Disparities in Pediatric Emergency Department Length of Stay and Utilization Associated with Primary Language

By

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Thesis

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Table 1. Descriptive Statistics

	English Primary Language n = 116,686	Spanish Primary Language n = 19,853	Other Primary Language n = 2,624	p Value
Female, n	54,864 (47.0%)	9,470 (47.7%)	1,198 (45.7%)	0.07
Male	61,819 (53.0%)	10,383 (52.3%)	1,426 (54.3%)	
Age, mean ± SD	6.58 ± 5.63	6.72 ± 5.46	6.19 ± 5.42	<0.001
Race/Ethnicity, n				
Asian	1,702 (1.5%)	3 (<0.1%)	471 (19.1%)	
Black or African American	15,143 (13.1%)	82 (0.4%)	628 (25.4%)	
Other	6,415 (5.5%)	496 (2.5%)	632 (25.6%)	<0.001
White	57,662 (49.7%)	285 (1.4%)	485 (19.6%)	
Hispanic/Latino Ethnicity*	34,994 (30.2%)	18,956 (95.6%)	253 (10.2%)	
Insurance, n				
Private	43,247 (37.1%)	1,313 (6.6%)	509 (19.4%)	
Public	69,365 (59.4%)	17,230 (86.8%)	1903 (72.5%)	<0.001
Self-Pay	4,074 (3.5%)	1,310 (6.6%)	212 (8.1%)	
Emergency Severity Index, n				
ESI 1 and 2	27,976 (24.0%)	2,812 (14.2%)	445 (17.0%)	
ESI 3	49,891 (42.8%)	7,888 (39.7%)	1,061 (40.4%)	<0.001
ESI 4 and 5	38,700 (33.2%)	9,133 (46.0%)	1,116 (42.5%)	
Day of Presentation				
Weekday	81,400 (69.8%)	13,909 (70.1%)	1,810 (69.0%)	0.46
Weekend	35,286 (30.2%)	5,944 (29.9%)	814 (31.0%)	
Time of Presentation				
Midnight to 7:59am	17,071 (14.6%)	3,263 (16.4%)	415 (15.8%)	
8am to 3:59pm	40,683 (34.9%)	6,865 (34.6%)	1,020 (38.9%)	<0.001
4pm to 11:59pm	58,932 (50.5%)	9,725 (49.0%)	1,189 (45.3%)	

Table 2. Mean Length of Stay by Primary Language, Stratified by Emergency Severity Index

	English Primary Language	Spanish Primary Language	Other Primary Language	p Value
ESI 1 and 2, min ± SD	258.82 ± 191.95	251.51 ± 193.25	247.68 ± 150.33	0.08
ESI 3	163.61 ± 101.01	167.10 ± 95.67	165.13 ± 95.74	0.015*
ESI 4 and 5	93.60 ± 60.20	102.76 ± 64.71	103.29 ± 63.87	<0.001**
Total	163.25 ± 135.00	149.45 ± 116.07	152.76 ± 109.10	<0.001***

