ORIGINAL RESEARCH

Professional Medical Interpreters Influence the Quality of Acute Ischemic Stroke Care for Patients Who Speak Languages Other than English

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***Background*—**The inability to communicate effectively in a common language can jeopardize clinicians' efforts to provide quality patient care. Professional medical interpreters (PMIs) can help provide linguistically appropriate health care, in particular for the >25 million Americans who identify speaking English less than very well. We aimed to evaluate the relationship between use of PMIs and quality of acute ischemic stroke care received by patients who preferred to have their medical care in languages other than English.

***Methods and Results*—**We analyzed data from 259 non–English-preferring acute ischemic stroke patients who participated in the American Heart Association Get With The Guidelines–Stroke program at our hospital from January 1, 2003, to April 30, 2014. We used descriptive statistics and logistic regression models to examine associations between involvement of PMIs and patients' receipt of defect-free stroke care. A total of 147 of 259 (57%) non–English-preferring patients received PMI services during their hospital stays. Multivariable analyses adjusting for other socioeconomic factors showed that acute ischemic stroke patients who did not receive PMIs had lower odds of receiving defect-free stroke care (odds ratio: 0.52; P=0.04).

***Conclusions*—**Our findings suggest that PMIs may influence the quality of acute ischemic stroke care. **(*J Am Heart Assoc.* 2017;6:e006175. DOI: 10.1161/JAHA.117.006175.)**

Key Words: disparities • quality of care • registry • statistics • stroke

Effective communication between patients and clinicians is critical to achieving quality care.[1] Language barriers can threaten the quality of care we provide to the >65 million Americans who speak >350 languages other than English.[2–4] Particularly at risk are a subgroup of >25.1 million Americans who self-identify as speaking English less than "very well" and thus are considered to have limited English proficiency.[4] To ensure equity, our healthcare system needs to effectively incorporate evidence-based practices that facilitate quality care across language differences.[5] Engaging professional medical interpreters (PMIs) in the care of patients with language barriers can help decrease clinical errors, enhance service utilization, improve clinical outcomes, and increase patient satisfaction.[6] The role of PMIs in the care of stroke patients is largely unknown; we are aware of only 1 Australian study that showed patients undergoing inpatient stroke rehabilitation who needed and received PMI services had a greater change in their functional independence rate compared with patients who needed but did not receive PMI services.[7] Our group previously described the influence of acute ischemic stroke (AIS) patients' language preference on their receipt of intravenous thrombolysis.[8] In this follow-up study, we analyzed the effect of involving PMI in the care of non–English-preferring (NEP) patients who participated in our institutional stroke registry. We hypothesized that NEP patients who did not receive PMI services would be less likely to achieve defect-free AIS care.

Methods

Study Population

Patients included in this retrospective study were enrolled in the GTWG-Stroke (Get With the Guidelines–Stroke) Registry at

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Clinical Perspective

What Is New?

- This study is the first showing that engaging a professional medical interpreter in the care of people who prefer to speak languages other than English may influence the quality of their acute ischemic stroke care.

What Are the Clinical Implications?

- Study findings highlight the pressing need to effectively understand and meet the linguistic needs of patients with acute ischemic stroke across the continuum of stroke care to provide quality care and improve outcomes for all patients.

Massachusetts General Hospital (MGH) between May 18, 2005, and April 30, 2014. As we described previously, GWTG-Stroke is a national data collection system and performance measurement tool developed by the American Heart Association to improve the quality of care and outcomes for patients with stroke and transient ischemic attack.[8] Our institution is a 999-bed hospital in Boston, MA, with longstanding efforts to provide quality stroke care per nationally accepted standards and recommendations. Hospital personnel are trained to use GWTG-Stroke to collect data on AIS patients by prospective clinical identification or retrospective use of *International Classification of Diseases, Ninth Revision* and *Tenth Revision* discharge codes. For this study, patients were included if they were (1) discharged from MGH between May 18, 2005, and April 30, 2014, with AIS as their primary hospitalization reason; (2) entered into GWTG-Stroke; and (3) known to be NEP based on their response to the standardized question, "In what language do you prefer to receive medical information?" asked during patient registration. Patients were excluded if their AIS occurred while already admitted at a healthcare facility; if they were transferred from another hospital; when their primary residence was out of country, as our analyses included neighborhood socioeconomic variables that require a US ZIP code; or if PMI data were not available. Patients with multiple admissions were included for only their first stroke-related hospitalization.

