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Disparities of Functional Outcomes for Limited English Proficiency (LEP) Patients in Inpatient Rehabilitation

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Abstract

Language barriers occur when the patient and healthcare provider do not share the same native language which can result in a major negative impact on the quality and cost of healthcare provided. Language barriers are responsible for reducing the satisfaction of both medical providers and patients, as well as the quality of healthcare delivery and patient safety. It is imperative that healthcare facilities appreciate and examine the literature on the topic of disparities and actively strategize how to ensure the best outcome for all patients under their care.

The purpose of this retrospective study was to examine the effectiveness of a recent upgrade of mobile, live interpreting devices by comparing the changes of mobility outcomes, also known as mobility quality indicator scores, from admission to discharge, prior to the upgrade in the year 2022, to the changes in outcomes after their extended use from October 2023 to September 2024, for all non-English patients. This study sought to also provide evidence of existing disparities within the year of 2024, and if there had been improvement and/or regression in outcomes for non-English speaking patients that require further mitigation.

MeSH Keywords: healthcare, disparities, language, outcomes

Introduction

Language barriers occur when a patient and their healthcare provider do not share a common native language. In turn, these communication challenges may substantively impact the quality and cost of healthcare provided. Unequal treatment related to language barriers is associated with unequal access to healthcare and disproportionately poorer health outcomes. A systematic review of fourteen studies conducted by Shamsi et al. demonstrated that language barriers are responsible for reducing the satisfaction of medical providers and patients, as well as the quality of healthcare delivery and patient safety [1].

According to Bond and Sholas, there are two major components of disparate outcomes for patients receiving rehabilitation services which influence one another: (1) disparate treatment of marginalized patients and (2) a lack of diversity in the workforce [2]. Firsthand, examples of racial and ethnic disparities in rehabilitation access and outcomes are well documented. Flores et. al. reported reduced healthcare utilization and access for Hispanics in the United States [3]. Gorman et al. (2020) found that Black and Latino adult patients were less likely to be discharged from acute care hospitals to rehabilitation centers than their white counterparts following initial treatment for significant brain injury [4]. Regarding outcomes, a study by Warren & Garcia (2022) showed that Black adults with traumatic brain injury (TBI) had lower cognitive, motor, and total functionality at discharge than non-Hispanic white adults [5].

In addition, the substantial lack of diversity in physical medicine treatment staff, including physicians and other rehabilitation-related allied health professionals, conflicts with the representation of racial and

ethnic groups in the larger population. Representation of the population being treated by their healthcare providers is crucial to maximizing positive health outcomes for those patients. Representation begets trust, which facilitates communication thereby increasing both patient and provider satisfaction. It is not only health outcomes that are negatively affected by stifled communication resulting from lack of representation, but clinical practices may also face financial and operational challenges as well. Lack of communication between the patient and healthcare provider may reduce treatment efficacy or impede it altogether. In turn, this may affect the reimbursement to the practice based on the patient's actual versus expected outcome.

Bond and Sholas explain that change requires approaches that move from micro to macro: targeting individual behavior, institutional factors, and systemic challenges [2]. When considering language as a barrier to rehabilitation services and a major component of racial and ethical disparities in healthcare, Mirza et. al. (2022) examined individual, institutional, and systemic barriers in an inpatient rehabilitation setting and developed technological, procedural, and structural solutions [6]. Technological solutions included flexible and mobile real-time interpreting devices to help limit the treatment process. Procedural solutions included establishing a systematic approach for recording patients' preferred language, creating a standard protocol for clinicians to obtain language supports, and hiring trained interpreters who are familiar with rehabilitation jargon. Structural solutions included budgeting for interpreter services, providing training for staff and clinicians, and adjusting clinicians' workload and expectations to allow greater time and flexibility to meet patients' language needs.

Herrmann et. al. (2024) conducted a retrospective study at an urban IRF using data from 2013–2019 on functional independence measure (FIM) scores and discharge destination to compare between race, language, and ethnic groups, with adjustment for patient characteristics [7]. This study found that non-White patients and patients with limited English proficiency (LEP) had significantly lower functional recovery, as measured by smaller changes in FIM scores from IRF admission to discharge. This study reiterates the already well documented existence of disparities in the preponderance of currently available literature. Further research is warranted in identifying the effectiveness of specific interventions that help minimize the gap in outcomes for patients with language barriers in the inpatient rehabilitation setting.

Memorial Rehabilitation Institute is an inpatient rehabilitation facility affiliated with Memorial Healthcare System, one of the major public healthcare systems in South Florida. Memorial Rehabilitation Institute is an eighty-nine-bed unit that received 2,153 patient admissions in 2022, in which 13.5% had limited English proficiency (LEP). Due to the diversity of the larger population served in South Florida, Memorial Rehabilitation Institute has developed similar solutions described by Mirza et. al. (2022) to aide in improving healthcare services and outcomes for limited English proficient (LEP) patients, including mobile interpretation devices, interpretation phone lines, preferred language recording in patient charts, and training of staff on use of these resources, along with cultural awareness and sensitivity through annual competencies. It is imperative that healthcare facilities appreciate and examine the literature on

the topic of disparities and actively strategize how to ensure the best outcome for all patients under their care.