*ESI 3 Bonferroni Post-Hoc:
EPL versus SPL, p = 0.012

**ESI 4 and 5 Bonferroni Post-Hoc:
EPL versus SPL, p <0.001
EPL versus OPL, p <0.001

***Total (All ESI) Bonferroni Post-Hoc:
EPL versus SPL, p <0.001
EPL versus OPL, p <0.001

Table 3. Bivariate Analysis of Independent Variables and Length of Stay		
Variable	**Mean LOS (± SD)**	**p Value**
Age	–	<0.001
Sex		
Female	167.58 ± 140.10	<0.001
Male	155.30 ± 124.28	
Race/Ethnicity		
Asian	152.31 ± 129.27	
Black or African American	152.28 ± 138.08	
Other	152.29 ± 117.91	<0.001
White	178.11 ± 144.03	
Hispanic/Latino Ethnicity	146.83 ± 115.64	
Insurance		
Private	176.15 ± 137.62	
Public	154.36 ± 129.80	<0.001
Self-Pay	146.04 ± 110.85	
Emergency Severity Index		
ESI 1 and 2	258.01 ± 191.55	
ESI 3	164.11 ± 100.23	<0.001
ESI 4 and 5	95.53 ± 61.27	
Day of Presentation		
Weekday	165.92 ± 137.97	<0.001
Weekend	149.91 ± 116.70	
Time of Presentation		
Midnight to 7:59am	153.15 ± 122.63	
8am to 3:59pm	175.58 ± 128.39	<0.001
4pm to 11:59pm	153.36 ± 136.45	

Abstract

Objectives

To investigate the association between primary language and length of stay (LOS) in the pediatric emergency department (ED) within the context of known disparities impacting healthcare experiences and outcomes for patients with language barriers.

Methods

We conducted a retrospective cohort study of consecutive encounters of patients presenting to, and discharged from, an urban pediatric ED from May 2015 through April 2018. Encounters were grouped into English primary language (EPL), Spanish (SPL), and other (OPL). Mean LOS comparisons were stratified by emergency severity index (ESI). Bivariate and multivariate analyses were employed to examine the relationship between LOS and variables including age, sex, race/ethnicity, insurance, and time of presentation.

Results

A total of 139,163 encounters were included. A higher proportion of SPL and OPL encounters were characterized as lower ESI acuity compared to EPL. Significantly longer LOS for SPL and OPL encounters was observed in the two lower acuity strata. The ESI 4–5 stratum demonstrated the greatest LOS disparity between EPL, SPL, and OPL (94 versus 103 versus 103 minutes, respectively; $p < .001$). In the highest acuity stratum, ESI 1–2, there was a non-significant trend towards longer LOS among EPL encounters ($p =$

.08). The multivariate model accounted for 24% of LOS variance, but effect sizes were small for all variables except for ESI and age.

Conclusions

Patients with Spanish or other non-English primary language who were triaged to lower acuity ESI levels experienced longer LOS in the pediatric ED than English-speaking counterparts. They also utilized the ED more frequently for low acuity issues, possibly reflecting disparities in access to primary care.

Introduction

Language barriers between providers and patients contribute to a range of poor outcomes.[1-4] Specifically in the pediatric emergency department (ED), patients with a non-English primary language (NEPL) or limited English proficiency (LEP) have been shown to experience higher rates of appendiceal perforation,[1] receive unnecessary diagnostic testing,[5,6] have more frequent short-term return visits,[7,8] and report lower satisfaction and trust in medical providers[9-11] than English-proficient counterparts. Identifying and addressing factors that contribute to healthcare disparities impacting children and families with LEP should be a priority in the United States' increasingly multilingual society.[12]

A recent report lends credence to a pattern of providers deferring or delaying communication when treating patients with LEP, potentially contributing to delays in care and communication lapses in the pediatric ED.[13] Inadequate communication can extend to the discharge process[14,15] and may disparately contribute to delays, poor outcomes, and increased ED return visits for LEP patients. Prolonged length of stay (LOS), which includes waiting time, is associated with decreased patient satisfaction[10,16] and may be an indicator of delays due to over-testing[5,6] or providers delaying points of contact with LEP patients due to a perceived barrier of requiring interpreter services.[13] Yet it remains unclear whether length of stay (LOS) differs between LEP and English-proficient patients in the pediatric emergency department. An early investigation reported that LEP was associated with significantly longer LOS.[6] However, LOS disparities have not been consistently replicated in following studies.[17,18] Overall, it is unclear whether

LOS is included among other well-demonstrated disparities faced by NEPL and LEP families.

The aim of this study was to quantify the relationship between language and LOS, which is an important component of the healthcare experience for patients in the pediatric ED and a potential indicator of disparity. Given reports of providers deferring or delaying communication with patients due to language barriers even when convenient modalities of interpretation are available,[13] we hypothesized that NEPL would be associated with longer LOS than English-primary language (EPL).

