Interpreter Services in a General Health Setting in Western Australia: A Retrospective Study

FINAL REPORT 2020

MICHELLE KWAN, ZAKIA JEEMI, RICHARD NORMAN, JAYA DANTAS

Suggested citation:

CONTACT
Curtin University
Kent Street Bentley WA
6102 GPO Box U1987
Perth WA 6845
Email: Jaya.Dantas@curtin.edu.au

ACKNOWLEDGEMENTS

EXECUTIVE SUMMARY

Overview

Migration patterns have rapidly changed in Australia which have contributed to an increasingly culturally and linguistically diverse society. This has brought new opportunities and challenges in the healthcare sector to address the different language needs of the culturally and linguistically diverse (CaLD) populations. A key strategy is the provision of interpreter services to bridge the language gap and assist patients and healthcare providers in clinical encounters.

This research project explored interpreter service usage at a Western Australian (WA) hospital, a general hospital located in Perth, providing hospital and community care to meet broader health needs of the population. The findings of this project aimed to inform current hospital practices, health policies and to support financial funding for hospital interpreter services. In relation to the current COVID situation, the WA Language Service Policy has been updated to provide guidance to all public services to ensure that all information can be accessible to the CaLD population.

Methods

The project comprised two components: an integrative review and a retrospective audit of patient medical records. An integrative review was undertaken to explore the global published literature about the impact of using interpreter services in the hospital setting. This approach was deemed suitable by incorporating quantitative and qualitative evidence to gain more in-depth understanding of the impact of using hospital interpreter services from existing published literature.

A retrospective audit of patient medical records was conducted in the second component of this project. Patient medical records were identified from TOPAS (a patient administrative system) used at the hospital institution in the period between January 2015 – December 2016. A random sample of patient UMRNs were then selected and the medical records of these patients were all UMRNs of patients seen in outpatient, emergency department (ED) and inpatient visits between January 2015 and December 2016 and that indicated "InterpreterRequired = TRUE" for Outpatients, "InterpreterRequired = TRUE" for Inpatients and Language = other than English were extracted. A random sample of 274 patient UMRNs were selected from the

aforementioned extracted data and the medical records of this random sample were audited. Any medical records from children, Aboriginal and Torres Strait Islander, and patients requiring sign language (AUSLAN) were excluded. Invoices were also included to provide cost information on interpreter service usage in patients' clinical visits

Key findings

The importance of using hospital interpreter services in language discordant encounters should be recognised by healthcare professionals to prevent unnecessary hospital readmissions and the occurrence of adverse medical events. The integrative review undertaken in the first component of this project suggested that using professional interpreter services would improve the overall hospital care processes to ensure patient safety and high quality of care. The three themes derived from the review included 1) communication quality, 2) hospital care outcomes and 3) hospital costs.

The second component of this project showcased patterns of interpreter service usage by population groups, the different types of interpretation used in patients' clinical visits and the associated cost of service provision. Recommendations were drawn from the study to inform hospital practices and the future planning of interpreter services to provide suitable language assistance for patients or customers with a language barrier.

Recommendation 1 – Encourage a collaborative approach between hospitals and the contracted interpreter service to create a uniformed system to plan interpreter services and capture data on interpreter service usage. This collaboration will help hospitals to arrange interpreter services for patients and to inform hospital services of the availability of accredited interpreters.

Recommendation 2 – Review language service policy from a health system perspective. This will help policymakers to consider the cost and service arrangements for interpreter services.

Recommendation 3 – Standardised the collection of patients' interpreter service usage to improve record-keeping. A mandatory requirement is to ensure that booking and invoices include patient UMRNs.

Recommendation 4 – Improve the process of recording interpreter service usage such as using standardised medical notes or forms to record information.

Recommendation 5 – Increase staff awareness of the importance of the provision of interpreter services and hospital language service policies.

Recommendation 6 – For future research, researchers can consider using a prospective study design by collecting real-time data to ensure adequate data is available.

These recommendations will help hospitals and other health services to create a culturally responsive, and community focus service in accordance with the WA Sustainable Health Review and the Multicultural Policy Framework.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

AOR	Adjusted Odd Ratio
CALD	Culturally and Linguistically Diverse
ED	Emergency Department
LEP	Low English Proficiency
OR	Odd Ratio
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analyses
US	United States
WA	Western Australia

INTRODUCTION

1.0   Overview

Effective communication between the patient and their health provider is critical to patient safety and quality of care in the hospital setting (1). In particular, language is essential for optimal communication in this therapeutic relationship to allow patients to understand and comprehend the details of diagnosis and understand care treatment plan for their hospital care (2). However, challenges arise from language discordant encounters (i.e. a situation where the patient and provider do not share a common language), which lead to poor quality of care and pose risks to patient safety (3, 4).

Extensive research has revealed that language barriers lead to adverse medical events including misdiagnosis, poor risk communication and medication errors (5). These adverse events can result in longer length of hospital stay and unplanned readmissions, which in turn, impact on patient satisfaction and healthcare cost (6, 7). With increasing demographical changes attributed to migration in Australia, raising the standards to bridge the language gap is crucial to meet the linguistic needs of the culturally diverse population.

1.1   Cultural and linguistic diversity in Australia

International migration is one of the main drivers of Australia's rich multicultural society. According to the 2016 Census, approximately 49% of the Australian population was born overseas, with a substantial increase of the population coming from non-English speaking backgrounds (8). The most common languages spoken were Mandarin, followed by Vietnamese, Italian, and Cantonese (9).

The term "cultural and linguistic diversity" (CaLD) in the Australian context refers to members coming from a cultural background and speaking a language that is not from the mainstream culture (10). While most members from the CaLD population can communicate in English, new migrants from the Family and Humanitarian streams have been reported to have lower rates of English proficiency 73% and 66% respectively (11). As Australia welcome the new cultural diversity, supporting services in the healthcare sector need to ensure that appropriate language services are available to provide accurate interpretation during clinical encounters.

1.2 Interpreter service usage in hospitals

State and national language services policies, such as the Victorian Language Services Policy and the WA Health System Language Policy, have been established to mandate the use of interpreter services in hospitals (12, 13). This ensures that patients requiring language assistance have the fundamental rights to communicate effectively in their visits and receive safe and high-quality care (13). Accredited interpreter services can be arranged in three different modalities, in-person interpreters, telephone and videoconferencing interpreter services (13). Guidelines to working with accredited interpreters are made available to health service providers to enhance professional standards in the delivery of cultural competence care (12, 13).

Despite the mandatory provision of interpreter services, trends of service underuse are widely documented in Australia and elsewhere (14-16). Common reasons for service underuse are associated with the complexities of engaging with an accredited interpreter in the consultation process and the convenient access to ad hoc interpreters such as family, friends and untrained bilingual providers (14). Growing evidence has revealed that the use of ad hoc interpreters in clinical encounters can pose risk to patient safety due to increasing interpretation errors with potential clinical consequences (17, 18). While previous reviews and studies have examined the impact of using accredited interpreters in the general healthcare setting, there is limited evidence about the cost and effectiveness of using interpreter services in the hospital setting (19, 20). Hence, further investigation is required for wider implementation of interpreter services in the hospital setting.

1.3 Aim and Objectives

The aim of this research project is to explore the impact of using interpreter services on patient hospital outcomes and the associated cost of service provision.

Specific objectives are:
- To undertake an integrative review to explore the global published literature around the impact of using interpreter services on patient hospital outcomes and the associated cost in Australia and elsewhere.
- To conduct a retrospective analysis of hospital audited data obtained from a general health setting in Western Australia (WA).
- To propose changes and recommendations for current hospital practices and health policy

1.4 Significance of the study

Prior research indicates that the use of interpreter services in the general healthcare setting can lead to positive outcomes for patients with LEP, however, there is less clear evidence about the effectiveness and cost impact in the hospital setting. Language barriers are detrimental to patient safety and quality of care during hospitalisation and can result in adverse medical outcomes (5). By undertaking this research project, exploring the impact of interpreter services on patient outcomes will be able to help inform policymakers and hospital administrators about funding support to strengthen service provision so the CaLD population in WA can benefit from the service.

1.5 Summary

In an increasing cultural and linguistic diverse society, promoting the use of accredited interpreter services is critical to ensure that the various linguistic needs of the CaLD population are met for effective communication, and, to enhance patient safety and quality of care in the hospital setting.

1.6 Structure of the report

The remainder of the report is structured in the following order:

> PART A: Integrative Review – detailing the background, methodological process, and findings
>
> PART B: A Retrospective Audit – detailing the data collection process, methods, and findings
>
> PART C: Discussion, recommendation and conclusion – a discussion of the overall findings of the research project and recommendations to inform policy change

PART A

AN INTEGRATIVE REVIEW

Professional Interpreter Services and the Impact on Hospital Care Outcomes: An Integrative Review of Literature

Michelle Kwan[1] Zakia Jeemi[1], Richard Norman[1], Jaya Dantas[1]

Corresponding Author – Professor Jaya Dantas
Email: jaya.dantas@curtin.edu.au

Tel: 61 8 9266 4151

Address GPO Box U1987, Perth, Western Australia, 6845

This section of the report presents findings from the integrative review undertaken as part of this research project. For purposes of publication, the contents will be updated. Please contact Professor Dantas for more information.

[1] School of Population Health, Faculty of Health Science, Curtin University, Australia

2.0   Introduction

The negative effects of language barriers in the hospital setting have been widely documented in the global literature. A worldwide strategy to bridge the language gap is the provision of professional interpreter services in hospitals (1). In Australia and other countries such as Canada, the US and the UK, language service policies, standards and guidelines have been developed to mandate the use of interpreter services (2, 3). However, trends of underuse are evident across the literature revealing the relatively high use of ad hoc interpreters such as family, friends and untrained interpreters, and the challenges of engaging with a professional interpreter (4-6). In some instances, bilingual providers adopt the interpreter role and may lack the skills of interpreting complex medical terminology (5, 6). Inappropriate language assistance also impacts on interpretation quality which could lead to potential clinical consequences (7, 8). Thus, strengthening the provision of professional interpreter services in hospitals is crucial to facilitate communication between healthcare providers and patients with a language barrier.

The aim of this integrative review was to explore the global literature on the impact of professional interpreter services on hospital care to understand the effectiveness of the intervention within the hospital setting. Literature that provides cost evidence of interpreter services would also be explored to identify potential cost-benefits to the health system. As all health systems face budgetary constraints, further examination into the effectiveness of interpreter service in the hospital setting is needed to increase funding support and to inform policy changes.

2.1   Methods

The methodological approach reported in this integrative review followed a systematic format proposed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (9). Adopting a systematic approach enabled a detailed search, to identify and summarise the available evidence to examine the impact of using interpreter services on hospital care and patient outcomes, and the associated cost of service provision.

Search Strategy

Five electronic databases including (EBSCO), MEDLINE, PROQUEST, PubMed, and Scopus were searched for peer-reviewed articles. A Boolean search was applied on the following combination: "Communication Barriers" OR "limited English proficiency" AND "interpret* services" AND "Quality of Health Care/" OR "length of stay and readmissions" OR "patient

satisfaction" OR "hospital cost". Search terms were meshed to subject headings based on specific database searching (the search strategy for the five databases is provided in Appendix A). All searches were limited to the English language. The references were managed and recorded using the reference management software, EndNote X9. Only studies that met the inclusion and exclusion criteria were included in the review (Table 1).

Table 1 Inclusion and exclusion criteria to assess articles

Inclusion and exclusion criteria	
Participants/ patients/ place	**Inclusion**: Patients or family members/ caregivers with a language barrier presented in their clinical visits and must be in a hospital setting. **Exclusion:** Patients with hearing disability or any patient visits that are not in a hospital setting (e.g. community health services)
Interventions	**Inclusion:** types of interpretation intervention (i.e. professional in-person interpreters - medical, clinically trained, telephone, and video conferencing interpreter services) No restriction on the duration and frequency on the use of hospital interpreter services **Exclusion:** untrained bilingual providers or hospital interpreter services that are not delivered by a professional interpreter, sign. Translation or written interpreter services
Comparison group	Different types of interpretation modalities as mentioned above, bilingual providers, ad hoc interpreters and no interpreter use
Outcomes:	Any hospital care and patient outcomes related to the quality of care, patient safety, hospital length of stay, readmissions, satisfaction, and hospital cost associated with interpreter service provision
Study Design	**Inclusion:** Quantitative, qualitative and mixed methods study designs **Exclusion:** case studies, reports and reviews, dissertations

Search Outcomes

The initial database search yielded 276 articles (Figure. 1). After the removal of duplicates, 196 articles remained for title and abstract screening. Two reviewers independently screened the titles and abstracts which excluded 130 articles for not meeting the inclusion criteria. Sixty-six papers remained for full-text screening and excluded 29 papers for not meeting the inclusion criteria. Qualitative studies were excluded from this review as they focus on patient encounters with language barriers in healthcare. In total, 37 papers were selected and were included in the review for quality assessment and data analysis.
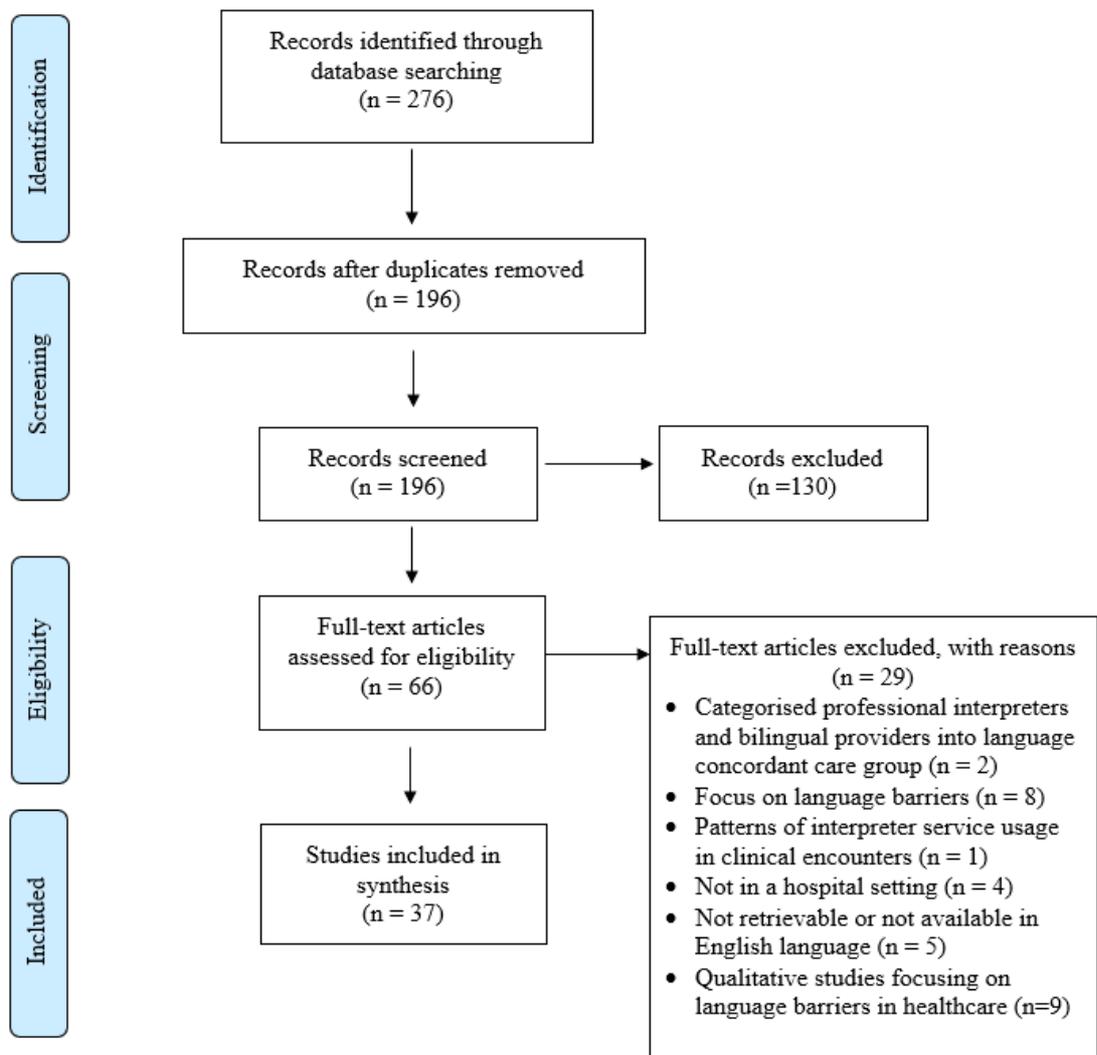
Figure 1 PRISMA flow chart presenting the screening and selection process of studies

Data synthesis and analysis

The inclusion of diverse sources presents a challenge for quality appraisal in this review. With no gold standard of evaluating primary sources in integrative reviews, quality assessment was not undertaken. Rather, data were abstracted based on the "authenticity, informational value, and representativeness" of primary sources (10) Data synthesis followed the stages described by Whittemore and Knafl (2005), including data reduction, data display, data comparison and conclusion drawing with verification (10).

The process involved extracting data onto a table which included the following items: author/year/ country, hospital setting, study design, types of interpreter service(s) and comparator, sample characteristics, outcome(s), and key findings. A narrative synthesis was conducted to arrive at conceptually coherent themes and subthemes. Study variables were organised into ten outcome categories and were then placed into conceptually coherent themes according to the review objectives. Three themes were derived which included communication quality between patients and healthcare providers, hospital care outcomes, and hospital cost (see Table 2).

Table 2 Hospital care outcomes and sub-categories

Themes	Sub-categories
Communication quality between patients and healthcare providers	Interpretation errors Patient comprehension
Hospital care outcomes	Throughput times and visit length Informed consent Discharge preparedness Treatment and care management Hospital resource utilization Length of hospital stay and readmissions Patient satisfaction
Cost	Cost of interpreter service provision

2.2   Results

Characteristics of studies

The majority of the studies were quantitative studies (n = 36) and only one used mixed-methods. Of the 37 studies included in this review, 30 studies were conducted in the US, six in Australia and one in Sweden. The sample population included families or patients with LEP or with lack of language proficiency in the host country, with a primary language not from the host country.

