Effects of the Limited English Proficiency of Parents on Hospital Length of Stay and Home Health Care Referral for Their Home Health Care–Eligible Children With Infections

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**Objective:** To examine the relationship of limited English proficiency of parents to hospital length of stay (LOS) and to home health care referral for their home health care eligible—children with infections.

**Design:** A retrospective cohort study.

**Setting:** Regional urban pediatric hospital.

**Participants:** A total of 1257 children aged 0 to 18 years admitted for infection requiring prolonged antibiotic treatment during the period from January 1, 2000, to December 31, 2008.

**Main Exposures:** The cohort of patients were defined by primary caregivers who had to report on their English proficiency.

**Main Outcome Measures:** Number of home health care referrals and LOS.

**Results:** The median LOS for the study group was 4.1 days (interquartile range, 2.6-7.2 days). Limited English proficiency was associated with longer LOS (adjusted relative LOS, 1.6 [95% confidence interval, 1.1-2.3]), indicating that patients who had caregivers with limited English proficiency stayed 60% longer, on average, than patients with English-proficient primary caregivers. Insurance status (Medicaid), absence of a primary care provider, home health care utilization, and presence of comorbidity were also associated with longer LOS. Limited English proficiency was associated with a significantly decreased number of home health care referrals (odds ratio, 0.2 [95% confidence interval, 0.04-0.81]). Patient insurance (Medicaid) and presence of any comorbidity were also significantly associated with decreased number of home health care referrals.

**Conclusions:** Among pediatric inpatients with infections requiring long-term antibiotics, a primary caregiver with limited English proficiency was identified as an important independent risk factor for both increased LOS and decreased number of home health care referrals.

important barrier to health care access in the Latino population. In 2002, the same group chronicled multiple adverse health care consequences due to language differences between the patient and medical staff, including poor medical care, misdiagnosis, inappropriate medications, and unnecessary hospitalization. The consequences of miscommunication have been shown to contribute to poor adherence, inappropriate follow-up, and patient dissatisfaction. In the emergency department, even when controlling for socioeconomic status, LEP has been associated with longer stays, increased resource use, and higher hospitalization rates. Furthermore, within a cultural or racial/ethnic group, English proficiency plays a larger role in health care quality than either culture or race/ethnicity alone.

An important, indirect measure of inpatient quality of care is hospital length of stay (LOS), which is associated with cost of care, patient outcome, and hospital-associated complications. The importance of a patient’s primary language to LOS in the pediatric emergency department was described by Goldman et al, who found that language other than English, among other factors, was associated with longer stays. Whether a similar relationship exists in the inpatient pediatric setting is unclear; however, the inpatient setting offers a unique opportunity to address LEP issues because the interaction between provider and family is more extensive, including history taking, clinical assessments, and discussion of management. Limited English proficiency could have an effect on all of these interactions, and it is conceivable that patients with LEP are at risk for longer hospital stays and other adverse health care consequences due to language differences between the patient and medical staff.

Inpatient hospital costs account for the largest portion of our nation’s health care expenditures, and it has been well established that home health care is less expensive and often has better outcomes than inpatient treatments. Home health care can be a surrogate marker for health care utilization because patients receiving this service typically use fewer resources, including daily physician care and hospital support services.

The aim of our study was to determine whether the LEP of parents is associated with length of hospital stay and referral of home health care services for pediatric inpatients. Multiple factors contribute to the decision of whether a patient will receive a home health care referral, such as provider perception of family ability to adequately manage home health care, family comfort level with patient care, insurance coverage of home health care services, and availability of home health care services in the community. The purpose of our study is to determine whether LEP is a contributing factor in LOS and home health care referrals. Patients receiving prolonged intravenous antibiotic therapy are commonly eligible for home health care, providing a useful study population for evaluating both LOS and home health care referral. Identifying disparities in measurable health service utilization among these patients is an important first step to understanding the effect of language barriers on health care service delivery. If a group of patients or families are unable, on the basis of LEP, to benefit from the lower cost and equal or better health outcome that home health care can offer, identifying such an inequity would allow for targeted improvement of the health care system and health outcomes, alike.

**METHODS**

**STUDY POPULATION AND SETTING**

Our study was conducted in an urban, tertiary care, freestanding Midwestern children’s hospital serving as a regional pediatric referral center. It has a multisate referral area and serves a multicultural population. Of the approximately 17 000 inpatient hospitalizations in 2008, 31% were for nonwhite patients, 49% either self-pay or are on Medicaid, and 3% are for families with LEP (Delynn Archer, information technologist, written communication, January 2009).