Methods

This study was conducted at a major medical center in the Northeast United States. Institutional review board approval was granted for this retrospective cohort study. Data were originally obtained and stored in the Epic electronic health record (EHR) (Verona, WI) at the time of patient registration in the ED. Encounters that met the inclusion parameters described below were deidentified and included in the analysis.

Emergency Department Setting and Interpretation Services

All patient encounters occurred in a high-volume, urban pediatric ED within a large academic medical center in the Northeast United States. The patient population is racially, ethnically, and linguistically heterogenous with between one third to one half of patients identifying as Hispanic ethnicity. The most common non-English primary language in the catchment area is Spanish. The institution has available in-person interpreter services for the most common languages at our institution (Spanish, Portuguese, Cape Verdean Creole, Russian, American Sign Language) upon provider request; however, only Spanish and Portuguese in-person interpreters are available 24 hours per day. Alternately, telephonic and mobile video interpreter services are immediately available at all times for treating providers and staff. Professional interpreter services – whether in-person, telephonic, or video – are utilized at the discretion of providers depending on the preference of patient families.

Inclusion and Exclusion Criteria

Encounters of patients from birth to 18 years old who presented to the pediatric emergency department from May 2015 through April 2018 were initially considered for inclusion in the study. Patient encounters were excluded if no primary language was listed, if there were insufficient data to derive LOS for the encounter, or if final disposition was not recorded. Patients who were admitted from the ED to inpatient care were excluded to ensure a more uniform sample, as ED boarding time prior to inpatient admission is highly variable and there is evidence that admission rates between patients with and without LEP may differ significantly.[11,19-21]

Study Variables

Patient encounters were separated into EPL, Spanish primary language (SPL), and other primary language (OPL) groups. For the purposes of this study, OPL patients were defined as patients whose primary language was recorded as anything other than English or Spanish upon registration in the ED. The primary outcome of interest was mean length of stay (LOS), which was favored over median LOS to allow for the application of parametric tests and remain comparable to prior studies examining language and ED LOS.[6,17,18,22] Parametric testing is a reasonable approach to large samples regardless of normality and allows for the application of linear regression, which is superior for evaluating confounding variables than the non-parametric equivalent. LOS was measured as time in minutes from arrival in the ED to departure. Time of departure occurred when the patient's nurse documented that discharge instructions were reviewed and the patient vacated the treatment room. Other variables collected included sex, age, race, ethnicity,

insurance provider, Emergency Severity Index (ESI), and the time and day of the week of the encounter. Race and ethnicity were combined into a single "Race/Ethnicity" variable to minimize multicollinearity within analyses, with 5 groups defined as non-Hispanic ethnicity with race listed as Asian (1), Black or African American (2), Other (3), White (4), and Hispanic ethnicity of any race (5). ESI is a validated and widely employed ED triage system that ranges from 1 to 5, with a ranking of 1 representing the most medically severe and 5 representing the least severe.[23,24] ESI is not impervious to bias due to elements of subjectivity,[25,26] but it is a reasonable and accessible approximation of acuity. The ESI variable was trichotomized into ESI 1-2, ESI 3, and ESI 4-5.

Statistical Analysis

Descriptive statistics were delineated by primary language group (Table 1). The mean LOS of each primary language group was compared via analysis of variance (ANOVA) within ESI stratifications to control for the influence of medical acuity on LOS. When applicable, post hoc Bonferroni correction was employed to elucidate specific between group differences and control for Type I error. Bivariate analysis with Chi-Square (χ^2) or independent samples *t*-tests were used to investigate the association between LOS and each study variable. Variables that demonstrated a significant association with LOS in the bivariate analyses (level of significance of $p < 0.05$) were included in a final multivariate linear regression model. Secondary analysis within each ESI stratum was also performed using multivariate linear regression. All statistical analyses were conducted using SPSS version 24 (SPSS, Chicago, Illinois).