Studies were conducted in various hospital settings: outpatient clinics (n = 9); Emergency department (ED) (n= 2) and paediatric ED (n= 7); inpatient ward (n = 3); both ED and inpatient ward (n= 1); primary care clinic and ED (n=1); general or paediatric hospital settings (n = 3); rehabilitation hospital (n=1); large metropolitan facility (n = 1); medicine or surgical floors (n =4), an obstetric and gynaecological unit (n= 1), tertiary care (n=2), internal medicine clinic

(n = 1) and infection diseases service (n = 1). Organisation of results were similar to Karliner and colleagues' (2007) review, in which outcomes were grouped into major themes, and when multiple outcomes appear, these were grouped according to their outcome category (11).

Theme 1: Communication quality between patients and healthcare providers

This theme illustrates the importance of using professional interpreter services to improve the communication quality between patients and healthcare providers which includes accuracy of interpretation and language comprehension. More details are provided in Table 3.

Interpretation errors

The persistence use of ad hoc interpreters such as friends or family members can have significant negative consequences for patients with a language barrier. Five US studies provided supporting evidence suggesting that professional interpreter services resulted in fewer interpretation errors with potential clinical consequences compared to ad hoc interpreters and no interpreter use (7, 8, 12-14). Using audio-taped transcribed clinical encounters, omission errors (uninterpreted words/ phrases) were the most common interpretation errors, particularly when using ad hoc interpreters or in encounters without interpretation use (7, 8). One study reported that healthcare providers were more likely to commit false fluency (76%) in encounters with a hospital interpreter present, 58% of these occurred when an interpreter was absent in the room or telephone interpretation, and 42% of errors occurred when providers were not corrected by the interpreter (12).

Two studies compared remote simultaneous medical interpreting (RSMI - a form of remote interpretation provided within milliseconds of the original speech) to the traditional interpretation method (Remote consecutive medical interpretation, in-person interpretation, and ad hoc interpretation) and found that RSMI resulted in fewer interpretation errors (13, 14). This finding may be due to the simultaneous nature of the mode of interpretation where interpretation is provided immediately after speech and interpreters and does not require interpreters to recall a large amount of information (13, 14). When comparing between interpretation modalities, there was no consensus on which mode

Table 3 Interpreter service usage and the communication quality between patients and healthcare providers

Author, year, & country	Hospital setting/ study design	Type of interpreter service/ Comparison group	Sample characteristics	Outcome(s)	Key Findings
			Interpretation errors		
Flores et al (2012), USA (7)	**Hospital setting** Pediatric ED in Massachusetts **Study design** Cross-sectional analysis	Professional interpreters vs ad hoc interpreters vs no interpreter use	57 encounters with patients/ caregivers with LEP – 20 used professional interpreters; 27 used ad hoc interpreters; 10 with no interpreter use **Primary language spoken:** Spanish	Medical interpretation errors and clinical consequences – Audiotaped encounters and transcript analysis	**Interpretation errors** "Omission" and "false fluency" errors were significantly more likely to be committed by ad hoc interpreters and no interpreter use Omission (P = 0.001): ad hoc (46.3%); no interpreter use (54.2%); professional interpreter (41.9%) False fluency (P < 0.01): ad hoc (31.6%); no interpreter use (35.9%); professional interpreter (13.6%) **Errors with clinical significance** Lowest for professional interpreters (12%); no interpreter use (20%); highest for ad hoc interpreters (22%) Professional interpreters with >100 training hours had a lower proportion of errors committed compared to interpreters with <100 training hours (2% vs 12%, P = 0.03)
Napoles et al (2015), US (8)	**Hospital setting** A Public hospital internal medicine clinic **Study design** Cross-sectional study	Professional interpreter service (In-person professional interpreter and video conferencing) vs ad hoc interpreters **Primary language spoken** Spanish	32 encounters from LEP patients; 5 used professional in-person interpreters; 22 used videoconferencing ; 5 used ad hoc interpreters **Primary language spoken** Spanish	Interpretation errors and potential clinical significance	**Interpretation errors** Professional interpretation had the least interpretation errors and potential clinical consequence compared to ad hoc interpretation Ad hoc interpretation committed the highest interpretation errors (54%), followed by in-person interpreters (25%) and Videoconferencing (23%)

					Omission was the most common type of error committed (P < 0.001); 33% from ad hoc interpreters, and 16% from both in-person interpreters, and video conferencing

Errors with clinical significance
Clinically significant errors occurred mostly in visits with ad hoc interpreters (8%), visits using videoconferencing (7%), and visits with in-person interpreters (3%) |
| Flores et al (2003), US (12) | **Hospital setting** Hospital outpatient clinic

Study design Quantitative – Not-specified | Professional hospital interpreters vs ad hoc interpreters | Audiotaped 13 clinical encounters with an interpreter present

Primary language spoken: Spanish | Interpretation errors and clinical significance | **Interpretation errors**
False fluency occurred more in encounters with hospital interpreters compared to encounters with ad hoc interpreters (22% vs 9%, *P= 0.*001).

76% of false fluency errors were committed by healthcare providers (58% occurred when the interpreter was not in the room or interpretation on the phone; 42% of errors were made by the provider without any correction by the interpreter)

Clinical significance
Errors with clinical significance were significantly likely to occurred in encounters with ad hoc interpreters compared to hospital interpreters (77% vs 53%, P <0.001). |
| Gany et al (2007), US (13) | **Hospital setting** Audiotaped transcripts of primary cases

Study design Quantitative – Not specified | Remote simultaneous (RSMI) vs remote consecutive, proximate consecutive (in-person interpreter), ad hoc interpreter | 16 encounters yielded 1,909 utterances. | Interpretation errors | **Interpretation errors**
Non-RSMI interpreting resulted in 12 times more medical errors compared to RSMI (P = 0.0002) |

Hornberger et al (1996), US (14)	**Hospital setting** Wellbaby clinic of a hospital **Study design** RCT	Remote-simultaneous medical interpretation (RSMI) vs proximate consecutive interpretation (in-person interpretation)	27 LEP mothers attended scheduled well-baby visits; 13 received in-person interpretation; 14 received RSMI intervention	Quality of interpretation and preference of interpretation	**Interpretation Quality** RSMI had lower rate (13%) of inaccurate interpreted utterances compared to in-person interpretation; omission errors were the frequent committed errors **Interpretation preference** Mothers preferred the experimental intervention compared to the in-person interpretation

<div align="center">Comprehension</div>

*Anttila et al (2017), US (15)	**Hospital setting** Tertiary care pediatric hospital **Study design** Observational study	Professional interpreter services (certified in-person medical interpreter, certified bilingual physician, telephone intepretation and videoconferencing via iPad) vs Ad hoc interpretation (Family member)	124 Spanish-speaking families; 29 used a certified medical interpreter; 22 used a certified bilingual provider; 26 used telephone interpretation; 7 for videoconferencing **Primary language spoken:** Spanish	efficacy of interpretation type	**Efficacy of interpretation type** Significant difference in caregivers' comprehension between the modes of interpretation (p = 0.01) All caregivers that used videoconferencing reported "complete" understanding of child's condition; 90% of in-person interpreter users felt the same; 58% and 50% of families reported "complete" understanding of their child's condition when using telephone interpretation during and after the visit
*Crossman et al (2010), US (16)	**Hospital setting** urban pediatric ED **Study design** Prospective, randomised trial	Telephone and in-person interpretation vs bilingual providers	1201 families were enrolled; 407 used telephone interpretation; 377 used in-person interpreters; 417 had a bilingual provider	Family comprehension and satisfaction	**Family comprehension** No difference in family comprehension of child's admission or discharge diagnosis amongst interpretation groups (telephone 95.1%; i-person 95.5%; bilingual 95.4%)
Lion et al (2015), US (17)	**Hospital setting** pediatric ED **Study Design** RCT	Remote interpretation modalities (telephone interpretation vs videoconferencing)	LEP patients – 107 in the telephone group and 142 in the video group	Comprehension of child's diagnosis; communication and interpretation quality	**Comprehension** Parents in the video group were significantly more likely to name their child's diagnosis compared to the telephone group ((74.6% vs 59.8%; P = 0.03) **Communication quality** No difference in communication and interpretation quality between the two remote modalities

provided the highest quality of interpretation. Rather, professional interpreters who trained longer than 100 hours committed a significantly lower proportion of errors with clinical consequences compared to interpreters that were trained for fewer than 100 hours (2% vs 12%, P = 0.03) (7). Regardless of interpretation types, the overall findings would suggest that using professional interpreter services reduces interpretation errors with clinical consequences.

Language comprehension

Conducted within the paediatric hospital setting, three US studies assessed parents' understanding of child's diagnosis using self-reported measures (15-17). In family-centred rounds where parents were invited in the medical decision-making process, one study reported that videoconferencing and in-person medical interpreters assisted with parents' understanding of their child's medical condition (15). Another study compared between remote interpretation modalities (telephone and videoconferencing) and found that parents using videoconferencing were significantly more likely to recall a child's diagnosis compared to those using telephone interpretation (P = 0.03) (17). With contrasting findings, one study compared professional interpreter services to bilingual providers and found no differences between interpretation types on family comprehension of the paediatric diagnosis (16).

Theme 2: Hospital care outcomes

Safe routine care in the hospital setting requires clear and effective communication between patients and healthcare providers. This theme focuses on outcomes related to the hospital care process when professional interpreter services are used. More details are provided in Table 4.

Visit length and throughput times

Efficient patient flow is crucial in the hospital setting to ensure all patients receive timely care (18-20). Examining the visit length in an outpatient setting, Fagan and colleagues (2003) found that in patient encounters using telephone and ad hoc interpreters, the visit length was longer compared to encounters using in-person interpreters (telephone encounters = 99.9 mins and ad hoc encounters = 92.8 mins vs in-person interpreter encounters = 91 mins) (18). Similarly, provider time was longer in telephone and ad hoc interpreter encounters compared to in-person interpreter encounters (telephone encounters = 36.3 mins and ad hoc encounters = 34.4 mins vs in-person interpreter encounters = 26.8 mins) (18).

Another study examining throughput time, an indicator for ED crowding, Grover et al (2012) found that throughout times were significantly shorter when patients used in-person interpreters (116 min, P < 0.0001) compared to telephone interpretation (141 min) and having a bilingual provider for interpretation (153 min) (19). In a surgical procedural setting, Burkle and colleagues (2017) revealed that while encounters with an in-person interpreter present was shorter, this varied based on the availability of interpreters and at times, remote interpretation modalities were conveniently accessed to ensure all language needs were met (20).

Informed consent

Risk communication before undergoing surgical procedure is crucial to allow patients to understand the reasons for undergoing surgery, the associated risks of the surgical procedure, and to communicate any concerns to clinicians. Only one study from the US examined the use of interpreter service on informed consent for LEP patients (21). In a pre-post bedside interpreter phone intervention, Lee and colleagues (2017) found that for 68 LEP patients enrolled in the post-implementation group, they were significantly more likely to receive adequate informed consent compared to 84 LEP patients in the pre-implementation group (54% vs. 29%, P = 0.001). Furthermore, after adjusting the propensity score, the odds of receiving adequate informed consent was higher for the post-implementation group in the three major informed consent elements: understanding the reasons for surgical procedure [AOR: 3.60; 95% CI (1.52–8.56)], the risks associated with the procedure [AOR: 2.39; 95% CI (1.08–5.29)] and having all questions answered [AOR: 14.1; 95% CI (1.43–139.0)] (21).

Discharge process

The hospital discharge process is a critical time-point where patients receive essential discharge education and instructions related to care management and medication dosing. Two US studies provided mixed findings concerning the effectiveness of interpreter service on improving discharge communication for LEP patients (22, 23). While Gutman and colleagues (2018) found that LEP patients who had professional interpretation were likely to receive complete discharge education from their provider, important discharge contents including medication dosing education, return precautions and follow-up were missed (22).

In a mixed method study, Lee et al (2018) conducted a pre-post bedside telephone interpreter intervention and used a 15-item Care Transitions Measure (CTM) to assess patient discharge Preparedness (23). From the 94 patients in the pre-implementation group, and 95 in the post-

implementation group, there was no significant difference in overall patient-reported measures of discharge preparedness (77.2 vs. 78.5; p = 0.62) (28). Further findings revealed that patients in the pre-implementation group scored high for medication purpose (88%), and the only significant finding was knowledge of discharge medication purpose which increased between pre-post groups (88% vs 97%, P= 0.02) (23). In the focus group conducted in the second part of the study, the researchers revealed that the non-significant findings may be attributed to clinician preference of using ad hoc interpreters (23).

Treatment and clinical care management

Six studies demonstrated that using professional interpretation for LEP patients with a language barrier increased their access to quality treatment and care for chronic health conditions (24-29). In one US study that examined interpreter use and the quality of acute pain treatment, the researchers found that patients who received interpreter services were significantly likely to have higher levels of pain control and timely pain treatment (P = 0.02), and perceived provider helpfulness for pain treatment (P = 0.005) (24).

One US study that focused on diabetes care found that the use of professional interpreters increased the likelihood for LEP patients of receiving quality diabetes care that met the American Diabetes Association (ADA) Guidelines including having two or more clinic visits per year (OR: 2.6; 95% CI: 1.2-5.4), and having one or more dietary consultation (OR: 2.8; 95% CI: 1.3-6.1) compared to English speaking patients (p < 0. 05) (25). Similar findings were found in an Australian study, where 47 LEP patients identified as requiring interpreter services in a psychiatric inpatient unit were more likely to undergo more consultant reviews (P = 0.036), however without a discharge diagnosis (26).

Focusing on stroke rehabilitation care, three studies demonstrated that access to interpreter services improved the quality of stroke care for LEP patients (27-29). One US study (27) and two Australian studies (28, 29) found that patients with professional interpreters were more likely to receive high quality of stroke care compared to those without interpretation. In particular, patients without professional interpretation were less likely to receive documentation related to contents of stroke education and rehabilitation (27-29).

Table 4 Summary of studies that examine the impact on hospital care outcomes

Author, year, & country	Hospital setting/ study design	Type of interpreter service/ Comparison group	Sample characteristics	Outcome(s)	Key Findings
Visit length and throughput times					
Fagan et al (2003), USA (18)	**Hospital setting** Hospital-based outpatient clinic **Study design** Time motion study	Hospital interpreter (trained and certified) and telephone interpretation	LEP patients; 51 used hospital interpreters; 31 used telephone; 90 used patient-supplied interpreter **Primary language spoken** Spanish	Visit length and provider time	**Visit length** Significantly longer when LEP patients used some form of interpretation compared to patients without interpretation (93.6min vs 82.4min, p = 0.002) and provider times (32.4min vs 28min, p < 0.001) **Telephone interpretation vs no interpreter use** – significantly longer mean clinic times (99.9 min vs 82.4min, p = 0.02) and provider times (36.3min vs 28 min, P < 0.001) **Ad hoc interpreter vs no interpreter use** – Significantly longer mean clinic times (92.8min vs 82.4 min, p = 0.027) and provider times (34.4min vs 28 min, P < 0.001) **Professional interpreter vs no interpreter use:** No significant difference in mean clinic times (91min vs 82.4min, P = 0.16) and mean provider times (26.8min vs 28.0 min, P = 0.51)
Grover et al (2012), US (19)	**Hospital setting** Paediatric ED **Study design** Prospective, secondary analysis	In-person professional vs telephonic interpretation vs bilingual provider	1196 families with LEP; 404 used telephonic interpretation; 375 used in-person interpreter; 417 in bilingual	Throughput time	**Throughput time** Shorter throughput time for professional in-person interpreters compared to telephonic interpretation and bilingual providers (116min vs 141min vs 153 min, P < 0.0001).