Variables of Interest

Data sources

Deterministic linkage was applied to merge participants' data from complementary sources: GWTG-Stroke provided demographics, medical history, receipt of evidence-based practices, and in-hospital outcomes; the Partners HealthCare Research Patient Data Registry provided language preference, neighborhood ZIP code, and marital status, as well as race, ethnicity, and insurance data when these were not available in GWTG-Stroke[9]; the MGH Medical Interpreter Services database identified patients who received PMI services at least once during their hospitalization; and the US Census Bureau geocoding program American FactFinder identified patients' neighborhood education and income levels based on the 2008 to 2012 American Community Survey 5-year estimates.[3,10]

Patient characteristics

Demographic and socioeconomic measures included patients' self-reported age (years); sex (female, male); race (Asian, black or African American, white, other); ethnicity (Hispanic, not Hispanic); language preference (Spanish, Portuguese, French or Haitian Creole, Mandarin or Cantonese Chinese, Italian, other); marital status (married or partnered, not married or partnered); insurance status (private, Medicare, Medicaid, uninsured or self-pay); and neighborhood education level (percentage of individuals aged >25 years with less than a high school degree using the 2008–2012 American Community Survey 5-year estimates).

Clinical information included patients' stroke severity at initial evaluation using the National Institutes of Health Stroke Scale (NIHSS; score of 0–42 from least to most severe stroke) and their known stroke risk factors: atrial fibrillation, coronary artery disease or prior myocardial infarction, carotid stenosis, diabetes mellitus, dyslipidemia, heart failure, hypertension, peripheral vascular disease, previous stroke/transient ischemic attack, prosthetic heart valve, and smoking history (all conditions identified as present when documented in the medical record).

In-hospital care

We used a summary defect-free care measure to quantify the proportion of AIS patients who received all interventions for which they were eligible based on performance measures developed by the American Heart Association, the Joint Commission, and the Centers for Disease Control and Prevention. These quality-of-care indicators included thrombolytic therapy administered, receipt of deep vein thrombosis prophylaxis within 48 hours of admission for nonambulatory patients, antithrombotic therapy by the end of hospital day 2, discharge on antithrombotic therapy such as an antiplatelet or anticoagulant, discharge on anticoagulation for patients with history of atrial fibrillation or history of paroxysmal atrial fibrillation, discharge treatment of lipid-lowering agent for patients with low-density lipoprotein >100 mg/dL, dysphagia screening, stroke education, smoking cessation counseling, and assessment for rehabilitation.[11] Patients were considered to have received defect-free care if they received all interventions for which they were eligible.

Table 1. Sociodemographic and Clinical Characteristics of NEP Stroke Patients (n=259)

	NEP Patients Provided PMI Services (n=147)	NEP Patients Not Provided PMI Services (n=112)	*P* Value
Patient sociodemographic measures			
Age, y, mean (SD)	68.94 (13.43)	72.15 (13.66)	0.06
Sex, n (%)			0.74
Female	81 (55.1)	64 (57.1)	
Male	66 (44.9)	48 (42.9)	
Race, n (%)			0.93
Asian	26 (17.7)	20 (17.9)	
Black	23 (15.6)	16 (14.3)	
White	72 (49.0)	57 (50.9)	
Other	2 (1.4)	3 (2.7)	
Unknown	24 (16.3)	16 (14.3)	
Hispanic ethnicity, n (%)			0.001
Hispanic	62 (42.8)	24 (23.1)	
Language, n (%)			<0.001
Spanish	51 (34.7)	23 (20.5)	
Portuguese	22 (15.0)	6 (5.4)	
French Creole/Haitian Creole	18 (2.2)	10 (8.9)	
Mandarin Chinese/Cantonese Chinese	14 (9.5)	9 (8.0)	
Italian	13 (8.8)	12 (10.7)	
Cambodian	5 (3.4)	3 (2.7)	
Other	24 (16.3)	49 (43.8)	
Marital status, n (%)			0.003
Married or partnered	94 (63.9)	51 (45.5)	
Not married or partnered	53 (36.1)	61 (54.5)	
Unknown	5 (3.4)	10 (8.9)	
Patient socioeconomic measures			
Patients aged >25 y with less than a high school degree, % (IQR)	23.3 (18.10–27.95)	19.20 (17.90–26.40)	0.02
Insurance status, n (%)			0.57
Private/other*	63 (42.9)	42 (37.5)	
Medicare	67 (45.6)	59 (52.7)	
Medicaid	5 (3.4)	5 (4.5)	
Uninsured or self-pay	12 (8.2)	6 (5.4)	
Clinical characteristics, n (%)			
No past medical history	14 (9.5)	9 (8.0)	0.68
Atrial fibrillation	23 (15.6)	18 (16.1)	0.93
Coronary artery disease or prior myocardial infarction	22 (15.0)	27 (24.1)	0.06
Carotid stenosis	3 (2.0)	2 (1.8)	0.88
Diabetes mellitus	52 (35.4)	31 (27.7)	0.19
Dyslipidemia	66 (44.9)	46 (41.1)	0.54
Heart failure	8 (5.4)	4 (3.6)	0.48
Hypertension	111 (75.5)	92 (82.1)	0.20