All children 0 to 18 years of age admitted to the hospital during the period from January 1, 2000, to December 31, 2008, for infections typically requiring prolonged antibiotic therapy were included in the LOS portion of our study. Cases of infection were selected in consultation with the hospital’s infectious disease specialists on the basis of the likelihood of home health care eligibility. They included joint and/or bone infections (International Classification of Diseases, Ninth Revision [ICD-9] codes 730.20–730.29 for osteomyelitis and ICD-9 codes 711.00–711.09 for infected joints) and central nervous system infections (ICD-9 codes 320.9, 320.7, 320.0, and 036.0 for bacterial meningitis, ICD-9 code 324.0 for brain abscess, and ICD-9 code 376.01 for orbital cellulitis). Because home health care data were only available starting after 2003, a subset of data was analyzed for home health care referral (723 patients). Patients were excluded if they died while hospitalized.

**STUDY VARIABLES**

Study groups were determined by the English proficiency of the patient’s primary caregiver, identified through a combination of data on self-reported primary language spoken at home and need for an interpreter. By hospital protocol, a patient’s primary caregiver is asked by the intake nurse or an admissions specialist to report on the primary language spoken at home and whether there is a need for an interpreter on admission to an inpatient service. Because the study hospital does not currently ask families their self-identified ability to speak English, for the purposes of our study, patients with primary caregivers who reported a primary language spoken at home other than English and the need for an interpreter were defined as having LEP. All other patients were deemed to be proficient in English. Hospital LOS was defined as the time between inpatient admission and subsequent hospital discharge, measured in hours. Home health care referral was defined as the documentation of an order for home health care in the discharge-planning portion of the medical chart.

Covariates included patient age in years, sex, race/ethnicity (white, African American, Latino, Asian, and other), insurance type (private, Medicaid, or self-pay), presence of a primary care provider (yes or no), and presence of comorbidities (asthma, malignancy, sepsis, diabetes, sickle cell disease, congenital cardiac disease, liver disease, and renal disease). These comorbidities were considered by the authors to be potentially related to both study outcomes (LOS and home health care referral). For the analysis, the comorbidity variable was dichotomized as presence or absence of a comorbidity.

**ANALYSIS**

Means, standard deviations, and proportions were used for descriptive analyses. Categorical variables were compared using
Table 1. Demographic and Clinical Characteristics of the Study Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All (N=1257)</th>
<th>English Proficiency (n=1218)</th>
<th>Limited English Proficiency (n=39)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>761 (60.5)</td>
<td>476 (39.1)</td>
<td>20 (51.3)</td>
<td>.13</td>
</tr>
<tr>
<td>Latino</td>
<td>85 (6.8)</td>
<td>50 (4.1)</td>
<td>35 (92.3)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Insurance type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private or commercial</td>
<td>688 (54.7)</td>
<td>685 (56.2)</td>
<td>3 (7.7)</td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>505 (40.2)</td>
<td>479 (39.3)</td>
<td>26 (66.7)</td>
<td></td>
</tr>
<tr>
<td>Self-pay or no insurance</td>
<td>64 (5.1)</td>
<td>54 (4.4)</td>
<td>10 (26.6)</td>
<td></td>
</tr>
<tr>
<td>No primary care physician</td>
<td>61 (4.9)</td>
<td>58 (4.8)</td>
<td>3 (7.7)</td>
<td>.40</td>
</tr>
<tr>
<td>Main diagnosis</td>
<td></td>
<td></td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td>Osteomyelitis</td>
<td>357 (28.4)</td>
<td>346 (28.4)</td>
<td>11 (28.2)</td>
<td></td>
</tr>
<tr>
<td>Infected joint</td>
<td>263 (20.9)</td>
<td>257 (21.1)</td>
<td>6 (15.4)</td>
<td></td>
</tr>
<tr>
<td>Bacterial meningitis</td>
<td>162 (12.9)</td>
<td>155 (12.7)</td>
<td>7 (17.9)</td>
<td></td>
</tr>
<tr>
<td>Brain abscess</td>
<td>49 (3.9)</td>
<td>48 (3.9)</td>
<td>1 (2.6)</td>
<td></td>
</tr>
<tr>
<td>Orbital cellulitis</td>
<td>426 (33.9)</td>
<td>412 (33.8)</td>
<td>14 (35.9)</td>
<td></td>
</tr>
<tr>
<td>Presence vs absence of comorbidity</td>
<td>190 (15.1)</td>
<td>187 (15.4)</td>
<td>3 (7.0)</td>
<td>.19</td>
</tr>
<tr>
<td>Home health carea</td>
<td>239 (33.1)</td>
<td>237 (34.1)</td>
<td>2 (6.9)</td>
<td>.001</td>
</tr>
<tr>
<td>Median LOS (IQR), d</td>
<td>4.1 (2.6-7.2)</td>
<td>4.0 (3.6-4.5)</td>
<td>6.1 (1.4-10.8)</td>
<td>.098b</td>
</tr>
</tbody>
</table>