			Primary language spoken: Spanish		
Burkle et al (2017), US (20)	**Hospital setting** Surgical and procedural floors **Study design** Quantitative – Not-specified	Language services (in-person, telephone and video interpretation)	A total of 318 LEP patient records – 241 in-person, 55 telephone, and 9 in video interpretation	Efficiency of interpreter services	**Efficiency** The mean arrival time for in-person professional interpreter service was 19 mins, however this varied based on the availability of in-person interpreters. The use of remote modalities resulted in no delay and cancellation of interpretation services
			Informed consent		
Lee et al (2017), US (21)	**Hospital setting** Cardiovascular, general surgery or orthopedic surgery floors **Study Design** Prospective, pre-post	Bedside interpreter phone	152 LEP patients; 84 pre-68 post implementation	Patient evaluation of informed consent (Survey)	**Informed consent** LEP patients were significantly likely to receive adequate informed consent compared in the pre-implementation stage (54% vs 29%, P = 0.001); higher odds of understanding the reasons for their procedure (adjusted odd ratio – 3.60; 95% CI = 1.08 – 5.29), the risks associated with the procedure (AOR = 2.39; 95% CI = 1.08 – 5.29), and had all their questions answered (AOR = 14.1; 95% CI = 1.43 -139)
			Discharge outcomes		
Gutman et al (2018), US (22)	**Hospital setting** Pediatric ED **Study design** RCT	Professional interpretation services (telephone and video) vs bilingual provider	47 caregivers with LEP 66% used professional interpreters and 3% had a bilingual provider as interpreter **Primary language spoken:** Spanish	Discharge preparedness	**Discharge preparedness** LEP patients that used professional interpretation compared to no interpreter use had increased odds of receiving complete discharge education (odds ration = 7.1; 95% CI = 1.4 - 37), and increased odds of high-quality assessment for caregiver comprehension by the provider (OR = 6.1; 95% CI = 2.3 – 15.9) Important discharge contents regarding medication dosing, return precautions and follow-up treatment were missed

Lee et al (2018), US (23)	**Hospital setting** Cardiovascular, general surgery or orthopedic surgery floors **Study Design** Mixed methods (Survey and focus group)	Bedside interpreter phone	189 LEP patients; 94 pre – 95 post implementation	Discharge preparedness	**Discharge preparedness** No significant difference in pre-post discharge preparedness (p = 0.62) Only significant finding was an increased knowledge of discharge medication purpose between pre-post intervention (P = 0.02) In a focus group discussion with physicians and nurses, they preferred in-person interpreters to communicate complex discharge contents

<div align="center">

Treatment and clinical care management

</div>

Jimenez et al (2012), US (24)	**Hospital setting** Obstetric and gynecological unit of a teaching hospital **Study design** Secondary analysis – Cross sectional surveys	Professional interpreter service (state-wide program) vs no interpreter use	27 % of patients always received an interpreter, and 73% sometimes (not always) received an interpreter **Primary language spoken** Not specified	**Quality of pain treatment**	**Treatment outcome** Quality of pain control was higher for patients who always received interpreters (P=0.02); timely pain treatment (P=0.02), and perceived provider helpfulness to treat their pain (P=0.005) compared to patients without frequent interpreter usage
Tocher et al (1998), US (25)	**Hospital setting** Primary and specialty care clinics at a university and a county hospital **Study design** comparative study	Professional interpreter vs English-speaking patients	93 LEP patients with Type 2 diabetes who all used professional interpreters, and 529 English-speaking patients **Primary language spoken** Spanish, Russian, Cambodian, Vietnamese, Tigrinya	Process and outcome of diabetes care (based on the American Diabetes Association – ADA guidelines) – including having two or more standardised glycohaemoglobin test or physician	**Outcomes of diabetes care** Overall provision of professional interpreters improved diabetes care that met the ADA guidelines for LEP patients with Type 2 diabetes; significantly likely to receive standardised glycohaemoglobin test or more than two physician visits per year (P < 0.05); and more likely than English speakers to receive one or more dietary consultations (P < 0.01).

			visits or dietary consultations		
Daly et al (2019), Australia (26)	**Hospital setting** Inpatient psychiatric unit **Study design** Retrospective study	Interpreter service usage vs English-speaking patients	Total of 47 LEP patients who required interpreter service and 47 English speaking patients	Clinical outcomes	**Clinical outcomes** LEP patients underwent more consultant reviews (P = 0.036) but attracted different diagnoses with no discharge diagnosis made (P = 0.018)
Luan et al (2017), US (27)	**Hospital setting** GTWG-Stroke (Get With the Guidelines–Stroke) Registry at Massachusetts General Hospital **Study design** Retrospective study	Professional medical interpreters vs no interpreter use	259 LEP patients; 147 used a professional medical interpreter; 112 did not use an interpreter **Primary language spoken** Spanish, Portuguese, French/ Haitian Creole, Mandarin/ Cantonese	Quality of acute ischemic stroke (AIS) care	**Stroke care outcomes** LEP patients without interpreter use were less likely to receive detect-free AIS care compared to those receiving professional interpretation (OR: 0.50; 95% CI: 0.27 – 0.90; P = 0.02) More specifically, contents of stroke education and consideration for rehabilitation were not documented for LEP patients without language assistance
Davies et al (2016), Australia (28)	**Hospital setting** Inpatient setting of two rehabilitation hospitals **Study design** Retrospective case–control study	Interpreter service use (low English proficiency group) vs High English proficiency group	Low English proficiency group (comprised of LEP patients whose preferred language was not English or Accessed to interpreter service) **Primary language spoken** Arabic, Turkish, Italian, Greek, Macedonian, Assyrian and Chaldean, Vietnamese and Chinese	Diabetes care – FIM (functional improvement measure)	**Diabetes care** Significant differences in FIM efficiency were found between interpreter service usage and without interpreter use (FIM efficiency, P = 0.01; and FIM Motor efficiency, P = 0.04)

Kilkenny et al (2018), Australia (29)	**Hospital setting** Data collected from the Australian Stroke Clinical Registry (AuSCR); from 45 hospitals **Study Design** Retrospective study	Use of interpreter service vs no interpreter use	A total of 1461 of 34562 (4.2%) patients required an interpreter – older patients and had greater severity of stroke, and took longer to arrive at hospital **Primary language spoken** Not specified	Stroke care	**Stroke care outcomes** Patients requiring an interpreter more often received care on a stroke unit (85% versus 78%; P<0.001) than those not requiring an interpreter while all other processes of care remained similar.

	Hospital resource utilisation

Bernstein et al (2002), US (30)	**Hospital Setting** ED **Study design** Retrospective Descriptive study	Interpreter service usage vs no interpreter use vs English-speaking patients	63 LEP patients with interpreter service usage; 374 LEP patients without interpreter use; 63 English-speaking patients **Primary language spoken** Spanish, Haitian Creole. and Portuguese Creole	ED utilisation and utilisation cost	**ED utilisation** LEP patients without interpreter use had the shortest length of visit, fewer assessment testing and procedures. Professional interpreter use was associated with increasing access to primary care and specialty clinic referrals, more likely to adhere to follow-up visits, and less likely to be readmitted to the ED. **Utilisation Cost** Both charges for ED visits and returns were the lowest for LEP patients with no interpreter use ($5303), followed by patients with interpreter use ($7584) and highest for English-speaking patients ($8724)
Hampers et al (2002), US (31)	**Hospital setting** Pediatric ED **Study design** Cohort study	Professional interpreter (Interpreters underwent a minimum of 40 hours training) vs no interpreter use vs bilingual provider vs	Total of 4146 visits – 550 families with LEP; 239 encounters with a professional interpreter; 141 encounters without a interpreter use; 170 encounters used a bilingual	ED resource utilization and associated cost	**ED resource utilisation** Bilingual cohort had similar rates of resource utilisation as English speaking patients **Professional interpreter cohort** – more likely to be admitted (OR: 1.7; 95% CI[1.1 -2.8]; least likely to be tested (OR: 0.73; 95%CI [0.56 –

26

					0.97]) but with longer ED visit length (+16 mins; 95%CI [6.2-26mins]
			Primary language spoken Spanish, Polish, Russian, Vietnamese		**No-interpretation cohort** – more likely to be tested (OR: 1.5; 95%CI[1.04 – 2.2] and receiving expensive testing cost (+$5.78; 95% CI($0.24 – 11.21); most likely to be admitted (OR= 2.6; 95%CI(1.4 -4.5) but no difference in ED visit length
Hartford et al (2019), US (32)	**Hospital setting** Pediatric ED **Study design** Retrospective cohort study	Videoconferencing vs in-person interpreters vs telephone interpretation	LEP patients – 51.6% received videoconferencing; 15.3% received in-person interpreters, and 9.7% telephone interpretation; 23.4% used multiple interpretation modalities **Primary language spoken** Spanish, Somali, Cantonese or Mandarin, Vietnamese, Amharic, Arabic, Oromo, Tigrinya and Russian	ED LOS, ICU admissions and return visits	**ED LOS** Shortest LOS for LEP patients without interpretation (186.18 mins) and the longest for those receiving interpretation (210.45) **ICU admissions** LEP patients without interpretation were less likely to be admitted than EP patients (OR 0.69, 95% [0.62−0.78]); when LEP patients received interpretation, their odds of admission were slightly higher than EP patients (OR 1.12, 95% CI [1.01−1.25]. **Return visits** No difference in return visits when comparing EP to LEP with or without interpretation;
			Hospital length of stay and readmissions		
Beagley et al (2020), Australia (33)	**Hospital Setting** Large metropolitan public healthcare facility **Study design** Longitudinal study –	interpreter-mediated encounters vs encounters without interpretation	Non-English speaking patients (NESP) vs English speaking patients	LOS and readmission rates	**LOS** LOS was significantly negatively correlated with TALS staffing suggesting that LEP patient (NESP) LOS decreased as interpreter staffing increase **Readmission rates** No significant finding

	Presenting data over a 10-year period				
Abbato et al (2019), Australia (34)	**Hospital setting** Emergency department (ED) and inpatient wards **Study design** Retrospective audit	Professional interpreter services vs No interpreter used	448 LEP patients; 93 patients (21%) received professional interpretation in the ED and 116 patients (26%) received professional interpretation in the inpatient ward **Primary language spoken** Greek, Vietnamese, Mandarin, Farsi/ Persian and Spanish	Length of stay (LOS) and 30-day readmission rates	**ED LOS** shorter LOS for patients only using professional interpreters in the ED but not either in the ED or the inpatient ward (IRR: 0.41; 95%CI: 0.31-0.55; P <0.0001) **Inpatient LOS** Longer LOS when LEP patients used professional interpreters only in the inpatient ward but not in the ED (IRR: 2.22; 95% CI: (1.76-2.82); P < 0.0001) **ED vs inpatient ward** Mean LOS for patients receiving interpreters in the ED was 19.3h compared to a mean LOS of 100.2 h for LEP patients using interpreters only in the inpatient ward **30-day readmission** No significant findings for hospital readmissions
Lindholm et al (2012), USA (35)	**Hospital setting** Tertiary care, university hospital **Study design** Retrospective analysis	Professional interpreter service vs no interpreter use	3071 LEP patients; 39 % of LEP patients received interpretation at admission and discharge; 14 % without interpreter use at admission or discharge. Spanish and Portuguese speakers more likely to receive interpretation at both admission and discharge, whereas patients with less prevalent	LOS and 30-day readmission rates	**LOS** Compared to patients using interpretation at both admission and discharge – increase LOS for LEP those without interpreter use between 0.75 and 1.47 days (P<0.02) A longer LOS was also found in patients only receiving interpretation at discharge but not admission **Readmission rates** Higher readmission rates for patients without interpretation at both admission and discharge

			languages were less likely to receive interpretation **Primary language spoken** Spanish, Portuguese, Vietnamese, Albanian, Russian and others		(24.3%); 16.9% when professional interpreter was used at admission only; 17.6% when professional interpreter was used at discharge only; and the lowest readmission rates (14.9%) for LEP patients that had professional interpretation at both admission and discharge (Chi-square = 19.5, df = 3, P < 0.001)
Lopez et al (2015), US (36)	**Hospital setting** General medicine service at a large tertiary academic hospital **Study design** Retrospective cohort analysis	Hospital interpreter service (in-person, telephone, and video interpretation) vs English-speaking patients	564 LEP patients – 65.8% had no interpreter use, and 34.2% used hospital interpreter service Patients were categorised into four groups: 1) interpreter use by a non-physician, 2) interpreter use by a non-Hospitalist physician, 3) interpreter use by Hospitalist, 4) no interpreter used **Primary language spoken** Not-specified 1963 LEP patients	LOS and readmission rates	**LOS** Using professional interpretation with a physician present had the longest LOS (7.3 ± 7.5); using professional interpretation with a non-physician present had the shortest LOS (4.7 ± 2.6) Patients with interpreter use and a physician present had the highest Charlson score (2.8±2.6), which would suggest that physicians were selective in their care for patients with severe conditions **Readmission rates** No significant finding
Karliner et al (2017), US (37)	**Hospital setting** A medicine floor of an academic hospital **Study design** Natural experiment (pre-post intervention)	Dual handset interpreter telephone at every beside (Intervention during the 8-month period) vs English speaking patients	Pre-intervention: 4131 patients; Intervention: 1714 patients; Post-intervention: 2132 **Primary language spoken** Chinese, Russian, Spanish, Others (Amharic, Arabic, Cambodian etc)		**Readmission rates** Readmission rates significantly decreased compared during the 8-month duration to pre-intervention (17.8% to 13.4%; p = 0.04)

Patient Satisfaction

Bagchi et al (2011), USA (38)	**Hospital setting** EDs of two hospitals **Study design** RCT **Primary language spoken** Spanish	Professional in-person interpreter service (treatment time-block) vs usual interpreter service in the hospital (ad hoc interpreters, telephone interpretation, untrained bilingual providers – control time block)	531 LEP patients – 47 refused, 37 patients excluded as they already participated in the study 242 in the treatment time block group (227 received a professional in-person interpreter, 1 did not receive an interpreter, 17 received the usual interpreter service in the hospital); 205 in the control time-block group (66 patients without interpreter use, 114 patients receiving the usual hospital service, 11 likely to receive a bilingual provider)	Patient satisfaction	**Treatment intervention** 96% of patients in the intervention reported to be "very satisfied" with the visit, and 93% found the visit interaction "very easy" to understand **Control group** Only 24% of patients in the control group reported to be "very satisfied" with the visit, 18% reported the visit interaction as "very easy" to understand
Locatis et al (2010), US (39)	**Hospital setting** Postpartum and pediatric clinics of a teaching hospital **Study design** Quasi-randomized control study.	In-person interpreters vs remote interpretation modalities	241 patients requiring interpreter services; 80 used in-person interpreters; 80 used telephone interpretation; 81 used videoconferencing **Primary language spoken** Spanish	Satisfaction with encounter quality – patients, provider and interpreters (Survey)	**Satisfaction outcome** Patients rated all interpretation modes the same Only 11 responded to communication method; six positive comments for video interpretation, three negatives for telephone interpretation, and two positives for in-person interpretation. A majority of providers and interpreters preferred in-person interpretation

*Anttila et al (2017), US (15)	**Hospital setting** Tertiary care pediatric hospital **Study design** Observational study	Professional interpreter services (certified in-person medical interpreter, certified bilingual physician, telephone interpretation and videoconferencing via iPad) vs Ad hoc interpretation (Family member)	124 Spanish-speaking families; 29 used a certified medical interpreter; 22 used a certified bilingual provider; 26 used telephone interpretation; 7 for videoconferencing **Primary language spoken** Spanish	Family satisfaction	**Family satisfaction** Higher satisfaction with videoconferencing via iPad interpretation compared to telephone interpretation during and after family-centred round ($P < 0.05$)
Schulz et al (2015), Australia (40)	**Hospital setting** The Travel and Immigrant Health Clinic in the Victorian Infectious Diseases Service at Royal Melbourne Hospital **Study Design** Quantitative (surveys) -Not specified	Video interpretation vs in-person and telephone interpretation	Refugees who recently settled in Australia – Total of 65 occasions with requested interpreter service bookings; 56 interpreter attended occasions; of these occasions, 47 LEP patients completed surveys **Primary language spoken** Burmese, Karen and Haka Chin	Patient and doctor satisfaction, and practical limitations	**Patient Satisfaction** **Overall** 98% of patients were satisfied with videoconferencing; **Compared to telephone interpretation** – 82% of patients thought videoconferencing was better, 15% considered both the same, 3% considered videoconferencing worse **Compared to in-person interpreters** – 16% thought videoconferencing was better or much better, 58% considered the same, and 24% considered the modality worse Professional in-person interpreters remain the most preferred type of interpreter service

Gany et al (2007), US (41)	**Hospital setting** Primary care clinic and ED at a municipal hospital in New York **Study design** RCT – stratified randomisation	RSMI (telephonic interpretation) vs Usual hospital interpreter service	735 LEP patients with language discordant encounters; 371 assigned to RSMI; 364 enrolled to the usual service (onsite trained interpreters, excluding ad hoc interpreters) **Primary language spoken** Spanish Mandarin or Cantonese	Patient satisfaction (Questionnaire)	**Patient satisfaction** LEP patients in the RSMI group reported the highest satisfaction; in which they felt respected by their physician compared to those in the in-person interpreter group (70% vs 57%, P < 0.05), and thought their physician understood them (45% vs 35%, p <0.05) Overall satisfaction with physician care was higher in the RSMI group compared to the in-person interpreter group (P< 0.05). RSMI can improve patient satisfaction and protect privacy among LEP patients
Cunningham et al (2008), US (42)	**Hospital setting** An urban university hospital affiliated practice – pediatric **Study design** Cohort study	Telephone interpretation vs ad hoc interpreters	98 Spanish-speaking mothers with LEP; 46 relied on ad hoc interpreters; 52 received telephonic interpretation	Patient satisfaction (Survey)	**Patient satisfaction** Compared to ad hoc interpretation, mothers who received telephone interpretation reported higher satisfaction with overall clinic visits (57% vs 85%, P < 0.05) and felt "very easy" to communicate with the doctor (22% vs 83%, P < 0.01) Overall use of telephonic interpretation service was helpful and improved well-baby visits of LEP mothers
*Crossman et al (2010), US (16)	**Hospital setting** urban pediatric ED **Study design** Prospective, randomised trial	Telephone and in-person interpretation vs bilingual providers	1201 families were enrolled; 407 used telephone interpretation; 377 used in-person interpreters; 417 had a bilingual provider	Satisfaction	**Satisfaction** The quality and satisfaction were worse in the in-person cohort compared to the telephone and bilingual cohort (P <0.001). Patients in the bilingual cohort were less satisfied with their language service than those in the in-person and telephone cohorts (P <.001) No type of interpretation is the best

Jacobs et al (2007), US (43)	**Hospital setting** Public hospital inpatient medicine service **Study design** Prospective intervention study.	Enhanced intervention (professional medical interpreters) vs usual interpreter service (ad hoc interpreters, bilingual interpreters – limited training)	LEP patients – 124 accessed to enhanced interpretation and 99 accessed usual interpreter service **Primary language spoken** Spanish	Patient satisfaction	**Patient satisfaction** – the intervention did not have significant impact on the outcome
Moreno et al (2010), US (44)	**Hospital setting** Outpatient setting across hospital sites in the US **Study design** Cross sectional cohort study	Interpreter service usage – Patients who needed and always used interpretation vs those who needed but not always used an interpreter vs no interpreter use	1,590 patients –18% patients needed an interpreter but not always using one; 39% always had interpreters available; 13% needed an interpreter but never had one; others indicated a need for an interpreter and usually or sometimes had one available **Primary language spoken** Spanish	Patient satisfaction; doctor communication and perceived helpfulness of office staff (survey)	**Patient satisfaction** Frequent interpreter usage was associated with greater satisfaction with overall care (P <0.01) and an increase in doctor/ staff communication scores (P <0.001) Overall provision of interpreter service improve patient satisfaction in the outpatient setting

Kuo et al (1999), US (45)	**Hospital setting** A medial primary care unit at a hospital **Study Design** Quantitative (Survey)	Professional interpreter (telephone interpretation vs ad hoc interpreters vs bilingual providers)	149 Spanish-speaking patients; 65% of patients reported frequent use of ad hoc interpreters; 45% used telephone interpretation, 65% used professional interpreters, 77% used a hospital employee, and 20.5% used bilingual providers **Primary language spoken** Spanish	Patient satisfaction	**Patient satisfaction** Professional interpretation received the highest level of satisfaction by patients (92.4%) however, they were significantly more satisfied when family members or friends were used (P < 0.01).
Bischoff et al (2008), Sweden (46)	**Hospital setting** Outpatient clinic **Study Design** Cross-sectional study	Doctor-patient gender concordant care – Professional interpreter use vs no interpreter use	A total of 363 clinical encounters with foreign language – speaking patients **Primary language spoken** Albanian, Serbo-Croatian/Bosnian, Somali, Spanish, English, Arabic, and Farsi	Doctor-patient gender concordant care and patient satisfaction	**Patient satisfaction** The use of professional interpretation improved patient satisfaction and communication in doctor-patient gender discordant encounters (P = 0.01)

Hospital resource utilisation

In the ED setting, three US studies illustrated that interpreter service usage has an impact on the likelihood of utilising hospital resources (30-32). In Bernstein and colleagues (2002) study, LEP patients receiving interpretation had more primary care and specialty clinic referrals, were more likely to adhere to follow-up visits, and were less likely to be readmitted to the ED (30). In contrast, LEP patients receiving no interpretation had the lowest cost charges of ED visits and return visits compared to LEP patients with interpreted encounters and English-speaking patients ($5303 vs $7584 vs $8724 respectively) (30). Another study found that LEP patients without interpreter use were more likely to receive expensive diagnostic testing (OR +$5.78; 95% CI: $0.24 - $11.21) and more frequent hospital admissions (OR: 2.6; 95% CI: 1.4-4.5) (31).