Continued

Table 1. Continued

	NEP Patients Provided PMI Services (n=147)	NEP Patients Not Provided PMI Services (n=112)	*P* Value
Previous stroke or TIA	23 (15.6)	11 (9.8)	0.17
Smoker	11 (7.5)	8 (7.1)	0.92
NIHSS score, mean (SD)	4 (2–12)	4 (2–12.75)	0.72

IQR indicates interquartile range; NEP, non–English-preferring; NIHSS, National Institutes of Health Stroke Scale; PMI, professional medical interpreter; TIA, transient ischemic attack.
*Other insurance: Veterans, Champus, preferred provider organization, health maintenance organization, and non-Medicaid assistance programs.

Statistical Analyses

Participants were characterized based on their demographic, socioeconomic, and clinical data using descriptive statistics. Means, standard deviations, and percentages or medians and interquartile ranges were computed for each variable. Two-sample *t* test and χ^2 tests were used to determine associations comparing NEP participants who received PMI services with those who did not. Statistical significance was set at the P=0.05 level.

Logistic regression models were built to examine associations between PMI involvement and patients' receipt of defect-free stroke care, adjusting for relevant covariates. The first regression model included participants' sex, age, race, ethnicity, marital status, and insurance status; a second model maintained all variables in the first regression model and incorporated participants' NIHSS scores. Odds ratios and 95% confidence intervals were calculated for each covariate.

IBM SPSS Statistics for Windows, version 20 was used for all analyses. Informed consent requirements were waived. The institutional review board granted approval for this study.

Results

A total of 259 NEP AIS patients met study inclusion criteria. PMI involvement was confirmed in the care of 147 of 259 patients (56.8%) who spoke 25 different languages. NEP patients who received PMI services were more likely to self-identify as Hispanic, to be married or partnered, and to speak Spanish or Portuguese (all P<0.05; Table 1). There did not seem to be significant clinical differences between patients who received PMI services and those who did not (Table 1). NEP patients who were not provided a PMI were significantly less likely to receive defect-free care compared with those who were provided PMI services (61.5% versus 73.9%, P=0.04).

In a regression model that accounted for sociodemographic factors, NEP patients who were not provided PMI services were half as likely to obtain defect-free AIS stroke care compared with those who were provided PMI services (odds ratio: 0.50; 95% confidence interval, 0.27–0.90; P=0.02; Table 2). This disparity persisted when accounting for patients' initial stroke severity (odds ratio: 0.49; 95% confidence interval, 0.25–0.94; P=0.03; Table 2). To better understand these findings, we reviewed differences in the individual elements that make up the defect-free care composite score and found that stroke education and consideration for rehabilitation were less often documented as completed among NEP AIS patients who were not provided language assistance (Table 3).

Table 2. The Association of PMI Involvement and Receipt of Defect-Free Care by NEP Patients With AIS (n=206)

	Unadjusted			Adjusted for SES			Fully Adjusted Model*		
	OR	95% CI	*P* Value	OR	95% CI	*P* Value	OR	95% CI	*P* Value
No interpreter	0.56	0.33–0.96	0.04	0.50	0.27–0.90	0.02	0.49	0.25–0.94	0.03
Female sex	1.46	0.85–2.49	0.17	1.33	0.73–2.41	0.35	1.00	0.52–1.94	0.99
Age	1.02	1.0–1.04	0.12	1.02	1.00–1.05	0.05	1.02	0.99–1.04	0.26
Not white race	0.93	0.55–1.59	0.79	1.17	0.66–2.08	0.58	1.08	0.58–2.01	0.80
Hispanic	1.08	0.6–1.93	0.80	1.29	0.67–2.48	0.45	1.33	0.66–2.67	0.43
Not married or partnered	0.68	0.40–1.18	0.17	0.56	0.30–1.06	0.07	0.56	0.28–1.13	0.16
Not privately insured	0.83	0.30–2.33	0.73	0.62	0.21–1.82	0.39	0.59	0.18–1.91	0.38
NIHSS score per point	1.18	1.10–1.25	<0.001				1.19	1.11–1.28	<0.001