The primary objective of this study was to identify if there was a significant difference in the change of mobility scores in the year prior to the introduction of upgraded video interpreter devices and the change of mobility scores after the extended use of the upgraded devices. We hypothesized that there would be a statistically significant improvement in scores for LEP patients due to more effective communication of interventions, and by engaging the patient in their overall care. A secondary objective was to identify if there was a difference in the change of mobility scores for LEP patients in comparison to English speaking patients.

Methods

Study Design

A retrospective review was conducted on all LEP patients admitted to Memorial Rehabilitation Institute from January 2022 to December 2022, prior to the introduction of the upgraded live video interpretation devices, with extraction of mobility scores on admission and at discharge to determine the average change seen in their scores throughout the rehabilitation stay for that year. Similarly, the average change in mobility scores for LEP patients was extracted for the period of October 2023 to September 2024, after extended use of the upgraded interpretation devices.

The mobility quality indicator scores included each patient's total score for mobility, including transfers, such as moving from bed/chair to chair, walking, and stairs, on both initial evaluation and at discharge. These scores are assigned by the rehabilitative staff and are based on a numeric scale from 0 to 7, with the higher number reflective of greater independence. For example, a score of 7 reflects the patient is independent and requires no assistance by the helper, whereas a score of 2 indicates the patient requires maximum assistance, or at least 75% assistance by the helper.

The averages, before and after upgrade of the interpretation devices, of each mobility quality indicator score, were compared to determine if a significant improvement of mobility outcomes occurred for LEP patients after the upgrade. Additionally, the average change in mobility scores for LEP patients from October 2023 to September 2024 were compared to the average change in mobility scores for English speaking patients to identify recent disparities.

Participants

Based on the year 2022, a total of 2,153 patients were admitted to Memorial Rehabilitation Institute, inpatient rehabilitation. From October 2023 to September 2024, a total of 1,888 patients were admitted. Therefore, a total of 4,041 records were reviewed to identify LEP patients for the years prior to and after the upgrade of video interpretation devices. Sample size for review of pre and post upgraded

interpretation device use mobility outcomes of LEP patients will total 542 subjects. Additionally, a total of 1476 subjects that were English-speaking post upgraded interpretation device use were used for review of their mobility outcome and latest comparison to LEP patients' outcomes. The study's key eligibility criteria include patients admitted to inpatient rehabilitation at Memorial Regional Hospital South from January 2022 to December 2022 and October 2023 to September 2024 that were non-English speaking or have limited English proficiency (LEP).

Study Procedures

Records were reviewed by the co-investigator from December 2024 to January 2025. Data extraction was completed by a single co-investigator, with use of UDSpro software, which pulls directly from the patient's electronic medical records to minimize human error in identifying all patients that meet criteria, specifically language. This software is restricted solely to authorized users for legitimate business purposes. Data points of language, ethnicity and race, are not available for direct extraction from EPIC, so UDSpro software was required to gather this information. UDSpro software was also able to calculate the key outcome measure of mobility QI scores which were not available directly from patient records, further limiting human error in calculations. This data, along with all other data points required that are directly available from patient records, such as pre-post period, gender, diagnosis, and age, was entered and extracted using Research Electronic Data Capture (REDcap) by the same co-investigator. REDCap is a web-based research survey and data management application that provides secure data capture. A separate research assistant then calculated the comparisons for each average change in mobility scores during the pre and post periods of the upgraded translation devices to obtain results utilizing REDcap database.

Data points collected from the study included the pre-post period which designated if the patient was treated prior to or after implementation of the upgrade of mobile, live interpreting devices introduced to inpatient rehabilitation. Other data points included race, ethnicity, gender, age of the patient at admission, the patient's admitting diagnosis, and the patient's preferred language, which was the patient's requested language for verbal and written communication throughout their inpatient rehabilitation stay. Last, the admission mobility QI score was the total score of the patient's level of various transfers, gait, and stairs on initial evaluation was compared to the discharge mobility QI score, which was the total score of the patient's level of various transfers, gait, and stairs the day prior to discharge from inpatient rehabilitation.

Ethics

The Memorial Healthcare System Institutional Review Board (IRB) approved and assigned this study as IRB project MHS.2024.220 on December 23, 2024. This study met criteria for exemption from the requirement for IRB oversight based on the exemption category of secondary research in which consent is not required. All data was maintained in a password-protected file accessible only to the study investigators. Patient information was de-identified and not released nor accessible to anyone other than

study investigators. The master key linking data to personal health information was destroyed at the completion of data collection and verification process. Access to private health information was conducted under the co-investigator's secured login and was inclusive of authorized work duties. Waiver of HIPAA authorization was requested as no private health information was stored with ability to link data to subjects once data was extracted.