Results

A total of 139,254 encounters were identified from May 2015 through April 2018. Of these, 91 encounters were excluded due to lacking documentation of primary language, with 139,163 encounters included in the final analysis. There were 116,686 EPL encounters, 19,853 SPL encounters, and 2,624 OPL encounters. The descriptive statistics stratified by language group are shown in Table 1. Notably, a larger proportion of EPL encounters were triaged as high acuity (ESI 1–2) compared to SPL and OPL encounters (24.0% versus 14.2% versus 17.0%, respectively). This trend was reversed in the lowest acuity stratum, ESI 4–5.

Primary Language and Length of Stay

Overall, mean LOS for EPL encounters was 14 minutes and 10 minutes longer than SPL and OPL encounters, respectively. However, stratification by ESI – a standardized measure of medical acuity – demonstrated that this difference was skewed by a larger proportion of high acuity EPL encounters associated with longer mean LOS (Table 2). In the highest acuity stratum, ESI 1–2, there was a non-significant trend towards longer LOS among EPL encounters. Significant LOS differences were observed in the lower acuity strata, ESI 3 and ESI 4–5. Post hoc Bonferroni analyses of the ESI 3 stratum demonstrated that LOS for SPL encounters was significantly longer than EPL encounters ($p = .01$). Post hoc analysis of the ESI 4–5 stratum revealed that SPL and OPL encounters were each significantly longer than EPL encounters ($p < .001$, both comparisons).

Bivariate and Multivariate Analyses

Bivariate analysis demonstrated that all clinical and demographic variables considered in this study were significantly associated with LOS (Table 3). Older age predicted longer LOS (Pearson correlation coefficient = 0.27). Similarly, all variables were statistically significant when included simultaneously in the multivariate linear regression model. The multivariate model accounted for 24% of the variance in LOS (R^2 = .24). Effect sizes (ES) for all variables except age and ESI were small (|Standardized beta coefficient| < 0.1). Age and ESI were associated with medium (beta = 0.167) and large (beta = -0.415) effect sizes, respectively.

Secondary Multivariate Analysis within ESI Strata

When linear regression was applied to the ESI 1-2 stratum, only gender, day of presentation, and age remained significant predictors of LOS. Language was not significantly associated with LOS in this highest acuity group. In the ESI 3 stratum all variable except for insurance were significant predictors of LOS. Lastly in the lowest acuity ESI 4-5 stratum, all variables were significantly associated with LOS. The multivariate models for each stratum accounted for 8%, 4%, and 4% of the variance in LOS, respectively.

Discussion

Our findings unveil a nuanced picture of primary language and LOS in our institution's pediatric ED. Within our sample, LOS was longer for SPL and OPL patients who presented with lower acuity complaints. However, the overall mean LOS was significantly longer in EPL encounters when pooling all ESI acuity levels. This difference was driven by a larger proportion of high acuity EPL encounters and the correspondingly longer LOS times. In the highest acuity stratum, the proportion of EPL encounters was 24% compared to only 14% of SPL encounters ($p < 0.001$). Conversely, a higher proportion of SPL and OPL encounters were triaged to the lowest acuity ESI levels 4-5 compared to EPL (46% versus 43% versus 33%, respectively). Interestingly, this pattern was reversed in the highest acuity stratum, where we observed a non-significant trend towards longer LOS for EPL encounters. Despite statistical significance, LOS was not meaningfully different in the ESI 3 stratum (EPL 164 min versus SPL 167 versus OPL 165).