AIS indicates acute ischemic stroke; CI indicates confidence interval; NEP, non–English- preferring; NIHSS, National Institutes of Health Stroke Scale; OR, odds ratio; PMI, professional medical interpreter; SES, socioeconomic status.
*The fully adjusted model included all SES variables (sex, age, race, ethnicity, marital status, insurance status) and included participants' NIHSS scores. These regressions represent 206 participants, as they automatically excluded cases with missing data (race was missing for 38 and marital status was missing for 15).

Table 3. The Influence of Performance and Defect-Free Measures of Care Among NEP Patients With AIS (n=259)

	Provided PMI Services (n=147)	Not Provided PMI Services (n=112)	*P* Value
In-hospital treatment			
Defect-free stroke care*	73.9 (105)	61.5 (67)	0.04
Performance measures†			
Arrive by 2 h, treat by 3 h	100 (20)	90.9 (10)	0.17
Early antithrombotics	100 (108)	100 (82)	NA
VTE prophylaxis	100 (113)	100 (69)	NA
Antithrombotics	100 (134)	98.9 (91)	0.24
Anticoagulants for atrial fibrillation	93.3 (14)	100 (12)	0.36
Smoking cessation counseling	77.8 (7)	85.7 (6)	0.69
Statin therapy	91.4 (64)	84.2 (48)	0.21
Dysphagia screening	82.5 (104)	77.3 (68)	0.34
Stroke education	71.2 (40)	50.0 (26)	0.04
Rehabilitation considered	96.9 (127)	87.5 (77)	0.007

Data are shown as percentage (count). AIS indicates acute ischemic stroke; NA, not applicable; NEP, non–English-preferring; PMI, professional medical interpreter; VTE, venous thromboembolism.

*Defect-free care represents the proportion of patients who received all measures for which they were eligible.

†Performance measures represent patients presenting within 2 h of symptom onset who received thrombolytics within 3 h of symptom onset; antithrombotics prescribed within 48 h of hospitalization, including antiplatelet or anticoagulant treatments; patients at risk of deep vein thrombosis (non-ambulatory) who received venous thromboembolism prophylaxis within 48 hours of hospitalization such as warfarin, heparin, other anticoagulants, or pneumatic pressure devices; antithrombotics prescribed at discharge; anticoagulants such as warfarin or heparin prescribed at discharge for patients with atrial fibrillation documented during hospitalization; smoking cessation intervention (medication or counseling) provided at discharge; lipid-lowering agents prescribed at discharge for eligible patients defined as having a low-density lipoprotein level >100 or if already being taken on admission; dysphagia or swallow screening before being given anything by mouth; given stroke education before discharge; assessment or receipt of rehabilitation services.

Discussion

In this small single-site study, we found that NEP patients who were not provided PMI services were half as likely to receive defect-free AIS care despite accounting for other clinical and socioeconomic factors. Specifically, NEP AIS patients who were not provided PMI were less likely to receive stroke education and less likely to be considered for rehabilitation. The direct relationship between receipt of PMI services and obtaining defect-free AIS care may have several explanations. AIS patients who received PMI services may have had an increased understanding of their diagnoses and could have asked clarifying questions to make informed decisions about topics pertaining to issues such as their stroke treatment options and rehabilitation needs.[12,13] Clinicians who engaged PMI services may have leveraged the interpreters' role as "cultural brokers" to better understand patients' needs and perspectives and to have more meaningful conversations on topics such as stroke risk reduction and smoking cessation.[14–16] This in turn may have increased the downstream likelihood of compliance with secondary stroke prevention strategies. Engaging a PMI might also be a marker of clinical teams who were already committed to achieving safe, effective, and equitable AIS care.