Abbreviations: IQR, interquartile range; LOS, length of stay.

aComorbidities included asthma, malignant neoplasm, sepsis, diabetes mellitus, sickle cell anemia, congenital cardiac disease, liver disease, and renal disease.

bRepresents a subset of the main data set because data on home health care were only available after 2002 (a total of 723 patients: 694 English-speaking patients and 29 non–English-speaking patients).

cDetermined by use of the Mann-Whitney U test.

the χ² test or the Fisher exact test, and continuous variables were compared using the t test.

Hospital LOS was compared between language proficiency groups using simple linear regression. Owing to a skewed distribution, LOS was transformed using the natural logarithm (ln) to achieve a normal distribution. The relationship of all study variables to language proficiency and ln(LOS) were analyzed by use of binary logistic regression and simple linear regression, respectively. Covariates were included in multiple linear regression models of the relationship between language proficiency and ln(LOS). Odds ratios (ORs) with 95% confidence intervals (CIs) expressed the relationship between the 2.

Because differences in ln(LOS) are not easily interpretable in the clinical setting, regression results were converted to relative LOS by exponentiating the unstandardized regression coefficient for each variable. This relative LOS represents the ratio of the geometric means of the compared groups, offering a measure of relative difference (eg, a relative LOS of 1.5 would indicate that 1 group stayed an average of 50% longer than the other).

Because home health care data were only available starting after 2003, a subset of data was analyzed for home health care referral (723 patients). Home health care referral was compared between language proficiency groups using logistic regression. Covariates were included in multiple logistic regression models of the relationship between language proficiency and home health care referral. Covariates were chosen to be included in the model using stepwise logistic regression. Odds ratios with 95% CIs were used to express the relationship between the 2. Data were analyzed using SPSS version 16.0.1 (SPSS Inc, Chicago, Illinois). Our study was approved by the hospital’s institutional review board.

RESULTS

On the basis of primary diagnoses, a total of 1282 subjects were eligible during the period of our study; however, only 1257 patients are included in the analysis because 25 deaths occurred during hospitalization. Demographic and clinical characteristics of the study population are detailed in Table 1. Of the 1257 patients, 39 (3.1%) had LEP and 1218 (96.9%) were proficient in English. Patients with LEP were more likely to be Latino and either uninsured or insured by Medicaid (P < .001).

The median LOS for all subjects was 4.1 days (interquartile range, 2.6-7.2 days), with a median LOS among the English-proficient and LEP groups of 4.0 and 6.1 days, respectively (P = .098). Adjusted LOS results are shown in Table 2. Limited English proficiency was associated with longer LOS (adjusted relative LOS, 1.6 [95% CI, 1.1-2.3]), indicating that patients with LEP stayed 60% longer on average than English-proficient patients. Absence of a primary care provider, presence of any comorbidity, receipt of home health care, and Medicaid insurance status were all associated with longer LOS.

Table 2. Association of Length of Inpatient Hospital Stay With Demographic and Clinical Characteristics

<table>
<thead>
<tr>
<th>Association</th>
<th>Adjusted Relative LOS (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insurance</td>
<td></td>
</tr>
<tr>
<td>Medicaid vs private</td>
<td>1.2 (1.1-1.4)</td>
</tr>
<tr>
<td>Self-pay vs private</td>
<td>1.1 (0.8-1.5)</td>
</tr>
<tr>
<td>LEP vs EP</td>
<td>1.6 (1.1-2.3)</td>
</tr>
<tr>
<td>Absence vs presence of PCP</td>
<td>1.5 (1.1-2.0)</td>
</tr>
<tr>
<td>Home health care vs none</td>
<td>1.7 (1.5-1.9)</td>
</tr>
<tr>
<td>Presence vs absence of comorbidity</td>
<td>1.7 (1.4-2.0)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; EP, English proficiency; LEP, limited English proficiency; LOS, length of stay; PCP, primary care provider.
Research shows that health care disparities in pediatrics continue to grow. The findings from our study add to the known associations between language barriers and health care quality. Many studies specifically addressing pediatric disparities have focused on race/ethnicity, insurance coverage, and socioeconomic status. Our study adds to the understanding of language barriers in pediatric care and is consistent with previous work identifying disparities in health and health care outcomes for children from families with LEP (ie, children who reside in households in which a language other than English is the primary language spoken).