Hartford and colleagues (2019) found that regardless of interpreter service usage, patients with a LEP status were likely to be transferred to the ICU within 24 hours of admission compared to English-speaking patients (32). The researchers suggested that language barriers and interpretation quality might be the reasons for the findings which impact on ED assessments and signs of clinical severity might be missed (32).

Hospital length of stay and readmission rates

Length of stay (LOS) and readmission rates are quality indicators that assess the overall hospital care performance. Five included studies collected hospital administrative patient data to observe patterns of LOS and readmission rates of patients provided with professional interpreter services (33-37).

LOS

Studies that focused on the impact of the provision of interpreter services on LOS reported complex findings. One longitudinal study from Australia found a significant negative correlation between LOS and the staffing of interpreter services which suggested that as staffing increased for interpreter services, patient LOS decreased (33). Two studies illustrated that the provision of professional interpreter services at different time-points of hospital admission and discharge has an impact on LOS (35, 36).

One Australian study by Abbato and colleagues (2019) found that LOS was significantly shorter when professional interpreter services were provided only in the ED but not provided at either the ED or the inpatient ward (incidence ratio rates [IRR: 0.41; 95%CI: (0.31-0.55); P <0.0001]

(34). In contrast, LOS was significantly longer when professional interpreter services were only provided in the inpatient ward, but not in the ED [IRR: 2.22; 95% CI: (1.76-2.82); P < 0.0001)] (34). Another study from the US showcased similar patterns in which LOS was significantly longer when professional interpreter services were only provided at discharge but not at admission (p < 0.01) (35).

In the inpatient setting, Lopez and colleagues (2015) discovered that LOS was the longest for LEP patients who had a physician using professional interpreter services (7.3 ± 7.5). In particular, the Charlson comorbidity score was the highest for LEP patients who had a physician utilising professional interpreter services (2.8 ± 2.6) (36). This would suggest that physician would be selective in their care for patients with severe conditions (36).

Readmission rates

Regarding the impact on readmission rates, two US studies found that the provision of interpreter service reduced readmission rates (35, 37). In a retrospective study, Lindholm and colleagues (2012) found that patients without interpreter use at both admission and discharge had higher readmission rates (24.3%) within 30-days compared to interpreter service usage at both admission and discharge (14.9%) (35). In a pre-post intervention study, Karliner and colleagues (2017) also found a decrease in readmission rates during the intervention period, but this was not maintained in the post-intervention period (37). In contrast, three studies did not have findings associated with the provision of interpreter services and readmission rates in which outcome factors were not fully captured on the hospital administrative system (33, 34, 36).

Patient Satisfaction

Different types of interpretation modalities have been demonstrated in studies to impact on patient satisfaction in clinical encounters.

Face-to-face interpretation (in-person and videoconferencing)

Face-to-face interpretation is described to be the most preferred type of interpretation which is either delivered by a professional in-person interpreter or through videoconferencing (15, 38-40). While studies have reported that professional in-person interpreters received the highest ratings on patient satisfaction (38, 39), with advancing technology, videoconferencing has been demonstrated to improve patient satisfaction, yielding similar effects as in-person interpreters (15, 40).

In one Australian study, Schulz and colleagues (2015) compared videoconferencing to in-person interpreters and reported that 16% of patients found videoconferencing better or much better, 58% considered both modalities the same, and 24% considered videoconferencing worse or much worse. In contrast, when compared to telephone interpretation, 82% of patients considered videoconferencing as better or much better, 15% thought that the modalities were the same and 3% considered to be worse (40). One study from the US also provided evidence in patients' preference in using face-to-face interpretation in family-centred rounds (15). Anttila and colleagues (2017) found that families using videoconferencing via iPad were significantly satisfied with their interpretation compared to families using telephone interpretation during and after family centred rounds (P <0.05) (15). Technical problems have been identified in studies and could create a barrier to increasing access to remote-interpretation, and therefore, appropriate resources should be available for successful implementation (39, 40).

Telephone interpretation

To increase wider access to professional interpretation, two US studies implemented telephone interpreter service and demonstrated improvements in patient satisfaction (41, 42). Gany and colleagues (2007) compared RSMI to the usual interpreter service in the hospital delivered by either ad hoc interpreters or in-person interpreters and found that LEP patients who used RSMI were significantly more satisfied with the service where they felt their privacy was being protected and respected by physicians compared to the usual interpreter services (70% vs 57%; P <0.05) (41).

In a paediatric hospital setting, Cunningham and colleagues (2008) conducted a cohort study that compared telephone interpretation to ad hoc interpreters. The researchers found that LEP mothers who received telephone interpretation were significantly satisfied with the visit compared to mothers who had ad hoc interpretation (85% vs 57%, p < 0.05) (42). Furthermore, when compared to ad hoc interpretation, LEP mothers that used telephonic interpreters reported that communication with the physician was "very easy" and understood all the information when the physician explained to them (80% vs 97%, P <0.05) (42).

Professional interpreters vs Bilingual providers

To ensure language concordant care for patients with a language barrier, bilingual providers are used to assist with interpretation even when professional interpreters are available. Two US

studies found that interpreter service usage had no effect on patient satisfaction when compared to bilingual providers (16, 43). In a paediatric ED setting, Crossman and colleagues (2010) randomised parents into three groups – in-person interpreter cohort, telephone interpretation cohort and bilingual provider cohort (16). The researchers reported high levels of satisfaction from all three groups, however closer examination revealed that the in-person interpreter cohort had worse scores compared to the two cohorts (P <0.001) (16). While the reason to this finding remained unknown, the researchers suggested that the study might be "overpowered", or the in-person interpreter was less respectful during the interview process (16).

In a prospective intervention study, Jacobs and colleagues (2007) compared an enhanced interpreter service intervention to the usual hospital interpreter service on patient satisfaction of Spanish-speaking patients (43). The enhanced interpreter intervention consisted of trained medical interpreters that completed a 120-hour internship whereas the usual hospital interpreter service was delivered by ad hoc interpreters or bilingual providers or hospital interpreters with limited training (43). Overall, there were no significant findings amongst interpretation groups to suggest that the enhanced interpreter intervention had an impact on patient satisfaction (43).

Professional interpretation vs no interpreter use vs ad hoc interpreters
Despite the different preferences of interpretation modalities, three studies demonstrated that professional interpretation has a positive impact on patient satisfaction and the importance of using professional interpreter services, instead of using ad hoc interpreters or no interpreter use (44-46). As part of a state-wide evaluation program, one US study examined the provision of interpreter services and patient satisfaction with overall ambulatory care (44). In this cross-sectional cohort study, Moreno and colleagues (2010) found that patients always using interpreter services was associated with an increase in satisfaction and overall care experience compared to patients who needed interpretation but not receiving one (44). Another US study demonstrated high levels of patient satisfaction when patients received professional interpretation (92.4%) compared to those receiving ad hoc interpreters including family members or friends (85.1%) or untrained hospital employees (40%) (45).

The use of professional interpreters has been described as cultural mediators for immigrants or ethnic minorities who do not share the same language as the host country (46). One Swedish study by Bischoff and colleagues (2008) found that the ratings on patient satisfaction were the highest when professional interpreters were present in clinical encounters (46). In particular, the researchers further discovered that in patient-provider gender discordant encounters, levels

of satisfaction were the lowest when professional interpreters were not used (46).

Theme 3: Cost

This theme presents the cost associated with the provision of interpreter services as described in Table 5.

Table 5 Data sources for cost calculation

Considerations for cost calculation	
Hospital expenditures	**Interpreter Network administrative data**
• interpreter salaries • bonuses for dual-role interpreters (include nurses, doctors who also served as interpreters) • manager salaries and time-spent managing the shared network • Cost to outsource telephone interpreter service and videoconferencing • Annual network fee • Investment for equipment	• Number of interpreted encounters • Durations of interpreted encounters and their usage each month • Languages interpreted • Time spent interpreting each month • The time for interpreters spent either waiting or interpreting

Cost of interpreter services

Limited studies have yet conducted a formal cost-benefit or cost-effective analyses associated with the provision of interpreter services in hospitals. One US study identified in this review investigated the provision of a shared network of interpreter service at a low cost (47). The researchers accounted for a range of data sources to be included for cost calculations which included hospital expenditures and duration of interpreted encounters.

The findings revealed that the most expensive encounters involved rarely encountered languages (47). When comparing the cost between interpretation modalities, this varied based on the contractual agreement with interpreters and the interpreter service provider. For instance, when considering the cost for in-person interpreters, the cost varied based on whether the interpreter was contracted or an employee at the hospital and would usually require a minimum payment even for only a short encounter (47).

Similarly, the cost for remote interpretation modalities (telephone interpreting and videoconferencing) would also involve a minimum payment depending on the interpreter service provider (47). For instance, when the cost for videoconferencing was $1.00-3.45 per

minute, and a duration of 10.6 minutes, the cost would be $10.60-36.57. With a minimum charge of fifteen minutes, the minimum cost for videoconferencing would be $15.00-51.75. The cost information presented in this study provided a guide for hospital institutions and policymakers to determine a cost-saving approach to providing interpreter services to serve the diverse linguistic needs of population groups (47).

2.3   Discussion

With growing cultural and linguistic diversity among migrants in developed countries, overcoming language barriers in the hospital setting should be a priority to eliminate health disparities. A strategic approach is the provision of professional interpreter services, however, ad hoc interpreters are frequently used by healthcare providers. The findings of this integrative review highlight the importance of using professional interpreter services in the hospital setting to improve communication quality and hospital care for patients with a language barrier.

Communication Quality

Clear and effective communication between patients and healthcare providers is crucial in clinical encounters to ensure all information is accurately conveyed and comprehensible by patients. Concerns regarding the quality and use of interpreter services have been voiced by patients and healthcare providers which resulted in their reluctance in using the services. The findings of this review suggested that using professional interpretation reduced interpretation errors that have potential clinical consequences (7, 8). Furthermore, comprehension studies suggested that the use of professional interpretation could improve understanding of discharge diagnosis, particularly important for parents or caregivers with a language barrier (15-17).

While evidence showcased that different interpretation modalities vary in interpretation accuracy, a consensus finding indicated that using ad hoc interpreters or going without interpreter use altogether when the patient needed one increased interpretation errors (7, 8). A study found that professional interpreters who trained more than 100 hours had fewer inaccurate utterances compared to the years of experience and this might have potential policy implications to enhance the professional development of in-person interpreters (7).

Hospital care outcomes

Safe and quality care is crucial in the hospital setting to deliver timely and effective care to patients, thus the use of interpreter services could shorten visit length and throughput times to alleviate hospital crowdedness (18-20). However, one type of interpretation is not sufficient to

meet the language needs of linguistically diverse patients, particularly when in-person interpreters are not readily accessible (20). Remote interpretation modalities should be available such as videoconferencing, which yields similar effects to in-person interpreters with improved patient satisfaction (15, 40). Understanding the purpose of different types of interpretation is crucial to allow wider access to professional interpretation in hospital services.

The planning of interpreter services requires collaborative efforts from policymakers and hospital administrators. Areas that require further examination regarding the hospital care process include risk communication for informed consent and discharge communication (21-23). The findings of these studies highlighted the complexity of using professional interpreter services to communicate important informed consent elements and discharge contents relating to medication doses, return precautions, and treatment follow-up (21-23). These processes of care require clear and concise communication between patient and healthcare providers and to address these issues in the hospital care process, hospital guidelines and instructions to working with interpreters should be available and accessible to healthcare providers.

Complex findings related to LOS were evident in this review. Interpreter service usage at different time-points at hospital admission and discharge have been demonstrated to impact on LOS. The findings from two studies suggested that when interpreter services were engaged in the ED or at admission, LOS was shorter compared to only using interpreter services in the inpatient ward or at discharge (34, 35). This may benefit patients and hospitals with lower risks to patient safety and potential cost savings through a shorter LOS (34, 35). From another perspective, a longer LOS may be associated with more timely care delivered to patients. Lopez and colleagues (2015) suggested that physicians tend to be selective in their care for patients with more medical complications which lengthen patients' hospital stay (36).

Regarding the impact of interpreter service usage and readmission rates, only one retrospective study found that patients without interpreter service usage at both admission and discharge were more likely to be readmitted (35). Another pre-post intervention study also observed a decrease in readmission rates during the intervention period (37). These studies would suggest that interpreter service usage reduced readmission rates, however, data on interpreter service usage need to be routinely captured on the hospital system for best practice and service evaluation purposes (34, 36, 37).

Cost of interpreter service usage

The cost of interpreter service provision remains a key consideration for wider implementation in hospitals. Research has shown limited formal cost-effectiveness analysis regarding the use of professional interpreter services in hospitals where cost information is restricted to specific service providers and institutions (47). One study provided an overview of cost information regarding interpreter services, which would be useful to guide institutions and policymakers to examine the overall cost of service provision and estimate funding support for future purposes (47). Evidence demonstrated that language barriers could impact long-term healthcare costs with increasing utilisation of hospital resources and more emergency visits (48). Therefore, decisions to implement professional interpreter services should consider the long-term cost and benefits for future funding support.

2.4   Summary

The integrative review undertaken in this section illustrates the importance of using professional interpreter services in the hospital setting to enhance patient safety and improve the quality of care for patients coming from culturally and linguistically diverse backgrounds. Clinicians and other hospital service providers should recognise the need to provide appropriate language assistance, rather than using untrained interpreters which could increase complications and medical errors. Recommendations for future practices are provided below:

- Targeted policies are needed to strengthen the use of interpreter services in different clinical situations including procedural care to ensure optimal hospital care delivery, this include (risk communication, patient assessments, and discharge)

- Hospital institutions can consult with relevant stakeholders including patients and healthcare providers to provide a better understanding of the patterns of using different interpretation modalities in clinical encounters. The outcome of the consultation process can help determine the purpose of different interpretation methods and in turn, inform service allocation to match patient and service needs.

- The cost of interpreter service provision remains as a key consideration for wider implementation in hospitals. While there is limited information on the economic impact of using hospital interpreter services, the cost of a language barrier can have long term healthcare cost (3). Therefore, decisions to implement hospital interpreter services should consider the long-term cost and benefits for future funding support. As the global population continues to increase, cultural competency should be embedded in healthcare to meet the needs of the linguistically diverse population.

PART B

A RETROSPECTIVE AUDIT

3.0   Overview

Western Australia (WA) is an increasingly culturally and linguistically diverse state and an important site of migrant settlement. According to the 2016 Census, the number of people born overseas accounted for 32.2% of the total population and of this population, 16.6% were born in non-English speaking countries (1). The proportion of people speaking a language other than English (LOTE) at home has also increased from 14.5% to 17.7% between 2011 and 2016 (2). Reflecting the linguistic diversity in WA, providing adequate language assistance for individuals with a language barrier is important when accessing health services.

The WA Language Service policy has been updated to ensure that public health services provide equitable access to health information and services to the CaLD population (3). The purpose of this quantitative component of the research project aims to explore the impact of using accredited interpreter services at a general hospital in Perth, Western Australia (WA). The lessons learnt in this audit would be addressed as recommendations for policymakers to consider in accordance with the WA Sustainable Health Review and the WA Multicultural Policy Framework (4, 5).

3.1   Study design and study population

A retrospective exploratory analysis was undertaken to examine the use of interpreter services by CaLD patients who visited the institution between January 2015 and December 2016. A research assistant from Curtin University audited patient medical records from TOPAS, a Patient Administration System used by the hospital. CaLD patients that had an outpatient, ED, or inpatient visit and required an interpreter were randomly selected and extracted into an Excel spreadsheet. Patient inclusion and exclusion criteria are listed below:

Inclusion criteria – All medical records of CaLD adult patients (18 years or above) with vwith outpatient, inpatient, and ED presentations at the general hospital between January 2015 and December 2016.

Exclusion criteria – Any medical records of children, Aboriginal and Torres Strait Islanders, and patients with AUSLAN (Australian Sign Language) status were excluded.

3.2   Data source

The study dataset included the following sources of data: Patient medical records obtained from TOPAS (Patient Administrative System) previously used by the hospital institution, interpreter service booking forms from the medical files and invoices from the interpreter service provider. Patients identified as requiring an interpreter in their clinical visits were identified in the TOPAS system. The "interpreter required field" of TOPAS was indicated "True" in the outpatient and inpatient spreadsheets and "language" other than English in the ED spreadsheet, as an indicator of patients potentially requiring interpreter services. All patient medical records were extracted into an excel spreadsheet and were assigned with a study code (UMRN).