Statistical Analysis

Descriptive statistics were calculated for all demographic and outcome variables. Pearson's Chi-Square Test and, where appropriate, Fisher's Exact Test was used to examine pre-post differences in categorical variables. Independent t-test, or its non-parametric equivalent, was used to assess continuous variables for pre-post differences. Statistical significance was set at $P < 0.05$.

Results

Patient Characteristics

The pre-to-post interpreter upgrade analysis for LEP patients included a total of 542 subjects, 285 prior to upgrade and 257 post upgrade. The preferred language of all LEP patients prior to interpreter upgrade was majority Spanish (76%), followed by Creole (14%), and then other preferred language (9.8%). Mobility change from admission to discharge averaged 29.1 for LEP patients prior to the upgrade. After the upgrade, LEP patients had an average change of 27.9, resulting in a p-value of 0.38 (Table 1).

The post upgrade analysis of English versus LEP patient included a total of 1,733 subjects, of which 1,476 had a preferred language of English, and 257 were LEP patients. The preferred language of LEP patients consisted of majority Spanish (11%) and Creole (2.4%), with 1.6% of patients having another preferred language (Table 2).

Mobility Outcomes

Admission mobility scores were similar between English and non-English patients (33.5 versus 34.7, respectively). The discharge mobility scores were slightly lower for LEP patients, averaging at 61.4, while English speaking patients averaged 64.6. However, the difference in discharge mobility scores between the two groups was not statistically significant (p = 0.077). Mobility change from admission to discharge averaged a score of 29.9 + 14.8 for English speaking patients while LEP patients averaged 27.9 + 16.7, resulting in a p-value of 0.30 (Table 2).

Adjusted Analysis

After adjustment, LEP status was associated with a lower discharge mobility QI score compared with English-speaking patients (β = -2.01, p = 0.050). Admission mobility QI score was a significant predictor

of discharge mobility outcomes. Age, gender, and race were included in the model as covariates.

Discussion

Language barriers create a multitude of challenges for patients, healthcare providers, and clinical practices, and are largely a result of racial and ethnic disparities between providers and the populations they serve. Oftentimes these challenges result in negative health outcomes for minority populations, especially when added to the cumulative effects of negative social determinants of health that also disproportionately affect these same populations. This study sought to identify the effectiveness of a specific intervention that would help minimize the gap in outcomes for patients with language barriers in the inpatient rehabilitation setting. Memorial Rehabilitation Institute took the recommended steps to incorporate technological, procedural, and structural solutions to improve the outcomes of disparate populations.

Although no significant difference was seen in LEP patient outcomes after the upgrade of the interpreter device in comparison to outcomes prior to the upgrade, the upgrade can still be used as an efficacy benchmark (outcomes remained largely unchanged from the previous version) to initiate continuous quality improvement. The lack of discernable changes post-upgrade could simply be that there was marked improvement with the first iteration which stalled with the newest version. This could serve as a focus of future investigation where the changes in the program, not the outcomes, are examined.

Changes in current disparities in functional outcomes between English speaking and LEP patients following use of the upgraded interpreter devices were not statistically significant. As such, we conclude that language barriers did not impact improvement in functional outcomes during rehabilitation at Memorial Rehabilitation Institute. Other mitigating factors that may have impacted the outcomes of this study such as a change in recent hiring practices to include a more diverse provider population, as well as the procedural changes to patient intake which allow us to document preferred language, and how information was interpreted for non-English speaking patients.

Conclusion

There was no significant improvement in the change of mobility scores for LEP patients after the upgraded interpreter devices in comparison to the change of mobility scores for LEP patients prior to the upgrade. Pre-to-post comparison does not support benefit of the upgrade. With admission mobility scores similar between groups, discharge mobility scores were slightly lower among LEP patients, but the difference was not statistically significant. Therefore, mobility improvement during rehabilitation stay was comparable between groups. Further investigation into the changes that were made between the initial and upgraded versions may provide valuable insight regarding why we did not see significant improvements in outcomes. We can also continue the trajectory of proven, successful methods, such as hiring a more diversified workforce, decreasing the gap in provider and patient representation thereby improving relatability.

Statements and Declarations

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

All authors contributed to the study conception and design. Karen Lanier and Cristina Ramsey completed data collection. Data analysis was done by Xiaoqi Sun and Danielle Katz. Karen Lanier wrote the first draft of the manuscript. Danielle Katz, Cristina Ramsey, Xiaoqi Sun and Karen Lanier all made edits and addendums on last version of the manuscript. All authors read and approved of the final manuscript.