Prolonged LOS is implicated in patients' satisfaction with the ED experience[10,16] and may present a safety concern for time-sensitive conditions such as appendiceal rupture that have disparately affected minorities and patients with LEP.[1,27,28] Our findings do not provide substantial insight into why LOS was prolonged for NEPL patients with lower acuity ESI. While it seems intuitive that interpretation would incur delays, existing studies report mixed results. [19,29,30] In the outpatient setting, there is evidence to suggest in-person interpretation does not lengthen visit duration.[31,32] Moreover, ED providers "getting by" without interpretation is well-documented.[33] Gutman et al conducted a prospective study in which 46% of ED providers endorsed less frequent communication

with LEP patients and 35% reported delays.[13] Therefore, modifiable provider behavior may be a factor in LOS delays. Future research should investigate whether delays for LEP patients in the ED are due to lengthened discussion time during interpreter-mediated communications or systemic bias in the form of "getting by" without a professional interpretation modality, deferring communication, or even prioritizing patients without language barriers.

The finding of similar LOS for encounters in the moderate acuity strata and trend towards longer LOS for the highest acuity EPL encounters was contrary to our hypothesis but suggests that the factors causing LOS disparities attenuated as triage acuity and overall LOS increased. If we were to speculate that communication delays contribute to prolonged LOS among LEP patients triaged to low acuity ESI – whether due to legitimate delays during interpreter-mediated discussion or deferred communication – this finding would suggest that the delays are not prominent for patients triaged as moderate or high acuity. Future studies could elucidate whether this is due to more equitable approaches to care and communication during clinically demanding encounters. Alternately, this could represent less frequent provider-initiated communication with NEPL patients,[13] inadequate discharge counseling,[7,8,14] or bias in triage assignment.[25,26] Whatever the underlying cause, it is notable that a meaningful LOS disparity exists in one stratum but not others.

Prior studies evaluating LOS and language are relatively sparse – especially pertaining to the pediatric ED setting – and have reported conflicting results. A variety of methodologies and settings has further complicated the matter. An early, US-based study reported prolonged LOS for a relatively small sample of LEP patients in the pediatric

ED.[6] A handful of investigations have since corroborated that trend but are not entirely generalizable to the pediatric ED setting in the US.[34,35] A pediatric study that evaluated ethnicity rather than primary language concluded that Hispanic and non-Hispanic black patients were more likely to experience prolonged LOS than non-Hispanic white patients.[36] Alternatively, there is evidence suggesting that LOS is comparable for patients with and without language barriers. Most notably, a large pediatric study by Greenky et al, which assumed LEP status if an interpreter was requested, found that LOS was similar between LEP and English-proficient patients after adjusting for ESI.[17] Consistent with our findings, Greenky et al reported that the unadjusted LOS was significantly shorter in their LEP cohort, which was seemingly due to greater frequency of lower acuity presentations among LEP patients. At least two other studies – one based in Canada[18] and the other a small study in an adult ED[22] – did not find LOS disparities. Similar to our investigation, prior studies investigating LOS have largely been single-center endeavors that may be lacking in generalizability due to unique institutional resources and patient populations. Nevertheless, our study benefits from a large sample within a diverse, urban patient population in the Northeast US, which represents a valuable addition to the relatively limited literature.

In essence, our findings suggests that the discussion of LOS disparities is inextricably related to triage acuity and ED utilization. In our sample, NEPL and OPL families were far more likely to receive lower acuity triage designations, ESI 4 or ESI 5. Nearly half of SPL patients were triaged to the lowest ESI stratum in comparison to only one third of the EPL cohort. This trend was reflected in the relationship between primary language and LOS times, but also appeared in other variables that may contribute to LOS.

For example, we observed that private insurance and non-Hispanic white race/ethnicity was associated with longer LOS. However, there is substantial multicollinearity between the variables of language, insurance type, and race/ethnicity. A potential contributing factor may be that EPL patients and families were more likely to identify as non-Hispanic white race and have private insurance, and this demographic tended to utilize the ED for higher acuity complaints with consequently longer LOS. This multicollinearity may explain the multivariate model findings which suggested that despite being significant predictors, the individual effect sizes of language, race/ethnicity, and insurance on LOS were small.