Invoices were generated when interpreter services were requested by the hospital, and these were used to determine interpreter service usage and to calculate the cost of services in this study. Information extracted from TOPAS for inpatients, outpatients and ED for the patients whose medical files were audited was used at the base for the final data set. There was no indication of interpreter service usage in the information extracted from the TOPAS system, a research assistant manually matched the coded patient medical records (UMRN) and service dates from the invoices into the final data set. Information from interpreter service booking forms identified in the medical files were also matched to UMRNs and service dates in the final data set.

The invoices with matching patient medical records (matched using dates) provided confirmation of interpreter service usage. In some cases when patient medical records did not match with an invoice (using dates), this accounted as an "unmatched" record. An invoice with a corresponding patient medical record accounted as a "matched" record. (Note that the presence of interpreters is not necessarily recorded as patients may use other forms of interpretation, however, this was not identified in this study).

3.3 Analysis

Descriptive analyses were conducted to present the demographic characteristics of patients who required interpreters at the hospital institution and interpreter service usage between January 2015 and December 2016.

Based on the audited data from patient medical records and invoices, 169 invoices did not match with a corresponding patient medical record, and only 141 invoices had a corresponding patient medical record. In particular, 74 invoices matched the TOPAS patient medical records via dates in the outpatient spreadsheet, 11 invoices with matching records in the ED spreadsheet, and 56 invoices with matching records in the inpatient spreadsheet. Patient outcomes such as adherence to follow-up appointments, hospital length of stay and unplanned readmissions were not examined due to unmatched records between the invoices and patient medical records.

Cost estimates.

Due to limited cost information, a formal economic analysis was not conducted. The cost of the provision of interpreter service were calculated as cost estimates in units of per encounter and per-minute cost for each language, hospital departments and interpretation modalities. These analyses undertaken were similar to the study conducted by Jacobs et al (2011), in which the average duration (minutes) incurred per encounter would be divided by the mean total payable cost (4). The 310 invoices of records of interpreter service encounters (and with cancelled encounters) were the source for cost calculations using the actual booking duration and the total payable cost to determine the average cost per encounter and per-minute (4).

The variables included for data analyses are presented below:
- Patient characteristics: age, gender, country of birth, preferred language
- Interpreter service usage (Invoices): Languages available, booking type (time-based or pre-booked), delivery methods (accredited in-person or telephone interpreter service), service date and time, booking and the actual duration of the service, hospital department, total payable cost

Statistical analyses were conducted using STATA, v.14.

3.4 Ethics approval

Ethics approval to undertake this study was granted by the Curtin Human Research Ethics Committee and the WA Department of Health with a waiver of informed consent.

3.5   Summary

This section presented a brief overview of the data collection and analysis for the research project to examine the use of interpreter services at a general hospital in Perth, WA. A retrospective research design was adopted to examine previous hospital records of patients who required interpreter services during their visits. The next chapter will present the results of this study, focusing on the demographics of patients, the preferred language for interpretation and the common languages used by interpreter services. Understanding patient demographics and their preferred language would help identify different linguistic needs and to help organise appropriate language services in hospital units.

\

RESULTS

4.0   Overview

A total of 274 patient medical records were extracted from TOPAS. After reviewing the patient inclusion/exclusion criteria, 15 records were excluded which belonged to either children or adult patients that had an AUSLAN (Australian Sign Language) status. A final total of 259 patient records remained for audit where patients had a CALD status and required an interpreter during their visits at a general hospital between January 2015 and December 2016.

4.1   Patient characteristics

From the patient sample, the mean age was 45 (SD 17.4) years old, 44.1 for females (n = 191), and 47.9 for males (n = 68). Patients came from various regions including Asia, the Middle East, Europe, and Africa (see appendix B). In particular, a majority of patients came from the Asia region and with Asian languages as their preferred language. Figure 2 and 3 provide a snapshot of the top five countries of origin and preferred languages from the patient sample.

	Malaysia	India	Burma (Myanmar)	China	Afghanistan
Frequency	11	14	30	30	40
Percentage	4.25%	5.41%	11.58%	11.58%	15.44%
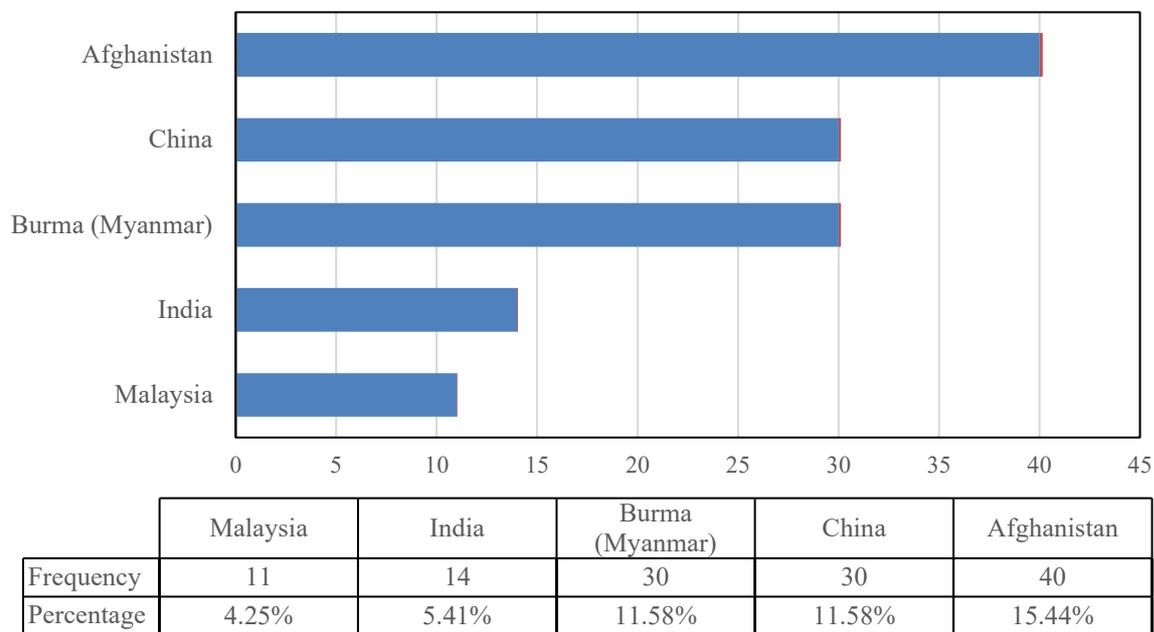
Figure 2 Top five patients' country of origin

	Hazaraghi	Karen	Arabic	Dari	Mandarin
Frequency	13	20	21	26	41
Percentage	5.02%	7.72%	8.11%	10.04%	15.83%
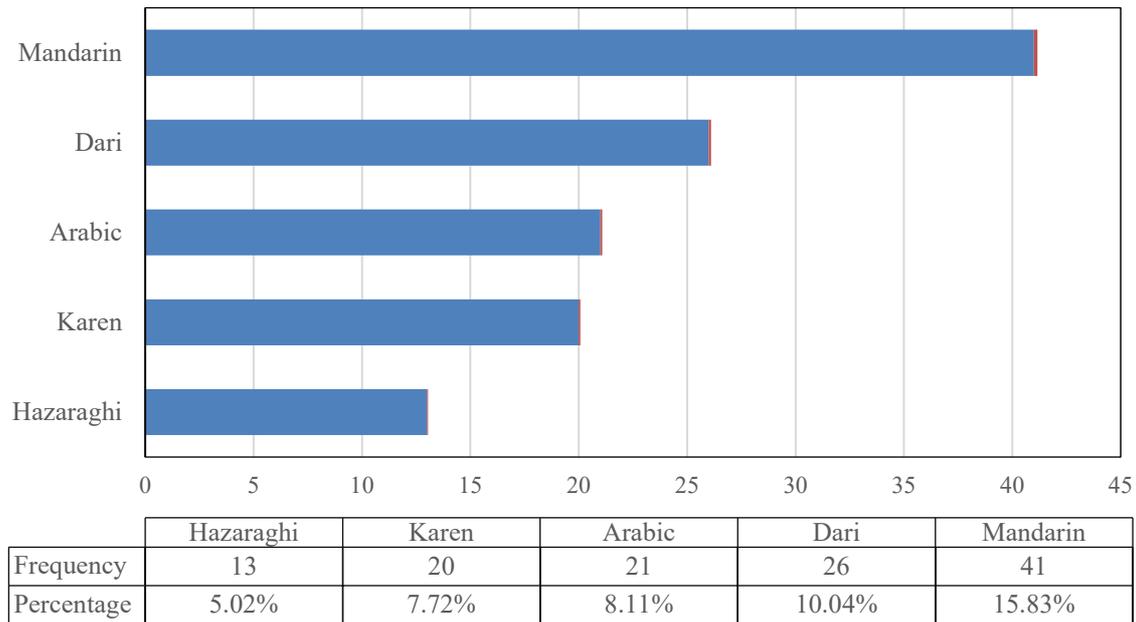
Figure 3 Top five patients' preferred languages

4.2 Interpreter service usage

To indicate interpreter service usage, 310 invoices were manually matched to patient medical records. Booking forms identified from the patient medical files provided an indication that an interpreter service was requested. A total of 26 booking forms were identified from 19 patient medical files. In particular, 14 patient medical records (i.e 14 different UMRNs) with invoices corresponded with the same service dates on 21 booking forms whereas 5 medical records (i.e 5 different UMRNs) with booking forms did not match with an invoice.

Languages available for interpretation

Based on the 310 invoices generated from the requested services, various languages were available for interpretation in patients' visits over the 24 months period. As illustrated in figure 4, the top five frequent encountered languages were Mandarin (n = 45, 14.52%), followed by Hazaraghi (n = 40, 12.90%), Dari and Arabic (n = 29, 9.35%), and Karen (n = 24, 7.74%). (See appendix E for full list of languages).

	Karen	Dari	Arabic	Hazaraghi	Mandarin
Frequency	24	29	29	40	45
Percentage	7.74%	9.35%	9.35%	12.90%	14.52%
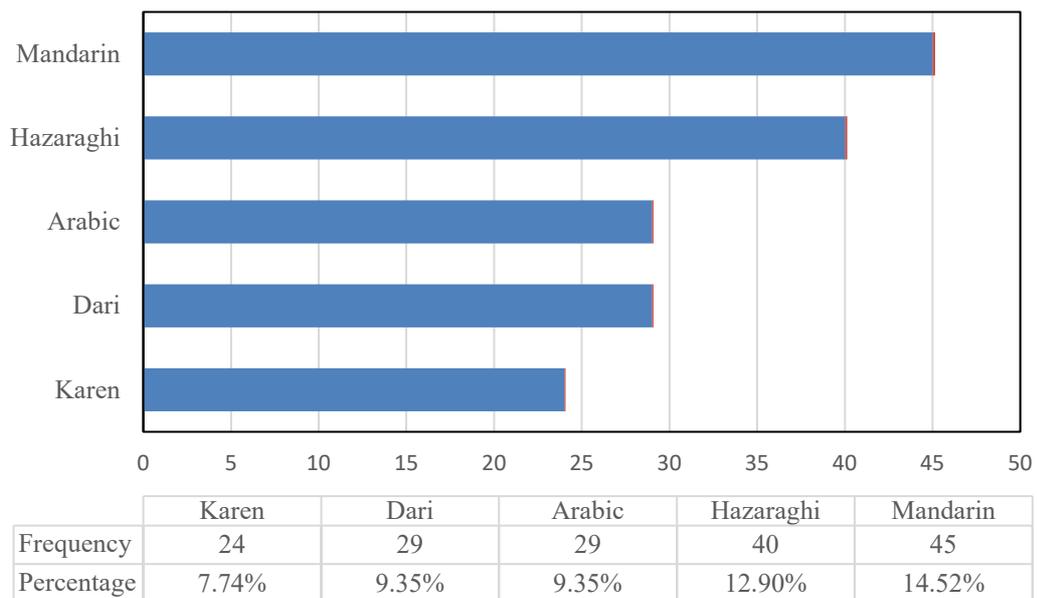
Figure 4 Top five frequent encountered languages

Delivery methods of interpreter services

Two modes of interpreter services were requested for patient clinical encounters, 206 encounters required onsite interpreter services, and 104 encounters required telephone interpreter services. All onsite interpreter services were time-based bookings, and none were pre-booked. For telephone interpreter service, 77 were time-based booked, and 27 were pre-booked. Note here that time-based bookings are unplanned bookings of interpreter services whereas pre-bookings are bookings made in advance prior to appointment. Overall, a majority of interpreter services were delivered in 300 encounters, and only ten encounters were cancelled. (see table 6).

Table 6 Modes of interpreter services - Booking methods and delivery status

Characteristics	Modes of interpreter services	
	Onsite interpreting service, N= 206, 66.45% N (%)	Telephone interpreting service, N = 104, 33.55% N (%)
Booking methods		
Time-based	206 (100)	77 (74.04)
Pre-booked	0 (0)	27 (25.96)
Delivery status		
Delivered	197 (95.93)	103 (99.04)
Cancelled	9 (4.37)	1 (<1)

Interpreter service usage in hospital services and departments

Figure 5 below presents the two modes of interpretation requested for patients' clinical visits across hospital services and departments between January 2015 and December 2016 as indicated in the invoices. In outpatient services, 135 encounters required onsite interpretation and 42 encounters required telephone interpretation. A majority of interpreter services were provided in the pre-admission unit, 74 (35.92%) for onsite interpreter services and 29 (27.88%) for telephone interpreter services. For inpatient services, 33 encounters required telephone interpretation and only nine for onsite interpretation. In the ED, a majority of 14 emergency visits required telephone interpretation and only one encounter required onsite interpretation. Other departments that were not specified had 30 (14.56%) encounters that required onsite interpretation and 9 (8.65%) encounters that required telephone interpretation.
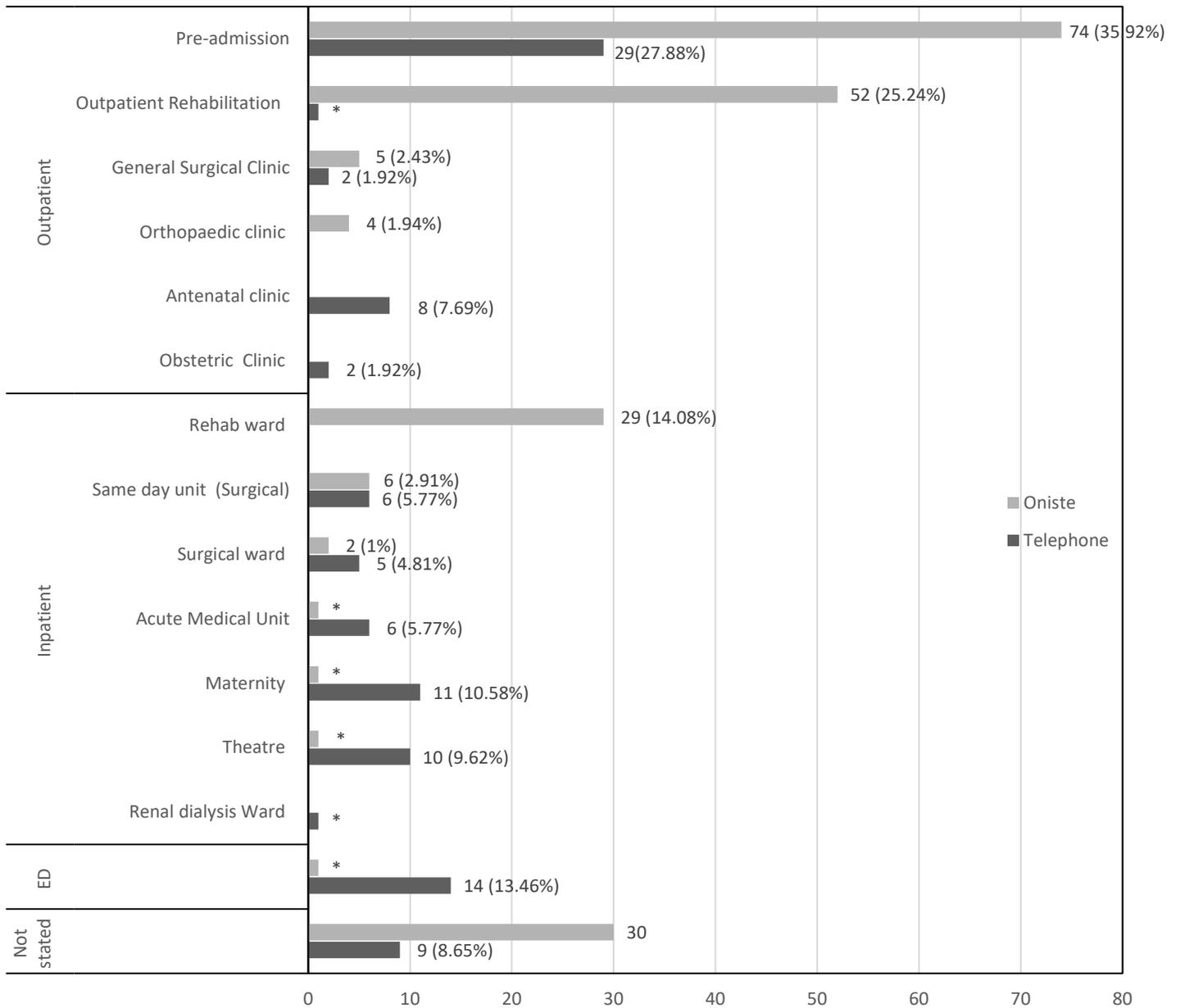
Figure 5 Interpreter service usage across patient visits

Note

* indicates only one encounter with the assigned mode of interpretation

Information about the above hospital services provided is shown in table 8

Table 7 Description of Hospital services provided at the Hospital

Outpatient	
Pre-admission	Provide assessment prior to admission to identify any risk factors before surgery and to minimise the risk of any complication during or following procedures
Outpatient Rehabilitation	Provides rehabilitative, aged care and specialist services to anyone above 18 years and above residing in the catchment area. Focus on regaining or retaining certain physical and cognitive abilities.
General Surgical Clinic	A general clinic for any issues requiring surgical intervention (appendicitis, hernia, lesions etc)
Orthopaedic clinic	Provide outpatient treatment for physical and medical conditions that impact on mobility, independence or function
Antenatal clinic	For women who wish to have their baby at the Hospital and live in the catchment area. Organise blood tests, screening dating and anatomy scans
Obstetric clinic	Provides care services for women during pregnancy, labour and postnantal care
Inpatient	
Rehab Ward	Provides a range of therapy and services for patient with cardiac, orthopaedic, respiratory, neurological and musculoskeletal conditions
Same day unit	A ward for surgical procedures and patients are discharged the same day
Surgical ward	A surgical ward for all overnight surgery cases
Acute Medical Unit	A ward for short term medical admissions from ED (under 72 hrs)
Maternity	Provide a range of services to women and their babies (labour, caesarean births, infant feeding and breast care)
Theatre	An operating theatre for surgical procedures (cardiology, general surgery, gastroenterology etc)
Renal Dialysis ward	Only provided to regular renal inpatients at the Hospital
ED	Provides 24-hr emergency services for serious or urgent conditions (obstetric, neonatial emergencies etc)

4.3 Cost of interpreter services

The 310 invoices provided by interpreter service providers were used to calculate the cost of interpreter services which varied in three categories: language, interpretation modalities and hospital units. On average, the overall duration of interpreter service usage was 73.04 minutes (*approx. 1hr 10mins*) which cost $115.02 per encounter and $1.57 per minute.