Ethics Declaration

The Memorial Healthcare System Institutional Review Board (IRB) approved and assigned this study as IRB project MHS.2024.220 on December 23, 2024. This study was conducted in accordance with the Declaration of Helsinki, US and international standards of Good Clinical Practice, applicable Federal regulations, International Conference on Harmonization guidelines, and institutional research policies and procedures.

Human Ethics and Consent to Participate

The Memorial Healthcare System IRB granted exemption from the requirement for IRB oversight based on the exemption category of secondary research as outlined in 45 CFR 46.101 or 21 CFR 56.104. The letter of approval for this exemption has been shared as a supplementary file.

Consent for Publication

This study met criteria for exemption of consent by Memorial Healthcare System IRB, based on exemption category of secondary research as outlined in 45 CFR 46.101 or 21 CFR 56.104. The letter of approval for this exemption has been shared as a supplementary file.

Data Availability

De-identified datasets are attached as a supplementary file for review. This study's IRB approved protocol has also been shared as a supplementary file to provide details on data collection methodology and sources. Last, the REDCap data collection instrument, REDCap code book, and R statistical analysis code files are also available as a supplementary file for review.

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Tables

Table 1. LEP Patient Characteristics and Mobility Scores Pre to Post Upgrade

Characteristic	Pre-upgrade N = 285[a]	Post-upgrade N = 257[a]	p-value[b]
Age at admission (years)	69.0 (15.0)	69.5 (14.5)	**0.68**
Gender			**0.008**
Female	155 (54%)	137 (53%)	
Male	129 (45%)	109 (42%)	
Unknown	1 (0.4%)	11 (4.3%)	
Race			**0.46**
American Indian/Alaska Native	0 (0%)	1 (0.4%)	
Asian	9 (3.2%)	4 (1.6%)	
Black or African American	50 (18%)	53 (21%)	
Other Race	9 (3.2%)	4 (1.6%)	
Unknown	1 (0.4%)	1 (0.4%)	
White	216 (76%)	194 (75%)	
Ethnicity			**0.56**
Hispanic or Latino	211 (74%)	186 (72%)	
Not Hispanic or Latino	73 (26%)	71 (28%)	
Unknown	1 (0.4%)	0 (0%)	
Preferred language			**0.66**
Creole	40 (14%)	42 (16%)	
Other	28 (9.8%)	28 (11%)	
Spanish	217 (76%)	187 (73%)	
Mobility outcomes			
Admission mobility QI score	36.2 (12.3)	33.5 (11.2)	**0.008**
Discharge mobility QI score	65.3 (18.7)	61.4 (21.3)	**0.025**
Mobility change (discharge - admission)	29.1 (14.2)	27.9 (16.7)	**0.38**

[a] Mean (SD); n (%).

[b] Welch two-sample t-test for continuous variables; Pearson's chi-squared test for categorical variables.

Table 2. LEP Patients vs. English Patients Characteristics and Mobility Scores Post Upgrade

Characteristic	English N = 1,476[a]	Non-English N = 257[a]	p-value[b]
Age at admission (years)	66.3 (17.2)	69.5 (14.5)	**0.016**
Gender			**<0.001**
Female	698 (47%)	137 (53%)	
Male	768 (52%)	109 (42%)	
Unknown	10 (0.7%)	11 (4.3%)	
Race			**0.067**
American Indian/Alaska Native	2 (0.1%)	1 (0.4%)	
Asian	34 (2.3%)	4 (1.6%)	
Black or African American	422 (29%)	53 (21%)	
Other Race	23 (1.6%)	4 (1.6%)	
Unknown	5 (0.3%)	1 (0.4%)	
White	990 (67%)	194 (75%)	
Ethnicity			**<0.001**
Hispanic or Latino	236 (16%)	186 (72%)	
Not Hispanic or Latino	1,236 (84%)	71 (28%)	
Unknown	4 (0.3%)	0 (0%)	
Preferred language			**0.7**
Creole	40 (14%)	42 (16%)	
Other	28 (9.8%)	28 (11%)	
Spanish	217 (76%)	187 (73%)	
Mobility outcomes			
Admission mobility QI score	34.7 (12.1)	33.5 (11.2)	**0.2**
Discharge mobility QI score	64.6 (18.8)	61.4 (21.3)	**0.077**
Mobility change (discharge - admission)	29.9 (14.8)	27.9 (16.7)	**0.3**

[a] Mean (SD); n (%).

[b] Fisher's exact test for categorical variables; Wilcoxon rank-sum test for continuous variables.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- LEPDeIdentifiedDataSet.csv
- LEPREDCapCodebook.pdf
- READMELEPtwoscripts.txt
- LEPprepostsubmission.r
- LEPpostsubmission.r
- LEPFinalProtocol.docx