Impact of Limited English Proficiency on Presentation
and Outcomes of Patients Undergoing Primary
Percutaneous Coronary Intervention for ST-elevation
Myocardial Infarction

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Abstract

Doctor-patient language discordance has been shown to lead to worse clinical outcomes. In this study of patients undergoing primary percutaneous coronary intervention for ST-elevation myocardial infarction at an Australian health service, we demonstrated that limited English proficiency (LEP) is an independent predictor of prolonged symptom-to-door time but does not lead to worse 30-day mortality compared to English-proficient patients. More effort needs to be placed in providing public health education in varied languages to encourage early presentation to hospital for patients with LEP.

Keywords: acute myocardial infarction; English proficiency

Figure1_IMJ.jpg

Introduction

Increasing global migration leading to cultural and linguistic diversity in society has presented challenges in healthcare delivery, as a growing problem of language discordance between healthcare providers and patients arises. In Australia, recent census data have shown that over a quarter of Australia's population was born overseas and nearly a fifth of the population speak a language other than English at home ^[1]. Language barriers can compromise patient-provider communication and negatively affect the ability to deliver safe and effective healthcare ^[2-3]. Previous studies have shown that in predominantly English speaking countries, limited English proficiency (LEP) is associated with prolonged hospital length of stay, higher readmission rates and poorer self-reported health status ^[4-8]. Within cardiology practice, patients with LEP have been shown to have lower rates of cardiac catheterisation and percutaneous coronary intervention (PCI) following presentation with an acute coronary syndrome (ACS) ^[9]. However, the impact of LEP on delays to cardiac catheterisation and outcomes in patients with ST-elevation myocardial infarction (STEMI) treated with PCI has not been specifically investigated. In this study, we aimed to examine whether among patients with STEMI undergoing primary PCI, LEP was associated with longer delays to reperfusion and worse clinical outcomes.

Methods

This study was performed at a multi-centre tertiary health service in Melbourne, Australia. The health service treats one of the most culturally

diverse communities in the state of Victoria, with 38% of the population speaking a language other than English at home ^[1]. Routinely collected data on all patients undergoing PCI includes baseline demographics, procedural information, in-hospital complications and 30-day follow-up events as part of the Victorian Cardiac Outcomes Registry (VCOR) – a multi-centre state-wide PCI registry including all public and private hospitals in Victoria, Australia which has been described previously ^[10 11]. All patients are provided with information on the VCOR data collection process and there is an opt-out consent process, with no patients at this health service having declined involvement to date. In this study, all STEMI patients undergoing primary PCI at this health service between 15th July 2013 and 31st December 2016 were included and data collected as part of VCOR was analysed. Patients who had PCI post thrombolysis or had an in-hospital STEMI were excluded.

In this study, the health service's patient administration system database was used to identify the patient's primary spoken language and country of birth. This data is documented at the time of hospital admission by a clerk and checked at each subsequent hospital attendance. Patients who identified a language other than English as their primary spoken language were defined as having limited English proficiency. All patients who identified English as their primary spoken language were defined as English proficient (EP).

Data for continuous variables were expressed as means and standard deviations while categorical variables were expressed as numbers of people and percentages. Categorical variables were compared using the Chi-squared

test or the Fisher exact test. Continuous variables were compared using the t test or Mann Whitney U test. Logistic multi-variable regression analysis was used to identify independent predictors of prolonged symptom-to-door time using variables with a p value of less than 0.1 on univariate analysis. A 2-sided p value of less than 0.05 was considered statistically significant. Statistical analysis was performed using IBM SPSS statistics software version 24 (IBM, Armonk, New York).

The study was reviewed and granted ethical approval by the ethics committee at Western Health.

Results

During the study period, 650 patients underwent primary PCI for STEMI and were included in this study. Of this, 98 patients (15.1 %) were classified as LEP based on their self-reported primary spoken language. Among the LEP patients, the most commonly spoken languages were Vietnamese (23.4%, n=23) and Greek (8.2%, n=8). Of the EP patients, 195 (35.3%) were born outside of Australia, New Zealand, the United Kingdom or North America.