By language:

The cost of each language varied based on the number of encounters and the actual duration of interpreter service usage (See table 9). For the five common languages including Mandarin, Hazaraghi, Arabic, Dari and Karen, the estimated cost per encounter was between $94.79 - $133.78, and $1.47 - $1.70 per minute. Mandarin, the most frequent encountered language, a mean duration of 60 minutes cost $94.79 per encounter and $1.56 per minute. The less frequent encountered languages, Greek and Thai, cost $49.61 and $79.05 per encounter, $3.65 and $3.31 per minute respectively.

Table 8 Number of frequent encountered languages, mean duration and encounter cost

Languages	No of encounters	Mean duration (mins)	Mean cost per encounter	Mean cost per minute
Mandarin	45	60.73	94.79	1.56
Hazaraghi	40	60	102.18	1.70
Arabic	29	85	133.78	1.57
Dari	29	77.07	113.29	1.47
Karen	24	80	128.60	1.61
Farsi	23	60.43	96.43	1.60
Burmese	22	66.60	114.16	1.71
Cantonese	11	98.18	142.06	1.45
Urdu	10	74.50	118.66	1.59
Italian	7	102.71	164.12	1.60
Vietnamese	7	115.71	160.75	1.39
Punjabi	6	85	128.59	1.51
Sinhala	6	62.50	102.33	1.64
Tamil	6	129.17	183.85	1.42
Malay	5	84	124.52	1.48
Serbian	5	98	151.72	1.55
Hakha Chin	4	27.50	49.09	1.79
Indonesian	4	93.75	149.74	1.60
Tigrinya	4	48.75	85.17	1.75
Khmer	3	50	80.08	1.60
Polish	3	68.33	104.39	1.53
Thai	3	21.67	79.05	3.65
Turkish	3	53.33	93.61	1.76
Greek	2	15	49.61	3.31
Hindi	2	52.50	79.53	1.51
Hokkien	2	135	168.14	1.25

Somali	2	90	127.05	1.41
Bosnian	1	60	95.04	1.58
Dutch	1	90	121.44	1.35
Spanish	1	120	156.20	1.30

By interpretation modalities:

In the general health setting, two modes of interpretation were provided to patient including onsite and telephone interpretation. A majority of 206 encounters required onsite interpreter services and 104 encounters required telephone interpreter services (See table 10). The actual mean duration for interpretation differed between the two interpretation modalities, in which onsite interpreter service had a longer interpreted duration of 93.50mins (SD = 43.76), whereas telephone interpreter service had a shorter interpreted duration of 32.55 mins (SD = 24.77).

For onsite interpretation, a mean duration of 93.50 minutes (*approx.1 hr and 30 mins*) had an average encounter cost of $140.63 and $1.50 per minute cost. A minimum of 15 minutes cost $22 and a maximum of 255 minutes cost $339.90. For telephone interpretation, a mean duration of 32.55 minutes cost of $64.28 per encounter and $1.97 per minute. A minimum of 15 minutes cost $22 and a maximum of 180 minutes *(approx. 3hrs)* cost $265.21.

Table 9 Estimated mean duration, mean cost per encounter and per minute, by modes of interpreter services

Modes of interpreter services	No of encounters	Mean duration (mins)	Mean encounter cost ($)	Mean cost per minute	Min -Max Cost
Onsite interpreter service	206	93.50	140.63	1.50	22 – 339.9
Telephone interpreter service	104	32.55	64.28	1.97	22 – 265.21

By hospital service departments:

The cost of interpreter services varied on the modes of interpreter services provided in different hospital units (See table 11). For emergency visits, 15 encounters with interpreter service usage, accounted for a mean duration of 24 minutes, which cost $63.20 per encounter and $2.63 per minute. A majority of 14 encounters with telephone interpretation usage, accounted a mean duration of 17 minutes, and cost $44.57 per encounter and $2.60 per minute.

A total of 42 inpatient visits had interpreter service usage of a mean duration of 39 minutes, costing $70.85 per encounter and $1.81 per minute. In particular, the Maternity unit had 11 encounters of telephone interpretation usage, which accounted for a mean duration of 24 minutes, and cost $58.20 per encounter and $2.42 per minute.

For outpatient visits, a total of 214 encounters had a mean duration of 80 minutes *(approx. 1hr 20mins)* which cost $125.26 per encounter and $1.56 per minute. Onsite interpreter service was frequently used in 166 outpatient services, particularly in the Pre-admission unit. A mean duration of 123 minutes cost $177.25 per encounter and $1.43 per minute in the unit. Further information about the cost of each interpretation modality in different hospital units is provided in appendix C.

Table 10 Cost of interpreter services – Mean cost per encounter and per minute, by hospital service departments

Hospital service departments	Mean duration (*approx. mins*)	Average cost ($)	Average cost per minute ($)	Interpretation modalities	
				Onsite	Telephone
ED (Emergency department) **Total = 15 encounters**	24	$63.20	$2.63	1	14
Inpatient **Total = 79 encounters**	49	$84	$1.73	40	39
AMU (Acute Medical Unit)	28	$58.50	$2.05	1	6
Colyer ward	36	$69.79	$1.92	2	5
Maternity	32	$66.36	2.04	1	11
Rehab ward	64 (approx. 1 hr)	$107.36	$1.67	29	-
Same day unit	74.08 (approx. 1 hr)	$111.59	$1.51	6	6
Theatre	18	$39.14	$2.15	1	10
Renal dialysis unit	30	$58.63	$1.95	-	1
Outpatient **Total = 177**	80.32	125.26	1.56	166	48

encounters					
Antenatal clinic	21	$42.97	$2.02	-	8
Community Rehab	66.70 (approx. 1 hr)	$108	$1.62	52	1
General Surgical clinic	53	$90.33	$1.69	5	2
Obstetric	20	$55.66	$2.78	-	2
Orthopaedic clinic	60 (1 hr)	102.50	$1.71	4	-
Pre-admission	103.62 (approx. 1 hr)	$154.59	$1.49	74	29
Not stated	87.69 (approx. 1 hr)	$126.33	$1.44	30	9
39 unspecified hospital services					

4.4 Outcome predictions using logistic regression analysis

Patient outcomes such as follow-up adherence, hospital length of stay and unplanned admissions were not included in the analyses due to unmatched records of interpreter service usage between the invoices and patient medical records. As mentioned in **section 3.4**, out of the 310 invoices, 141 invoices had matching patient medical records and 169 invoices without matching patient medical records. Outcome patterns of interpreter service usage were difficult to monitor across the stages of patient visits, with 74 invoices belonging to outpatient visits, 11 invoices from the ED, and 56 invoices belonging to inpatient visits.

A logistic regression analysis was performed to predict the probability of odds whether language groups, hospital departments and booking types were associated with unmatched invoices and patient medical records. The outcome was a binary variable with two levels, "Yes" labelled as 0, indicated that both records of invoices and patient medical records were present, and "No" indicated that an invoice did not match with a corresponding patient medical record. The three predictors, "language", "departments", and "booking type" were categorical variables with two or more levels. Table 8 presents the results of a logistic regression analysis in odds ratio.

Table 11 Predictions of complete hospital records with both interpreter service invoices and patients' hospital visits

Categorical variables	*OR*	*P*	95% CI
Language			
Middle-East	1.41	0.16	0.87 – 2.29
African	0.68	0.66	0.12 – 3.77
European	1.25	0.45	0.47 – 3.30
(base = Asian)			
Hospital departments			
Inpatient	1.09	0.83	0.50 – 2.39
Outpatient	0.87	0.71	0.43 – 1.78
ED	0.32	0.09	0.09 – 1.20
(base = Not stated)			
Booking type			
Pre-booked	3.27	0.016	1.25 – 8.54
(base = Time-based)			

Log-Likelihood = -206.49. OR = Odds Ratio. CI = Confidence interval

Amongst the three predictor variables in the logistic regression model, "pre-booked" in the "booking type" category was the only variable that had a significant finding ($p < 0.05$). This indicated that when an interpreter service was pre-booked, the likelihood of invoices that matched with a patient record was 3.27 odds more likely without a matching patient medical record.

The intention of the logistic regression model was to explain the unmatched records between the invoices and patient medical records. However, there was no sufficient evidence to indicate that the three predictors, "language group", "hospital departments" and "booking types" had an association with this occurrence. With no standard collection of patient UMRNs for bookings of interpreter services, this presented difficulties to match patient UMRNs with invoices. Clear record-keeping of interpreter service usage is required for consistent bookings of interpreter services.

4.5   Summary

In this section, the findings provided insight into the demographic profile of patient who required interpreter services during their hospital visits, which included country of origin and preferred language. Interpreter service usage was also explored in this section which provided information on the number of languages available for interpretation, the frequently used interpretation modalities and service usage across the stages of patient visits. Cost estimation of interpreter services was presented to help inform funding support from policymakers and hospital administrators. Using the cost data derived from invoices of interpreter service usage, the cost varied in service duration, language, interpretation modalities, and usage in hospital units. Further discussion will be presented in the next section.

PART C

DISCUSSION, RECOMMENDATIONS and CONCLUSIONS

5.0   Overview

With an increasingly culturally and linguistically diverse (CaLD) population in Western Australia (WA), health services are encouraged to create a culturally responsive and culturally sensitive environment for CaLD patients. The objective of this change is to meet the strategic priorities indicated in the WA Sustainable Health Review and the WA Multicultural Policy Framework (4,5). The provision of interpreter services is a step forward to embed cultural care into health service delivery and patient care, in which, this research project aimed to examine the overall use of interpreter services in the global literature and the lessons learnt at a WA hospital.

5.1   Interpreter service usage in the global literature

The integrative review presented in this report explored the global published literature about the use of professional interpreter services on hospital care to understand the effectiveness of the intervention within the hospital setting. The findings from the 38 research studies suggested that the provision of interpreter services would improve the communication quality between healthcare providers and patients, and in turn, improve the hospital care process.

Limitations

Several limitations should be noted. The majority of studies included in the review were conducted in Australia and the US, and only one from Sweden, which may not be generalisable to other countries and settings. This may be due to studies not being available in the English language or not retrievable. However, the lack of research beyond a small set of countries suggests that further work is needed to assess generalisability of findings. Furthermore, while a wide range of databases was searched, the review might have missed studies that were relevant to the topic. There were studies grouped ad hoc interpretation or bilingual provider with professional interpretation which masked the effects of professional interpretation. Another limitation was the lack of findings on cost impact from the published literature which prevented from concluding the cost-effectiveness of professional interpreter services. This information would be useful to inform policymakers and hospital administrators for future funding of interpreter services.

5.2 Findings from the retrospective audit

Exploring interpreter service usage at a WA hospital is crucial to determine strategies for improvement to strengthen the provision of interpreter services. Through this audit, there are several areas that can be addressed as recommendations and to be translated into best practice in the hospital setting. The retrospective audit presented in this report provided insight into the population groups that required language assistance, the languages preferred for interpretation, and the frequent usage of interpretation modalities (accredited in-person interpreters and telephone) across clinical visits. The following sections will further elaborate on the key findings of the retrospective audit.

Demographic profile of patients requiring an interpreter

The demographic composition of the audited CaLD patient sample provided insight into the langauges spoken by patients which were predominatly Asian languages including Mandarin, Dari, Arabic, Karen, and Hazaraghi. Comparing the Census data and the current findings of the project, the differences in the language spoken at home and the preferred language of patients may reflect the changing patterns of the CaLD population with new emerging communities residing in the district of the WA hospital. Hence, understanding the CaLD community profile is critical to help prepare health service providers to address the diverse language needs of patients and to reduce cultural-linguistic barriers. The collection of variables such as "country of origin" and "patients' preferred language" of CaLD patients are important information to assist hospitals and other healthcare settings to identify patients' language needs and help organise interpreters for the particular language.

Interpreter service usage across patient visits

The audit findings revealed that most clinical visits required accredited in-person interpreter service, particularly for outpatient visits. Previous studies have indicated that accredited interpreters could help build rapport by using visual cues and body language to assist the interpretation process (6). This is important in the outpatient setting which relies heavily on direct patient-clinician interaction for health diagnostic assessments as well as communicating about treatment plans and follow-up care (7). In contrast, telephone interpreter service was used more frequently in the ED and inpatient visits. This might be due to the convenient access to telephone interpretation in emergency situations, usually when an onsite interpreter was not readily organised or due to time constraints (8).

Estimated cost of interpreter services

Based on the calculated cost of interpreter services, the findings revealed that the cost of interpreter services varied by languages, interpretation modalities and service usage in different hospital units. Furthermore, interpretation sessions with longer duration incurred more cost which would be expected in most cases. Similar to Jacobs et al (2013) study, the estimated cost calculated in the retrospective study provided a narrow focus of the cost associated with service provision (9).

In the case of long-term funding for interpreter services, policymakers need to be aware of the cost impact associated with inadequate provision of language interpreter services (Jacobs et al., 2013). A study from Switzerland has found that while patients (asylum seekers) who used interpreter services increased access to health services, they had lower subsequent visits compared to patients facing a language barrier without interpretation (10). The study would suggest that providing interpreter services to patients with linguistic needs could prevent the escalation of healthcare cost (10). While this area remains unexplored, further investigation could help identify key measures to reduce health disparities and provide adequate language assistance (10).

Limitations

The methodological limitation of the retrospective audit needs to be noted. The methods of identifying records of interpreter service usage was determined by webPAS, and for this reason, the data collected did not capture the intended patient outcomes including adherence to follow-up appointment, length of stay and readmissions. The nature of a retrospective research design might also be a contributing factor where outcome variables are determined by the data available in the hospital computer system and databases. To consider alternative research designs, future studies could consider incorporating a qualitative component which would provide valuable insights into patients' experiences of service delivery and capture patients' views of using interpreter services in their hospital journey of care.

5.3 Recommendations

The following recommendations are presented for consideration to strengthen the provision of interpreter services:

Recommendation 1 – Encourage a collaborative approach between hospitals and contracted interpreter service to create a uniformed system to plan interpreter services and capture data on interpreter service usage. This collaboration would help inform hospital services of the availability of accredited interpreters

Recommendation 2 – Review language service policy from a health system perspective.

Recommendation 3 – Standardised the collection of patients' interpreter service usage to improve record-keeping. A mandatory requirement is to ensure that booking and invoices include patient UMRNs.

Recommendation 4 – Improve the process of recording interpreter service usage such as using medical notes or forms to record information.

Recommendation 5 – Increase staff awareness to ensure clear recordkeeping

Recommendation 6 – Future research can consider using a prospective study design by collecting real-time data to ensure adequate data is available

The above recommendations emphasise on strengthening the collaboration between hospitals and interpreter service agencies for the planning of interpreter services and to allow better data linkages on hospital systems and databases. The updated WA Language Service Policy and the WA health system data collection practices provide core recommendations to ensure adequate collection, monitoring and tracking of interpreter service usage, as well as the provision of interpreter services (3, 11). These recommendations and guidelines are essential steps to achieve the strategic vision stated on the WA Multicultural Policy Framework and the direction towards building a sustainable health system (4, 5).

5.4   Summary

With an increasingly culturally diverse population, the provision of interpreter services needs to be strengthened in hospital settings to ensure patient safety and quality of care. As part of this research project, the review undertaken highlighted that providing hospital interpreter services to patients faced with a language barrier could potentially lead to improved processes of care, patient safety and quality of care, and patient satisfaction. However, research designs tend to be retrospective in nature which relies heavily on hospital system data and potential confounding factors cannot be controlled. Further exploration into the impact of hospital interpreter services on patient hospital outcomes is needed for wider implementation in hospitals and other healthcare settings to provide a culturally safe environment for CaLD patients. While cost remains an important aspect of the decision-making process, policymakers and hospital administrators need to consider other factors when planning and investing resources for interpreter services to accommodate different linguistic needs of CaLD patients.

References to the introduction

1. Li C, Son N, Abdulkerim BA, Jordan CA, Son CG. Overcoming communication barriers to healthcare for culturally and ligusitically diverse patients. North America Journal of Medicine and Science, 2017;10(3):103-109.

2. Meuter RF, Gallois C, Segalowitz NS, Ryder AG, Hocking J. Overcoming language barriers in healthcare: A protocol for investigating safe and effective communication when patients or clinicians use a second language. BMC Health Services Research, 2015;15:371.

3. Karliner LS, Jacobs EA, Chen AH, Mutha S. Do professional interpreters improve clinical care for patients with limited English proficiency? A systematic review of the literature. Health Services Research, 2007;42(2): 727-54.

4. White J, Plompen T, Osadnik C, Tao L, Micallef E, Haines T. The experience of interpreter access and language discordant clinical encounters in Australian health care: a mixed methods exploration. International Journal for Equity in Health, 2018;17(1):151.

5. van Rosse F, de Bruijne M, Suurmond J, Essink-Bot M-L, Wagner C. Language barriers and patient safety risks in hospital care. A mixed methods study. International Journal of Nursing Studies, 2016; 54:45-53.