Other studies have reported a similar trend of NEPL or LEP patients having lower acuity triage designations compared to English-proficient counterparts. Goldman et al reported among a diverse sample of non-English speaking patients at a Canadian pediatric ED.[18] Three single-center, US-based studies also recently reported this trend at pediatric EDs in Atlanta, GA,[17] Seattle, WA,[19] and Cincinnati, OH.[5] Each found that LEP patients were more likely to be triaged as ESI 4 or 5. Notably, one prior study based in Atlanta, GA found the opposite to be true.[37] We posit two potential factors that may contribute to this widely-replicated phenomenon. The first being disparities in access to high quality primary care. The second being the possibility of bias during triage assignment resulting in more LEP patients inappropriately triaged to less acute designations. The latter has been demonstrated with regard to race.[25,26]

There is ample evidence that LEP families experience poorer access to primary care or a medical home[38,39] which increases non-urgent ED utilization.[40] Furthermore, low health literacy – a measure that is related to English proficiency when it comes to

navigating the US healthcare system[41-43] – has been linked to higher non-urgent ED utilization.[44,45] Our findings corroborate the theory that LEP families face disparities in access to primary care and functional health literacy that may underlie higher rates of "non-urgent" ED visits.

We acknowledge that LOS is not inherently an endpoint measure of quality of care, which is particularly true given the multitude of professional interpretation modalities employed in current day healthcare settings that can introduce varying amounts of time to each ED encounter. Nevertheless, LOS is undoubtedly pertinent to the healthcare experience of NEPL and LEP families and has been shown to be a principal component of patient satisfaction in the pediatric ED.[16] We also contend that LOS may well be a concerning marker of disparity in the delivery and efficiency of care in the pediatric ED, especially given reports that many providers admit deferring or avoiding communication when encountering language barriers.[13]

Our study is subject to several limitations. Despite a large sample size, this was a single-center investigation and the generalizability of our findings to other settings is limited. We excluded patients who were admitted because the time between admission order placement and actual transport out of the ED adds a variable amount of time to LOS depending on inpatient bed availability. Previous studies evaluating LOS have also used this exclusion criteria.[18,34] However, there is substantial evidence of disparities in admission rates related to language proficiency.[11,19,20,29] Our analysis did not account for any disparities in admission rates and may be subject to bias as a result. Of note, our analysis evaluated LOS of individual encounters but did not account for repeat visits by the same patient during the 3-year study period. Beyond characterizing LOS, our study is

not able to further delineate causes of LOS differences. Most notably, data on interpreter involvement and modality were not regularly available within the central EHR at our institution during the study timeframe. Therefore, while we recognize that interpreter utilization is a key factor in LOS for NEPL and LEP families, the influence of interpreter services is beyond the scope of our study. While widely used and validated,[23] ESI may be subject to bias that results in under-triage of minority patients.[25,26] Therefore, ESI may not be entirely reflective of the true severity of a patient's condition. Lastly, we recognize that primary language is an inferior metric compared to true English proficiency when investigating language barriers.[27] Patients and families with a non-English primary language may also be proficient in English. Unfortunately, validated assessment of English proficiency[46] is not performed at our institution. Primary language was deemed a reasonable proxy that was readily accessible via EHR and thereby enabled the large sample size included in this study.

Conclusion

When presenting for lower acuity conditions, patients discharged from the pediatric ED whose primary language was Spanish or another non-English language experienced longer LOS than English-speaking counterparts. There was a non-significant reversal of this trend among higher acuity encounters, suggesting that the factors contributing to these LOS disparities attenuated with greater clinical severity. The most notable predictors of LOS were the ESI triage designation and age. Patients who primarily spoke Spanish or other non-English languages presented to the ED for low acuity conditions more frequently, which may be due to inequities in access to primary care and health literacy. Future research should investigate the underlying cause of LOS delays for NEPL and LEP patients with non-urgent complaints and evaluate whether provider bias is a contributing factor. Furthermore, ongoing disparities in ED utilization trends suggest that more work must be done to address long-standing deficiencies in primary care access.

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