusting for patient level characteristics (AOR 0.95; 95% CI 0.78, 1.27; $p=.6$). Adjusting for receipt of cardiac procedure/surgery (AOR 0.97; 95% CI 0.79, 1.18; $p=.7$) and hospital (AOR 0.97; 95% CI 0.78; 1.21; $p=.8$) did not significantly alter this result. Race/ethnicity was not associated with differences in mortality.

CONCLUSIONS

We found that Non-English language preference was associated with an increased length of stay, but not greater in-hospital mortality among non-disabled Medicaid patients admitted for acute myocardial infarction in acute care California hospitals from 1994 to 1998. Differences in length of stay by language were completely accounted for by hospital-level characteristics.

Our results are similar to those found for AMI by John-Baptiste et al.¹⁶ in that there was no association with LOS or in-hospital mortality after controlling for other variables. However, our study has a number of important differences in methodology. Our AMI sample size was several times larger, which allowed us to see an initial association between NEP and length of stay that was not observed in this prior study. Further, our study included race/ethnicity data and more than 400 acute care hospitals, whereas the prior study had no race/ethnicity data and was limited to 3 hospitals. These key

Figure 1. Association of language preference on acute myocardial infarction mean hospital length of stay among California non-disabled Medicaid beneficiaries, 1994–1998.

differences allowed us to additionally control for effects of race/ethnicity and clustering previously unexplored, thus affording greater confidence that our findings represent a more accurate assessment of the independent effect of non-English language preference for patients admitted with AMI.

We expected NEP would be associated with greater hospital mortality and longer LOS independent of all other factors because language barriers may impede communication and, therefore, management. Our findings suggest two explanations. First, our finding of no difference in hospital mortality speaks to factors inherent to AMI management. AMI may be a minimally communication-sensitive condition. In other words, perhaps a patient with a hand to the chest conveys a universal language of chest pain, which prompts an automatic cascade of events to conclude or exclude a common and potentially fatal condition such as AMI. AMI management is more driven by standard protocols than other conditions. Therefore, once the initial diagnosis of AMI is made, differences in outcomes such as hospital mortality are not observed despite differences in patient language preference. Second, our finding that differences in LOS are accounted for by controlling for receipt of cardiac procedure/surgery and hospital of care suggests that hospital level factors may contribute more than do individual patient characteristics. In other words, whether or not the hospital has access to quality staff and services may be more important for determining processes of care rather than whether or not the patient can speak English.

In our study, more than half of patients with NEP ($n=1,433$, 52%) received care at a small fraction of hospitals ($n=44$, 11%). The segregation of NEP patients could create a risk for sub-optimal care. Providers caring for minority patients in Massachusetts reported a lack of access to the full range of clinical resources needed to provide quality care.¹⁹ Our study of AMI patients suggests that this is not the case in California. AMI patients with NEP were more likely than EP patients to receive a cardiac procedure/surgery. In addition to the availability of technical resources, hospitals with higher numbers of patients with NEP might have been better equipped to overcome language barriers through bilingual staff and interpreter services. On the other hand, this finding may reflect cultural acceptance of physician paternalism, a lack of proper consenting of patients with NEP, or lower clinician thresholds to take a patient they cannot easily communicate with to procedure or surgery. Such potentially explanatory data were not available in our administrative dataset, but warrant further investigation.

Our study had several limitations. First, although our dataset was chosen to compare with the John-Baptiste et al. study, the data were collected roughly 10 years ago. It is unclear how or if recent advances in clinical practice standards would affect more recent data. Second, we investigated only 1 condition for which a standard protocol for diagnosis and treatment exists. AMI may be less communication-sensitive than other conditions for which no standard protocol exists. Third, our study was unable to assess the effect of language preference on longer term outcomes such as 30-day mortality. Language barriers have been shown to compromise patient understanding of discharge instructions, which may affect long-term outcomes.¹⁰ Fourth, we were unable to assess quality of care or the extent of language access services, which may have yielded important differences in processes of care

and outcomes. Finally, our findings in Medicaid patients may not generalize to other socioeconomic groups. Our Medicaid population does not capture immigrants with NEP without access to Medicaid programs. Such patients with less access may have different experiences.

In conclusion, we found language preference is not associated with differences in hospital mortality for AMI patients and apparent differences in LOS between NEP and EP individuals are no longer significant after accounting for receipt of cardiac procedure/surgery and hospital. Our findings suggest that it is important to consider hospital factors in studies of the effect of language barriers in the health care setting. Further research is needed to see if our findings generalize to non-Medicaid populations and for other conditions.

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