6. Karliner SL, Auerbach JA, Nápoles JA, Schillinger JD, Nickleach JD, Pérez-Stable JE. Language barriers and understanding of hospital discharge instructions. Medical Care, 2012; 50(4):283-9.

7. Bischoff A, Denhaerynck K. What do language barriers cost? An exploratory study among asylum seekers in Switzerland. BMC Health Services Research, **10,** 248.

8. Australian Bureau of Statistics. 2071.0 - Census of population and housing: Reflecting Australia - Stories from the Census, 2016 [Internet]. Canberra (Australia): Australian Bureau of Statistics 2017. Available from https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2071.0~2016~Main%20Features~Cultural%20Diversity%20Data%20Summary~30

9. Australian Bureau of Statistics. Census reveals a fast-changing, culturally diverse nation. 2017. Available from: https://www.abs.gov.au/ausstats/abs@.nsf/lookup/media%20release3.

10. Forrest S. Review of Cultural and Linguistic Diversity (CaLD) Data Collection Practices in the WA Health System 2018. Department of Health, Western Australia. Available from: https://ww2.health.wa.gov.au/-/media/Files/Corporate/general-

documents/Population-health/PDF/Review-of-CaLD-Data-Collection-Report.pdf

11.   Australian Bureau of Statistics. Understanding Migrant Outcomes - Insights from the Australian Census and Migrants Integrated Dataset, Australia2016. Available from: https://www.abs.gov.au/statistics/people/people-and-communities/understanding-migrant-outcomes-insights-australian-census-and-migrants-integrated-dataset-australia/2016.

12.   Department of Health and Human Services. Language Services Policy 2017. Available from: https://www.dhhs.vic.gov.au/publications/language-services-policy-and-guidelines.

13.   Department of Health WA. WA Health System Langauge Service Policy Guidelines. State of Western Australia; 2017.

14.   Baurer D, Yonek J, Cohen A, Restuccia J, Hasnain-Wynia R. System-Level Factors Affecting Clinicians' Perceptions and Use of Interpreter Services in California Public Hospitals. Journal of Immigrant & Minority Health, 2014;16(2):211-7.

15.   Blay N, Ioannou S, Seremetkoska M, Morris J, Holters G, Thomas V, et al. Healthcare interpreter utilisation: analysis of health administrative data. BMC Health Services Research. 2018;18(1):348.

16.   Ryan J, Abbato S, Greer R, Vayne-Bossert P, Good P. Rates and predictors of professional interpreting provision for patients with limited english proficiency in the emergency department and inpatient ward. Inquiry, 2017;54:46958017739981.

17.   Flores G, Abreu M, Barone CP, Bachur R, Lin H. Errors of medical interpretation and their potential clinical consequences: a comparison of professional versus ad hoc versus no interpreters. Annals of Emergency Medicine. 2012;60(5):545-53.

18.   Napoles AM, Santoyo-Olsson J, Karliner LS, Gregorich SE, Perez-Stable EJ. Inaccurate language interpretation and its clinical significance in the medical encounters of spanish-speaking latinos. Medical care, 2015;53(11):940-7.

19.   Flores G. The impact of medical interpreter services on the quality of health care: a systematic review. Medical Care Research and Review, 2005;62(3):255-99.

20.   Karliner LS, Jacobs EA, Chen AH, Mutha S. Do professional interpreters improve clinical care for patients with limited English proficiency? A systematic review of the literature. Health Services Research. 2007;42(2):727-54.

References to the systematic review

1. Rechel B. Migration and health in the European Union: McGraw-Hill Education (UK); 2011.

2. Betancourt JR, Renfrew MR, Green AR, Lopez L, Wasserman M. Improving patient safety systems for patients with limited English proficiency: a guide for hospitals. Rockville, MD: Agency for Healthcare Research and Quality; July 2012. AHRQ Publication No. 12-0041. September 2012. Available from https://www.ahrq.gov/sites/default/files/publications/files/lepguide.pdf

3. Joint Commission International. Joint Commission International Accreditation Standards for Hospitals Including Standards for Academic Medical Center Hospitals, 6 ed. 2017. Available from: https://www.jointcommissioninternational.org/-/media/jci/jci-documents/accreditation/hospital-and-amc/jci-standards-only_6th-ed-hospital.pdf.

4. Baurer D, Yonek JC, Cohen AB, Restuccia JD, Hasnain-Wynia R. System-level factors affecting clinicians' perceptions and use of interpreter services in California public hospitals. Journal of Immigrant & Minority Health, 2014;16(2):211-7.

5. Mayo R, Parker VG, Sherrill WW, Coltman K, Hudson MF, Nichols CM, et al. Cutting corners: Provider perceptions of interpretation services and factors related to use of an ad hoc interpreter. Hispanic Health Care International, 2016;14(2):73-80.

6. Lundin C, Hadziabdic E, Hjelm K. Language interpretation conditions and boundaries in multilingual and multicultural emergency healthcare. BMC International Health and Human Rights, 2018;18(1):23.

7. Flores G, Abreu M, Barone CP, Bachur R, Lin H. Errors of medical interpretation and their potential clinical consequences: a comparison of professional versus ad hoc versus no interpreters. Annals of Emergency Medicine, 2012;60(5):545-53.

8. Napoles AM, Santoyo-Olsson J, Karliner LS, Gregorich SE, Perez-Stable EJ. Inaccurate Language Interpretation and Its Clinical Significance in the Medical Encounters of Spanish-speaking Latinos. Medical Care, 2015;53(11):940-7.

9. Moher D, Liberati A, Tetzlaff J, Altman DG, The PG. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLOS Medicine. 2009;6(7):e1000097.

10. Whittemore R, Knafl K. The integrative review: updated methodology. Journal of Advanced Nursing, 2005;52(5):546-53.

11. Karliner LS, Jacobs EA, Chen AH, Mutha S. Do professional interpreters improve

clinical care for patients with limited English proficiency? A systematic review of the literature. Health Services Research, 2007; 42(2):727-54.

12. Flores G, Laws MB, Mayo SJ, Zuckerman B, Abreu M, Medina L, et al. Errors in medical interpretation and their potential clinical consequences in pediatric encounters. Pediatrics, 2003;111(1):6-14.

13. Gany F, Kapelusznik L, Prakash K, Gonzalez J, Orta LY, Tseng C-h, et al. The impact of medical interpretation method on time and errors. Journal of General Internal Medicine, 2007; 22:319-23.

14. Hornberger JC, Gibson CD Jr, Wood W, Dequeldre C, Corso I, Palla B, Bloch DA. Eliminating language barriers for non-English-speaking patients. Medical Care, 1996; 34(8):845-56.

15. Anttila A, Rappaport DI, Tijerino J, Zaman N, Sharif I. Interpretation modalities used on family-centered rounds: perspectives of Spanish-speaking families. Hospital Pediatrics, 2017; 7(8):492-8.

16. Crossman KL, Wiener E, Roosevelt G, Bajaj L, Hampers LC. Interpreters: telephonic, in-person interpretation and bilingual providers. Pediatrics, 2010;125(3):e631-8.

17. Lion KC, Brown JC, Ebel BE, Klein EJ, Strelitz B, Gutman CK, et al. Effect of telephone vs video interpretation on parent comprehension, communication, and utilization in the pediatric emergency department: a randomized clinical trial. JAMA Pediatrics, 2015;169(12):1117-25.

18. Fagan MJ, Diaz JA, Reinert SE, Sciamanna CN, Fagan DM. Impact of interpretation method on clinic visit length. Journal of General Internal Medicine. 2003;18(8):634-8.

19. Grover A, Deakyne S, Bajaj L, Roosevelt GE. Comparison of throughput times for limited english proficiency patient visits in the emergency department between different interpreter modalities. Journal of Immigrant and Minority Health, 2012; 14(4):602-7.

20. Burkle CM, Anderson KA, YaPa X, Guerra AE, Tschida-Reuter DA, Xiong Y. Assessment of the efficiency of language interpreter services in a busy surgical and procedural practice. BMC Health Services Research, 2017; 17:1-6.

21. Lee JS, Pérez-Stable EJ, Gregorich SE, Crawford MH, Green A, Livaudais-Toman J, et al. Increased Access to Professional Interpreters in the Hospital Improves Informed Consent for Patients with Limited English Proficiency. Journal of General Internal Medicine, 2017; 32(8):863-70.

22. Gutman CK, Cousins L, Gritton J, Klein EJ, Brown JC, Scannell J, et al. Professional

interpreter use and discharge communication in the pediatric emergency department. Academic Pediatrics, 2018; 18(8):935-43.

23. Lee JS, Nápoles A, Mutha S, Pérez-Stable EJ, Gregorich SE, Livaudais-Toman J, et al. Hospital discharge preparedness for patients with limited English proficiency: A mixed methods study of bedside interpreter-phones. Patient Education and Counseling, 2018;101(1):25-32.

24. Jimenez N, Moreno G, Leng M, Buchwald D, Morales LS. Patient-reported quality of pain treatment and use of interpreters in spanish-speaking patients hospitalized for obstetric and gynecological care. Journal of General Internal Medicine, 2012;27(12):1602-1608.

25. Tocher TM, Larson E. Quality of diabetes care for non-English-speaking patients. A comparative study. Western Journal of Medicine, 1998;168(6):504-11.

26. Daly C, Phillips K, Kanaan R. The effect of limited English proficiency and interpreter service use on clinical outcomes in psychiatric inpatient units. Australasian Psychiatry, 2019; 27(5):465-8.

27. Luan Erfe BM, Siddiqui KA, Schwamm LH, Kirwan C, Nunes A, Mejia NI. Professional Medical Interpreters Influence the Quality of Acute Ischemic Stroke Care for Patients Who Speak Languages Other than English. Journal of the American Heart Association. 2017;6(9).

28. Davies SE, Dodd KJ, Tu A, Zucchi E, Zen S, Hill KD. Does English proficiency impact on health outcomes for inpatients undergoing stroke rehabilitation? Disability and Rehabilitation, 2016; 38(14):1350-8.

29. Kilkenny MF, Lannin NA, Anderson CS, Dewey HM, Kim J, Barclay-Moss K, et al. Quality of life is poorer for patients with stroke who require an interpreter an observational Australian registry study. Stroke. 2018;49(3):761-4.

30. Bernstein J, Bernstein E, Dave A, Hardt E, James T, Linden J, et al. Trained medical interpreters in the emergency department: effects on services, subsequent charges, and follow-up. Journal of Immigrant Health. 2002;4(4):171-6.

31. Hampers LC, McNulty JE. Professional interpreters and bilingual physicians in a pediatric emergency department: effect on resource utilization. Archives of Pediatrics & Adolescent Medicine. 2002;156(11):1108-13.

32. Hartford EA, Anderson AP, Klein EJ, Caglar D, Carlin K, Lion KC. The Use and Impact of Professional Interpretation in a Pediatric Emergency Department. Academic Pediatrics. 2019;19(8):956-62.

33. Beagley J, Hlavac J, Zucchi E. Patient length of stay, patient readmission rates and the provision of professional interpreting services in healthcare in Australia. Health and Social Care in the Community. 2020;28(5):1643-50.

34. Abbato S, Greer R, Ryan J, Vayne-Bossert P, Good P. The Impact of Provision of Professional Language Interpretation on Length of Stay and Readmission Rates in an Acute Care Hospital Setting. Journal of Immigrant and Minority Health. 2019;21(5):965-70.

35. Lindholm M, Hargraves JL, Ferguson WJ, Reed G. Professional language interpretation and inpatient length of stay and readmission rates. Journal of General Internal Medicine. 2012;27(10):1294-9.

36. López L, Rodriguez F, Huerta D, Soukup J, Hicks L. Use of Interpreters by Physicians for Hospitalized Limited English Proficient Patients and Its Impact on Patient Outcomes. Journal of General Internal Medicine. 2015;30(6):783-9.

37. Karliner LS, Perez-Stable EJ, Gregorich SE. Convenient Access to Professional Interpreters in the Hospital Decreases Readmission Rates and Estimated Hospital Expenditures for Patients With Limited English Proficiency. Medical Care. 2017;55(3):199-206.

38. Bagchi AD, Dale S, Verbitsky-Savitz N, Andrecheck S, Zavotsky K, Eisenstein R. Examining Effectiveness of Medical Interpreters in Emergency Departments for Spanish-Speaking Patients with Limited English Proficiency: Results of a Randomized Controlled Trial. Annals of Emergency Medicine. 2011;57(3):248-56.e4.

39. Locatis C, Williamson D, Gould-Kabler C, Zone-Smith L, Detzler I, Roberson J, et al. Comparing in-person, video, and telephonic medical interpretation. Journal of General Internal Medicine. 2010;25(4):345-50.

40. Schulz TR, Leder K, Akinci I, Biggs B-A. Improvements in patient care: videoconferencing to improve access to interpreters during clinical consultations for refugee and immigrant patients. Australian Health Review. 2015;39(4):395-9.

41. Gany F, Leng J, Shapiro E, Abramson D, Motola I, Shield DC, et al. Patient satisfaction with different interpreting methods: A randomized controlled trial. Journal of General Internal Medicine. 2007;22(SUPPL. 2):312-8.

42. Cunningham H, Cushman LF, Akuete-Penn C, Meyer DD. Satisfaction with telephonic interpreters in pediatric care. Journal of the National Medical Association. 2008;100(4):429-34.

43. Jacobs EA, Sadowski LS, Rathouz PJ. The impact of an enhanced interpreter service

intervention on hospital costs and patient satisfaction. Journal of General Internal Medicine. 2007;22 Suppl 2:306-11.

44. Moreno G, Morales LS. Hablamos Juntos (Together We Speak): interpreters, provider communication, and satisfaction with care. Journal of General Internal Medicine. 2010;25(12):1282-8.

45. Kuo DMD, Fagan MJMD. Satisfaction with methods of spanish interpretation in an ambulatory care clinic. Journal of General Internal Medicine. 1999;14(9):547-50.

46. Bischoff A, Hudelson P, Bovier PA. Doctor-patient gender concordance and patient satisfaction in interpreter-mediated consultations: an exploratory study. Journal of Travel Medicine. 2008;15(1):1-5.

47. Jacobs EA, Leos GS, Rathouz PJ, Fu Jr P. Shared networks of interpreter services, at relatively low cost, can help providers serve patients with limited English skills. Health Affairs. 2011;30(10):1930-8.

48. Bischoff A, Denhaerynck K. What do language barriers cost? An exploratory study among asylum seekers in Switzerland. BMC Health Services Research, **10,** 248.

References to the retrospective audit

1. Office of Multicultural Interests. New and Emerging Communities in Western Australia 2018. Available from: https://www.omi.wa.gov.au/docs/librariesprovider2/statistics/new-and-emerging-communities-fact-sheet-2018.pdf?sfvrsn=e8b4054d_4.

2. Office of Multicultural Interests. Cultural and Linguistic Diversity in Western Australia (WA) 2016 Census 2016. Available from: https://www.omi.wa.gov.au/docs/librariesprovider2/statistics/cultural-and-linguistic-diversity-in-western-australia-(wa)-2016-census.pdf?sfvrsn=91788551_2.

3. Office of Multicultural Interests. WA Language Services Policy 2020. Available from https://www.omi.wa.gov.au/docs/librariesprovider2/language-services-policy-2020/wa-language-services-policy-guide_2020_edited2.pdf?sfvrsn=51165610_6

4. Office of Multicultural Interests. Western Australian Mulitcultural Policy Framework2020. Available from: https://www.omi.wa.gov.au/docs/librariesprovider2/default-document-library/wa-multicultural-policy-framework.pdf?sfvrsn=f0746f45_1.

5. Sustainable Health Review. (2019). Sustainable Health Review: Final Report to the Western Australian Government. Department of Health, Western Australia. Available from https://ww2.health.wa.gov.au/-/media/Files/Corporate/general-documents/Sustainable-Health-Review/Final-report/sustainable-health-review-final-report.pdf

6. Schulz TR, Leder K, Akinci I, Biggs B-A. Improvements in patient care: videoconferencing to improve access to interpreters during clinical consultations for refugee and immigrant patients. Australian Health Review. 2015;39(4):395-9

7. Jacobs B, Ryan AM, Henrichs KS, Weiss BD. Medical interpreters in outpatient practice. The Annals of Family Medicine. 2018 Jan 1;16(1):70-6.

8. Burkle CM, Anderson KA, YaPa X, Guerra AE, Tschida-Reuter DA, Xiong Y. Assessment of the efficiency of language interpreter services in a busy surgical and procedural practice. BMC Health Services Research, 2017; 17:1-6.

9. Jacobs EA, Leos GS, Rathouz PJ, Fu Jr P. Shared networks of interpreter services, at relatively low cost, can help providers serve patients with limited English skills. Health Affairs. 2011;30(10):1930-8

10. Bischoff A, Denhaerynck K. What do language barriers cost? An exploratory study among asylum seekers in Switzerland. BMC Health Services Research, **10,** 248.