The LEP group was slightly older (mean age 65.6 years vs. 58.8 years, $p<0.01$) with a greater proportion of females (31.6% vs. 19.2%, $p<0.01$). There were no other significant differences in baseline demographics and comorbidities, including in the history of previous PCI or coronary artery bypass graft surgery (Table 1). Presentation with out-of-hospital cardiac arrest

or cardiogenic shock was similar in the two groups. Pre-hospital notification by paramedics was also similar. There were no significant procedural differences in terms of PCI success, use of drug-eluting stents or lesion complexity between the groups.

Door-to-balloon times were similar in both the LEP and EP groups (71 [IQR 48-112] minutes vs. 68 [IQR 44-103] minutes, $p=0.21$). Total ischaemic time defined as time from symptom onset to first balloon inflation in a coronary artery was significantly longer in the LEP group 281 [IQR 160-720] minutes vs. 203 [IQR 150-350] minutes, $p<0.01$), driven by longer symptom-to-door times (193 [IQR 94-502] minutes vs. 120 [IQR 85-226] minutes, $p<0.01$) (Figure 1). Median symptom-to-door time (STDT) for the entire cohort was 124 minutes. Patients with a STDT greater than 124 minutes were considered to have a prolonged STDT. On multiple logistic regression analysis, limited English proficiency was an independent risk factor for prolonged STDT (OR 1.63, 95% CI 1.05 – 2.54; $p=0.03$) while a history of PCI or coronary artery bypass graft surgery (OR 0.50, 95% CI 0.30 – 0.83; $p<0.01$), and pre-hospital notification (OR 0.64, 95% CI 0.47 – 0.87; $p<0.01$) were found to be independent protective factors for prolonged STDT.

The median length of hospital stay was equal between the two groups at 3 days ($p=0.70$). There was no difference in in-hospital mortality and major adverse cardiac events (MACE) between the 2 groups (7.1% vs. 5.3%, $p=0.45$ and 7.1% vs. 5.8%, $p=0.61$ respectively). 85.5% in the EP group and 89.8% in the LEP group had 30-day follow up completed ($p=0.26$). There was

no significant difference in 30-day mortality ($p=0.69$) or unplanned readmissions ($p=0.85$) between the 2 groups.

Discussion

In our study, we found a marked difference in symptom-to-door time between LEP and EP patients, with median symptom-to-door time being 73 minutes longer in LEP patients. Limited English proficiency was also found to be an independent predictor of prolonged symptom-to-door time. However, once patients entered the hospital system, there were no apparent differences in treatment times or outcomes. In-hospital and 30-day mortality were both slightly higher in the LEP group but these differences were not statistically significant, possibly due to a small sample size.

Recent focus in STEMI care has been on reducing delays to reperfusion by both encouraging patients to present early, and improving systems of care of STEMI management. In Australia, the National Heart Foundation health promotion organisation has for many years run a media campaign to educate the public on potential symptoms of an acute myocardial infarction (AMI) ^[12]. Yet the significantly longer symptom-to-door time in LEP patients however suggests that knowledge on AMI symptoms may be deficient in the LEP population. This has also been demonstrated in the United States where knowledge on stroke and AMI symptoms was found to be lower in Spanish-speaking Hispanics compared to all other English-speaking racial groups ^[13]. Other American studies have also found longer delays to treatment for AMI for

Hispanics than for non-Hispanic Caucasian Americans^[14 15]. Potential barriers to seeking early treatment for LEP patients in our study may have been a reluctance to call for urgent ambulance services for cultural reasons, language barriers as well as concerns about cost. Strategies to improve knowledge in communities with a high proportion of LEP with targeted education are needed.