To interpret these findings, one must consider the context in which our institution provides AIS care. More than 36% of residents in the city of Boston speak a language other than English at home, with a total of 150 languages spoken.[17,18] Massachusetts has the 11th highest proportion of residents who speak languages other than English and mandates that hospitals provide language assistance to all patients free of cost.[19,20] Our institution has 24/7 PMI services that in fiscal year 2014 provided 53 471 face-to-face interpretations, 72 801 telephone-enabled interpretations, and 7678 video-enabled interpretations free of cost to patients.[21,22] Although GTWG-Stroke does not routinely collect data on AIS patients' language needs and how these were met, our hospital asks patients to identify the language in which they prefer to receive their medical care at registration and makes this information available in their medical record. We previously reported that ≈9.3% of AIS patients cared for at our institution were NEP and that they were more likely than English-speaking patients to self-identify as racial/ethnic minorities, to be uninsured or have Medicaid, and to live in neighborhoods with higher poverty levels.[8]

Several potential barriers may have affected NEP AIS patients who did not receive PMI services despite our institutional policies and systems to facilitate PMI use. Treating clinicians may have perceived a lack of available PMIs, experienced time constraints, or preferred to communicate through other means including ad hoc interpretation by patients' family members or other hospital staff.[23–28] Aligned with the literature, a survey study of 82 neurology clinicians at our institution showed that participants had high satisfaction with but inconsistent use of PMI services because of factors such as perceived time constraints, limited amount of video-interpretation equipment, and inconsistent availability of face-to-face PMI services, which seemed to be clinicians' PMI modality of choice.[29] It may also be that patients and their families requested that PMI services not be included in their care despite what was stated in their records, fearing that this could delay or otherwise negatively influence the way they were treated.[30] Although our hospital does not routinely ask patients to characterize how well they speak English, some NEP patients may have considered themselves proficient enough to speak English rather than their preferred language during clinical encounters and thus opted to use English.[31] It

is also plausible that language-concordant clinicians cared for some patients who did not receive PMI services, but these data are not available.[32,33] Beyond the provision of PMI services, our results may be influenced by our institution's lack of systems to routinely provide written stroke education materials in languages other than English.

Patients who received PMI services in this study were more likely to self-identify as Hispanic, to be married or partnered, and to speak Spanish or Portuguese. Patients' Hispanic ethnicity could have been perceived by clinicians as equivalent to Spanish or Portuguese language preference, leading clinicians to activate PMI services sooner when encountering these patients.[33,34] With Spanish and Portuguese being 2 of the most spoken languages in our catchment area, patients who spoke those languages may have benefited from our hospitals' more robust infrastructure to serve their needs: Spanish and Portuguese are the only 2 languages available via video equipment located in our inpatient areas, in addition to phone and in-person PMI modalities that are available for other languages.[35] Although we do not have data on patients being accompanied by others during their care, being married or partnered may have been a proxy for patients having greater social support during their hospitalization that in turn could have resulted in patients' linguistic needs being more effectively understood and met.[36,37]

Our findings have several implications. First, it is evident that hospitals serve a linguistically diverse AIS population and should strive to be better prepared to meet patients' language needs. Although other institutions may be providing AIS care in less linguistically diverse areas, our country is expected to continue to diversify linguistically over the next few decades, requiring our healthcare system to be prepared for this demographic shift.[38,39] GWTG-Stroke, when linked to administrative data, provides a unique opportunity to systematically characterize patients' linguistic needs, understand how they are met, and identify their influence on patients' care and outcomes. Second, our study results expand our knowledge of racial and socioeconomic factors associated with stroke care disparities, reinforcing that we need to better understand and address the social determinants of stroke care and outcomes.[40–51] The Office of Minority Health provides a framework for healthcare systems to meet patient linguistic needs through the National Standards for Culturally and Linguistically Appropriate Services in Health Care.[52] Third, we perceive an opportunity to understand the influence of patients' linguistic needs on outcomes such as mortality, discharge destination, and hospital costs.[53]

This study has several limitations. Most important, this is a single-site small-sample study in a highly diverse geographic area and within an institution with robust PMI resources. We may be underpowered to detect clinically meaningful differences in patient characteristics and outcomes. There may be quantitative and qualitative measures beyond defect-free care that would help characterize the influence of PMI on AIS patients' care and outcomes. There may also be factors that mediate the relationship between PMI and defect-free care for which we do not account. There may also be information beyond patients' preferred language, such as their level of English proficiency, to better characterize their linguistic needs. We did not have data on clinicians' linguistic abilities, which, if appropriate, could provide an excellent option for caring for NEP patients.[33,54] These and other unmeasured confounders may limit the ability to generalize our findings to other sites. We propose that future larger multisite studies aim to systematically understand the linguistic needs of AIS patients across the continuum of stroke care, how these needs are met, and their influence on patients' care and, ultimately, outcomes. We must continue to leverage national data collection systems and performance measurement tools such as GWTG-Stroke to consistently provide patient-centered, safe, timely, effective, efficient, and equitable stroke care to all patients.[55]

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