11. Forrest S. Review of Cultural and Linguistic Diversity (CaLD) Data Collection Practices in the WA Health System 2018. Department of Health, Western Australia. Available from: https://ww2.health.wa.gov.au/-/media/Files/Corporate/general-documents/Population-health/PDF/Review-of-CaLD-Data-Collection-Report.pdf

APPENDICES

Appendix A – Search strategy

CINHAL (EBSCO) (n = 48)
1. MJ "Communication barriers" OR ("limited English proficiency") OR ("low English proficiency") OR (MH Language)
2. ("interpret service") OR "language service" OR "professional interpret"
3. "Patient Satisfaction"
4. (MH "Diagnostic Errors") OR (MH "Adverse Health Care Event")OR "clinical consequence"
5. ("visit length") OR (Length of Stay or readmission) OR (MH "Patient Admission") OR (MH "Patient Discharge") OR (MH "Patient Discharge Education")
6. (MH "Patient Care") OR (MH "quality of health care") OR (MH "Outcomes (Health Care)") OR "efficiency"
7. (hospital cost) OR (MH "Health Care Costs")
8. 3 OR 4 OR 5 OR 6 OR 7
9. 1 AND 2 AND 8 Limit to – Abstract available Source types: Academic Journals

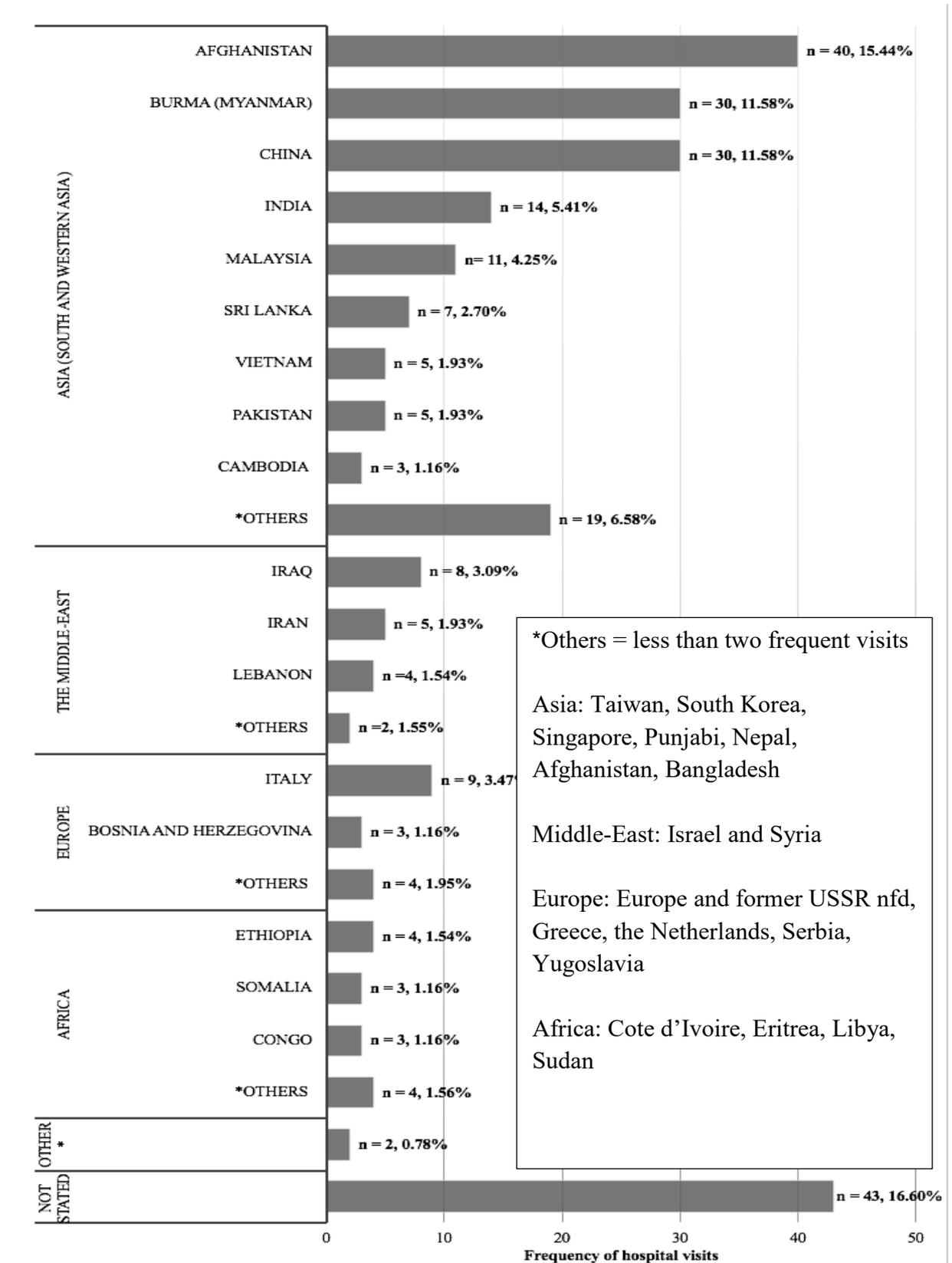| ProQuest (n = 52) |
|---|
| 1. MJMESH (Language) OR MJMESH (Communication Barriers) OR IF (limited English proficiency) |
| 2. ("interpret service" OR "professional interpreter" OR IF (medical interpreters) OR "interpret modalities") OR SU ("interpreters") |
| 3. ("hospital admission" OR "patient admission") OR ("hospital discharge" OR "patient discharge") |
| 4. (MESH (Quality of Health Care) OR MESH ("Patient Care") |
| 5. "length of stay" AND "patient readmission" OR "hospital readmission" |
| 6. "diagnostic error" OR SU (medical errors) |
| 7. MESH (patient satisfaction) |
| 8. "hospital cost" |
| 9. 3 OR 4 OR 5 OR 6 OR 7 OR 8 |
| 10. 1 AND 2 AND 9
Limit to peer-reviewed
Source type – scholarly journals |

MEDLINE (n = 71)
1. "limited English proficiency".ab. or "low English proficiency".mp. or Communication Barriers/
2. "language proficiency".mp.
3. ("culturally and linguistically diverse").mp
4. Language/
5. 1 or 2 or 3 or 4
6. "interpret service".ab. or ("professional language interpretation" or "language service").mp.
7. ("interpretation modalities" or "professional medical interpreter").mp.
8. 6 or 7
9. Hospitalization/ or hospital admission.mp. or Patient Admission/
10. ("Hospital discharge" or "discharge education").mp.
11. Patient Safety/
12. Quality of Health Care/
13. (("hospital length of stay" or "length of stay") and ("hospital readmission" or "readmission rates")).mp.
14. patient satisfaction/
15. "clinical outcome".mp. or treatment outcome/
16. medical error/ or "clinical consequence".mp. or "interpretation error".mp.
17. "cost and cost analysis"/ or hospital costs/ or healthcare cost/
18. 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17
19. 5 and 8 and 18
20. Keep 19 Limit 19 to Abstracts and English language = 71

PubMed (n = 55)
1. (Communication Barriers [MeSH Terms] OR (Language [MeSH Terms]) OR (healthcare disparities[MeSH Terms])
2. (("interpreter service"[Title/Abstract]) OR ("professional interpret"))
3. quality of health care [MeSH Terms]
4. hospitalization [MeSH Terms]) OR (length of stay [MeSH Terms])) AND ("patient readmission")
5.   (Medical Errors / adverse effects[MeSH Terms])
6. "patient satisfaction"
7. hospital cost [MeSH Terms]
8. #3 OR #4 OR #5 OR #6 OR #7
9. (hospitals [MeSH Terms]) OR (inpatients[MeSH Terms])) OR (outpatients [MeSH Terms])) OR (emergency service, hospital[MeSH Terms])) OR (primary health care[MeSH Terms])
10. 1 AND 2 AND 8 AND 9
11. Keep 10

SCOPUS (n = 50)
1. (KEY ("limited English proficiency") OR KEY ("language barriers") OR KEY ("communication barriers")
2. (KEY ("interpreter service") OR TITLE-ABS-KEY ("language services") OR TITLE-ABS-KEY ("professional interpret") OR TITLE-ABS-KEY ("medical interpret") OR TITLE-ABS-KEY ("interpret modalities") AND KEY (hospitals)
3. KEY ("Quality of health care") OR KEY ("treatment outcome")
4. (TITLE-ABS-KEY ("length of stay" OR "patient readmission") OR TITLE-ABS-KEY ("visit length")
5. TITLE-ABS-KEY ("diagnostic errors")
6. KEY ("patient satisfaction")
7. TITLE-ABS-KEY ("hospital cost")
8. #3 OR #4 OR #5 OR #6 OR #7
9. 1 AND 2 AND 8 = 50   Limited to Article AND EXCLUDE (SUBJAREA , "PHAR")   (Pharmacology, Toxicology and Pharmaceutics

Appendix B – Demographic profile of the patient sample

Country of origin

*Others = less than two frequent visits

Asia: Taiwan, South Korea, Singapore, Punjabi, Nepal, Afghanistan, Bangladesh

Middle-East: Israel and Syria

Europe: Europe and former USSR nfd, Greece, the Netherlands, Serbia, Yugoslavia

Africa: Cote d'Ivoire, Eritrea, Libya, Sudan

Preferred Language

*Others include: Bengali, Galpu, Greek, Hokkien, Korean, Kuku Yalanji, Malayalam, Maltese, Nepali, Polish, Tagalog
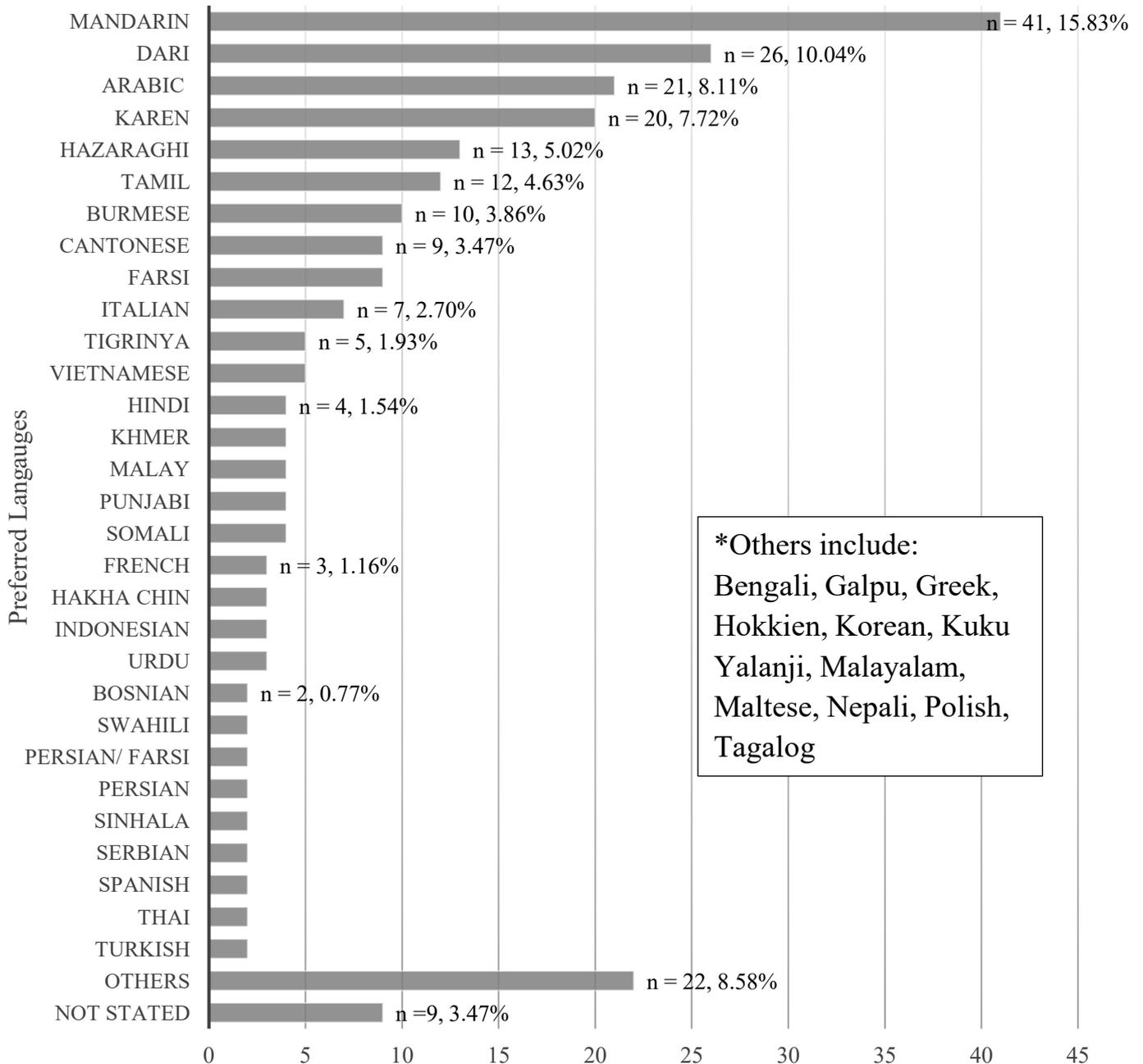
Appendix C – Interpreter service usage

Languages Available

Mandarin — n = 45 (14.52%)
Hazaraghi — n = 40 (12.90%)
Arabic — n = 29 (9.35%)
Dari — n =29 (9.35%)
Karen — n = 24 (7.74%)
Farsi
Burmese
Cantonese
Urdu
Italian
Vietnamese
Punjabi
Sinhala
Tamil
Malay
Serbian
Hakha Chin
Indonesian
Tigrinya
Khmer
Polish
Thai — n = 3 (0.97%)
Turkish
Greek — n = 2 (0.65%)
Hindi
Hokkien
Somali
Others

Others include:
Bosnian and Spanish

0   5   10   15   20   25   30   35   40   45   50
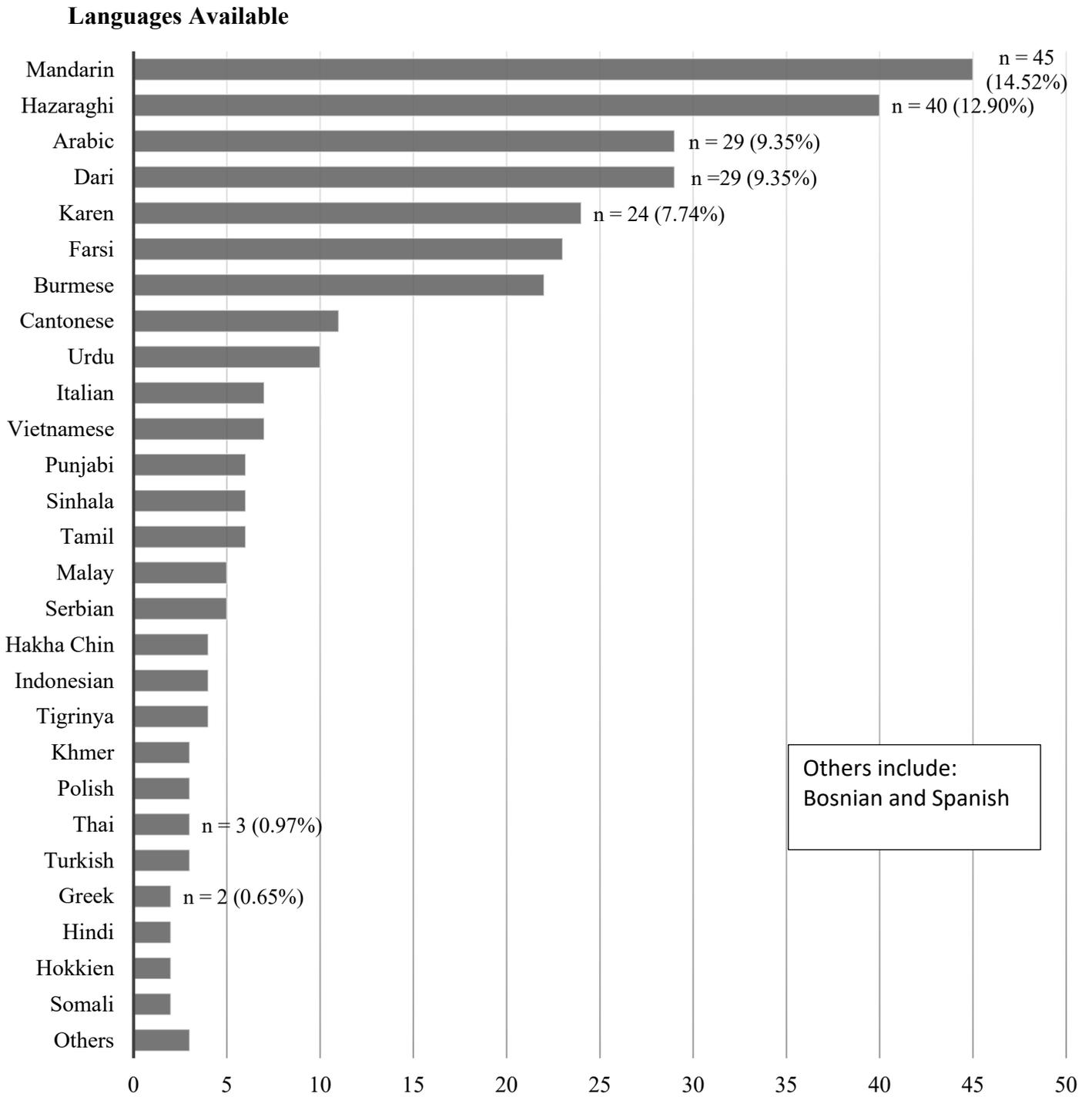
Cost estimates of interpreter services

	Onsite interpreter service			Telephone interpreter service		
	Duration (mins)	Mean cost ($)	Mean cost per minute ($)	Duration (mins)	Mean cost ($)	Mean cost per minute ($)
ED	**120**	**324.06**	**2.70**	**17.14**	**44.57**	**2.60**
Inpatient	**102.66**	**144.20**	**1.40**	**22.88**	**50.84**	**2.22**
AMU	60	103.4	1.72	23.3	51.02	2.1
Colyer ward	60	102.19	1.70	27	56.83	2.10
Maternity	120	156.2	1.30	24.55	58.20	2.37
Rehab ward	64.48	107.36	1.67	-	-	
Renal dialysis unit	-	-		30	58.63	1.95
Same day unit	121.5	169.37	1.39	26.67	53.80	2.02
Theatre	15	22	1.47	18.5	40.85	2.21
Outpatient	**91.58**	**138.86**	**1.52**	**41.45**	**78.23**	**1.89**
Antenatal clinic	-	-	-	21.25	42.97	2.02
Community Rehab	67.69	109.52	1.62	15	29.26	1.95
General Surgery specialty clinic	60	102.19	1.70	37.5	60.67	1.62
Obstetric	-	-		20	55.66	2.78
Orthopaedic Clinic	60	102.49	1.71	-	-	
Pre-admission	123.69	177.25	1.43	52.41	96.77	1.85
Not stated	**100.5**	**143.27**	**1.43**	**45**	**69.86**	**1.55**

CONTACT US

Faculty of Health Sciences
Curtin University
Kent Street Bentley WA
6102 GPO Box U1987
Perth WA 6845

Professor Jaya Dantas
Email: Jaya.Dantas@curtin.edu.au