

Role of Medical Students as Interpreters in Bridging Language Barriers across Academic Healthcare Centers: Scoping Review

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Abstract

Background: Linguistic concordance between healthcare providers and patients is critical for ensuring quality healthcare. Professional interpretation can be expensive and challenging to access. This scoping review aimed to explore the evidence on the role and education of medical students as interpreters in caring for patients with limited language proficiency (LLP), and to determine the benefits and risks associated with this practice. **Methods:** A scoping review using the Joanna Briggs Institute methodology was conducted. Six literature databases were searched systematically between 1946 – 02 Aug 2023. All publications discussing the use of medical students as interpreters in healthcare settings were included. Retained documents were analyzed using Covidence, with coding by two raters and regular team discussions. A thematic analysis framework was used. **Results:** Thirteen articles met the eligibility criteria. Multilingual medical students are frequently asked to interpret in healthcare settings. This was found to be advantageous in reducing communication barriers, improving care quality, and contributing to students' clinical experience. Concerns were raised regarding the lack of knowledge on the professional obligations of interpreters. Interpretation training programs for medical students have been implemented at selective healthcare centres and demonstrated successful results in providing care to LLP patients. **Conclusions:** Medical students play an important role in addressing language barriers in healthcare institutions when serving LLP patients, by combining their unique position in the healthcare team with their medical, linguistic, and cultural competency skills. Academic institutions stand to benefit from offering interpretation training programs and integrating medical students as a resource towards delivering language-concordant care.

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Authors’ Contributions

Shihan Chen and **Jun Yang Liu** contributed equally to this work. **Shihan Chen** : Substantial contributions to the conception or design of the work and the acquisition, analysis, and interpretation of data for the work; Drafting the work and reviewing it critically for important intellectual content; and Final approval of the version to be published. **Jun Yang Liu** : Substantial contributions to the conception or design of the work and the acquisition, analysis, and interpretation of data for the work; Drafting the work and reviewing it critically for important intellectual content; and Final approval of the version to be published. **Darya Naumova** : Substantial contributions to the conception or design of the work; Reviewing the work critically for important intellectual content; and Final approval of the version to be published. **Kenzy Abdelhamid** : Substantial contributions to the conception or design of the work and Final approval of the version to be published. **Amy Bergeron** : Substantial contributions to the conception or design of the work and Final approval of the version to be published. **Anish Arora** : Substantial contributions to the conception or design of the work; Reviewing the work critically for important intellectual content; and Final approval of the version to be published. **Bertrand Lebouché** : Substantial contributions to the conception or design of the work; Reviewing the work critically for important intellectual content; and Final approval of the version to be published.

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Abstract

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Methods: A scoping review using the Joanna Briggs Institute methodology was conducted. Six literature databases were searched systematically between 1946 – 02 Aug 2023. All publications discussing the use of medical students as interpreters in healthcare settings were included. Retained documents were analyzed using Covidence, with coding by two raters and regular team discussions. A thematic analysis framework was used.

Results: Thirteen articles met the eligibility criteria. Multilingual medical students are frequently asked to interpret in healthcare settings. This was found to be advantageous in reducing communication barriers, improving care quality, and contributing to students' clinical experience. Concerns were raised regarding the lack of knowledge on the professional obligations of interpreters. Interpretation training programs for medical students have been implemented at selective healthcare centres and demonstrated successful results in providing care to LLP patients.

Conclusions: Medical students play an important role in addressing language barriers in healthcare institutions when serving LLP patients, by combining their unique position in the healthcare team with their medical, linguistic, and cultural competency skills. Academic institutions stand to benefit from offering interpretation training programs and integrating medical students as a resource towards delivering language-concordant care.

Keywords: Language barriers, medical interpretation, medical students, medical education

Highlights

- Medical students are essential in addressing language barriers in healthcare
- Interpretation training programs may improve medical student performance
- Lack of guidelines and policies surrounding the scope of student interpreters
- Policy directives to develop trainings and include students as interpreters

Introduction

Communication is a cornerstone to the safety and quality of medical care delivery.¹ Effective communication facilitates the formation of trustful patient-healthcare provider relationships, thereby enabling better understanding of patients' perspectives, concerns, and expectations.^{2, 3} On the other hand, unresolved linguistic and cultural barriers can lead to the misunderstanding of symptoms, incorrect diagnosis, reduced patient compliance and satisfaction, and poor health outcomes.⁴⁻⁷

Communication barriers disproportionately affect populations with limited language proficiency (LLP) which include official language minorities, Indigenous people, and migrants⁸⁻¹⁰ Medical interpretation services have been shown to be effective in bridging cultural and linguistic gaps for LLP patients.¹¹ The use of professional medical interpreters is considered the highest standard in medical interpretation. Studies have shown that when caring for patients with language barriers, the quality of clinical care is improved and the number of medical errors is reduced if professional medical interpreters are used.⁷ However, several studies have reported relatively low rates of use of face-to-face professional interpretation services (i.e., 33% - 42%), which could be related to limited service availability, cost, and time inefficiency.¹²⁻¹⁷