Our study has important limitations. It was conducted at a single site in the Midwest. Other locations may have more extensive interpreter services available for parents, decreasing the influence of language as a barrier to home health care for families with LEP. Differences in treatment styles among infectious disease specialists or between regions or institutions may also affect home health care recommendations. Such variability is seen in the recent trend in some institutions to transition patients with diagnoses described in our study to oral antibiotics earlier than in the past. Earlier transition to oral antibiotics could decrease the necessity for home health care by nullifying the need for antibiotic infusion; however, one would not expect a differential effect in this trend by English proficiency status. Despite the large sample size of patients with the defined infections, only 39 of 1257 patients (3.1%) had LEP. This is inconsistent with the overall percentage of admissions of patients who had LEP to the study hospital and raises the question of why our study population differed demographically from the larger hospital population.
of illness could not be included. No standardized severity scores currently exist or are used for the infections in question. Although severity of illness is a factor in LOS and in home health care referral decisions, to our knowledge, there are neither studies nor empirical evidence associating LEP with severity of the infections reviewed in our study. Therefore, it is difficult to imagine that the difference in home health care referral in our study was driven by patients with LEP having different levels of severity of infection. Lastly, the gold standard for determining LEP is self-report of ability to speak English, not self-report of primary language spoken at home or need for interpreter services. It is reasonable to assume that the need for interpreter services is a proxy for LEP status. However, misclassification may occur in either direction. There is a possibility that primary caregivers identified as needing an interpreter did not have LEP but were bilingual. It is equally possible that caregivers identified as being proficient in English were not bilingual and had LEP.

The clinical importance of increased relative LOS (60% longer in this sample) depends on the reference LOS. Because the median LOS in our study population was 4.1 days, a 60% increase represents approximately 2.5 more days in the hospital. This could be significant from a financial, clinical, and social standpoint for hospitals, patients, and payors. Although formal cost calculations were not made, at the time of our study, the average daily charge for an inpatient bed at the study hospital was approximately $2500. Using the difference in median LOS, this implies an increase of $6250 for total-stay room charge for a patient having LEP compared with an English-proficient patient. This estimate does not account for other charges but shows the potential scale of cost difference based on language. Besides financial strains, families who stay in the hospital longer have to deal with other difficulties such as time off from work, child care for their offspring who are not ill, and transportation.

Patients who receive home health care typically use fewer resources, including daily physician care and hospital support services. Patients who receive home health care also tend to have superior outcomes. In our study, the lower likelihood of home health care for patients having LEP may represent a denied opportunity for equitable health and health care outcomes.

The language-based home health care referral gap described herein provides a specific opportunity for improvement in the provision of adequate and equitable health care for the children of our diverse, multilingual society. Assessing the fit between home health care services and the communities they serve may help in clarifying the causes of the home health care gap. Providers, who ultimately decide which patients to recommend for home health care, could be studied with regard to attitudes and knowledge about families with LEP and the services available to them. One possible solution for addressing the disparities in LOS and home health care referral would be to educate physicians, housestaff, and medical students about the home health care system and to foster closer work with medical interpreters. Education might also highlight the need for vigilance in assessing whether families with LEP are willing or able to use home health care as thoroughly as English-proficient families. Lastly, an LOS of greater-than-expected duration for orthopedic and brain infections could be seen as a quality improvement issue and should merit further investigation.

With the population of people with LEP in the United States growing exponentially, the medical community must ensure that all patients with LEP receive adequate interpreter services. Increasing the number and quality of trained medical interpreters and translators, improving the infrastructure for a multilingual approach to care, and further minimizing multitiered care based on language are important areas for advocacy. Future studies on interventions to address language-related disparities such as those described in our study are needed to improve the care of patients with LEP.

Accepted for Publication: February 16, 2011.
Published Online: May 2, 2011. doi:10.1001/archpediatrics.2011.61

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Financial Disclosure: None reported.

Additional Contributions: We thank Christopher Kennedy, MD, and Vidya Sharma, MD, MPH, for their contributions to the initial planning of the study. We also thank Ashley Sherman, MA, for her assistance with the statistical analysis.

REFERENCES