In this study the delays to presentation did not translate to an increased length of stay in LEP patients. Data from the CONCORDANCE registry comparing LEP and EP patients with ACS showed longer length of stay, as well as higher in-hospital and 6-month mortality in the LEP group^[9]. Similarly an older Australian study comparing outcomes by English-speaking background also found a longer average length of stay in the non-English-speaking group – however, this study divided patients according to country of birth rather than language preference, which may have affected the results^[16]. However, a large American study of MI patients by Grubbs et al showed that length of stay and in-hospital mortality were not higher in LEP patients when adjusted for receipt of cardiac catheterisation or surgery^[17]. STEMI care is much more streamlined than care of non-ST elevation ACS and our study only included those undergoing PCI which may explain the similarity between our results and those of Grubbs et al^[17]. Streamlining of STEMI management with PCI and the use of clinical pathways with a checklist approach such as those used across our health network, is likely to be an important contributor in ensuring that equal care is provided to all patients regardless of English-speaking capacity. Implementing similar care pathways in other areas of cardiology and

healthcare in general may help to ensure LEP patients are not disadvantaged in their care.

There are a number of limitations to our study. There is no standardised tool to assess English proficiency status in the published literature and previous studies have used varying mechanisms to assess this ranging from using the language spoken in the patients' country of birth only, to using patients' self-reported language preference at different times in the hospital admission ^[8 16]. We performed our analysis based on patients' self-identification of their primary spoken language, which does not take into account their fluency, particularly in the EP group, which may affect patient care and understanding. In addition, similar to other studies, patients in our study were dichotomised into LEP and EP groups while in reality, English proficiency is much more of a continuum. As the registry did not collect data on ambulance utilisation, we were unable to compare this between the groups. The sample size in this study was also small and not adequately powered for assessing differences in mortality and MACE. As a result, we could not adequately adjust for baseline differences including unmeasured variables such as socioeconomic status and educational level, which may have confounded the impact of English proficiency. The results therefore should be validated in a larger cohort in the future.

Conclusion

In conclusion, limited English proficiency was associated with significantly longer symptom-to-door time but similar door-to-balloon times, in-hospital and

30-day mortality, compared to English-proficient patients in our study of STEMI patients undergoing primary PCI. While it is reassuring that STEMI systems of care are robust such that LEP patients are not disadvantaged within the health system, these results highlight the need for better education about cardiovascular emergencies targeted to non-English speaking communities.

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Table 1: Comparison of baseline and procedural characteristics and outcomes in English-proficient and limited English proficient patients

	English-proficient (EP)	Limited English proficiency (LEP)	P value
Number	552	98	
Mean age $\pm$ SD, years	58.8 $\pm$ 12.7	65.6 $\pm$ 11.9	<0.01
Male, n (%)	446 (80.8)	67 (68.4)	<0.01
Mean body mass index, kg/m²	28.8 $\pm$ 5.8	26.3 $\pm$ 4.7	<0.01
Diabetes, n (%)	94 (17.0)	23 (23.5)	0.13
Stage 4-5 chronic kidney disease (estimated glomerular filtration rate <30 ml/min/1.73m²), n (%)	12 (2.2)	4 (4.1)	0.26
Previous percutaneous coronary intervention, n (%)	63 (11.4)	7 (7.1)	0.21
Previous coronary	9 (1.6)	1 (1.0)	0.65

artery bypass graft surgery, n (%)			
Out-of-hospital cardiac arrest, n (%)	35 (6.3)	8 (8.2)	0.50
Cardiogenic shock on presentation, n (%)	59 (10.7)	13 (13.3)	0.45
Pre-hospital notification, n (%)	293 (53.1)	45 (45.9)	0.19
Radial access, n (%)	271 (49.1)	44 (44.9)	0.44
AHA/ACC type B2/C lesion, n (%)	303 (54.9)	63 (64.3)	0.08
Drug-eluting stent used, n (%)	359 (65.0)	73 (74.5)	0.68
Successful percutaneous coronary intervention, n (%)	527 (95.5)	92 (93.9)	0.50
Length of stay in days, median (IQR)	3 (3 – 3)	3 (3 – 4)	0.50
In-hospital mortality, n (%)	29 (5.3)	7 (7.1)	0.45
In-hospital major	32 (5.8)	7 (7.1)	0.61

adverse cardiac events, n (%)			
In-hospital bleeding (BARC type 2 or more), n (%)	16 (2.9)	2 (2.0)	0.09
30-day mortality, n (%)	37 (7.8)	8 (9.1)	0.69
30-day unplanned readmissions, n (%)	46 (9.7)	8 (9.1)	0.85

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