When professional interpreters are not available, ad hoc interpreters, or friends and family members accompanying the patient, are often asked for translational support.⁸ There are several disadvantages to this. Ad hoc interpreters include people recruited through hospital-wide intercom announcements, other patients in the waiting rooms, or hospital employees. Both ad hoc interpreters and friends or family members are often untrained individuals whose language proficiency and dialect remain unverified prior to recruitment. There is evidence to suggest that when compared to no interpretation service, the use of untrained interpreters leads to greater miscommunication, an increased number of medical errors, and reduced quality of care.^{8, 18, 19} There is also a major issue of confidentiality and lack of ethical training associated with using untrained interpreters.⁸

Interestingly, studies from multiple countries have reported an increase in the diversity of incoming trainees across medical programs.²⁰⁻²³ For example, at McGill University (Montreal, Canada), 22 to 36% of students admitted to medical school in the last three years declared their mother tongue to be a language other than English or French (the national languages of Canada).²⁴ Such a heterogenous population of multilingual students with medical training are a valuable resource and could potentially bridge the gap in medical interpretation. Recruitment of medical student interpreters could mitigate the challenges associated with accessing professional interpretation services or relying on untrained native speakers. Medical students are proficient in medical terminologies, are familiar with the structure of healthcare institutions, are available on-site, and are trained in ethics and the intricacies of medical communication. As some healthcare institutions are exploring the role of medical students as medical interpreters,^{15, 25} more knowledge of the current evidence regarding the use of medical student interpreters is required to address these issues, specifically the current landscape of medical student interpretation, the existing interpretation training programs, as well as the benefits and risks associated with this practice. To address these knowledge gaps, a scoping review was conducted.

Methods

The present study was conducted in accordance with the Joanna Briggs Institute methodology for scoping reviews, namely 1) specify the research/review question, 2) identify relevant literature, 3) select studies, 4) charting the data, 5) summarize, synthesize, and report the results, and 6) identify implications for policy, practice, or research.²⁶ The scoping review methodology is pertinent in synthesizing research evidence, mapping out existing literature, and identifying current research gaps in a given field. No previous literature reviews have been published on this topic.

Identify the Review Question

This scoping review was guided by the following three questions: (1) what is the current evidence on the role and education of medical students as interpreters in care delivery for patients with LLP? (2) what is the feasibility, benefits, and disadvantages with this practice? and (3) what are the existing policies and ethical considerations?

Search Methods

The following databases were searched for relevant records on January 25 2022: Medline (via Ovid 1946 to 2022 January 24) The Cochrane Database of Systematic Reviews (via Wiley, from Inception to Issue 1 of 12, January 2022) and CENTRAL Register of Controlled Trials (via Wiley, from Inception to Issue 12 of 12, December 2021); Embase (via Ovid 1947 to 2022 January 24), CINAHL (via Wiley), Web of Science (via Clarivate, editions A&HCI, BKCI-SSH, BKCI-S, CCR-EXPANDED, ESCI, IC, CPCI-SSH, CPCI-S, SCI-EXPANDED, and SSCI), and Global Index Medicus (indexes WPRIM, LILACS, IMEMR, IMSEAR, AIM).

The search strategies were designed by an experienced librarian (AB), using text words and relevant subject headings to identify reports about medical students doing patient-professional translation in for linguistic minorities.

The final search strategies (**Appendix A**) were adapted for all databases, with modifications to search terms and syntax as necessary. No language or publication date limits were applied.

All records were imported into EndNote X9.3.3 for deduplication by the librarian.²⁷

To capture any advancements in the literature, the search strategies were rerun in all databases on August 2nd, 2023 (**Appendix B**).

Inclusion Criteria

Publication characteristics

Various publication types were eligible for inclusion, including primary and secondary literature, as well as guidelines and opinion pieces.

Population

The population of interest was undergraduate medical students serving as interpreters in the clinical setting. A medical student was defined as a person enrolled in an educational program in pursuit of an MD degree (or equivalent) at the time of the study. Studies may focus on either pre-clerkship students, clerkship students, or both. A medical interpreter was defined as a person who serves as a liaison between LLP patients and healthcare professionals by providing oral translation services. There were no selection criteria around the training of medical students, meaning the presence of a training program in medical interpretation is not a requirement for study inclusion.

Intervention

Documents had to focus on interventions to address volunteer-based or paid interpretation services by medical students. Publications describing interpretation performed by medical students in various clinical settings, including primary care settings, tertiary care settings, urgent-care settings, or telemedicine appointments were included. Exclusion criteria included articles that focused on either (a) medical imaging interpretation; and/or (b) translation, adaptation, or validation of scales, software, and other non-linguistic medical interpretation tools.

Following a pilot test, titles and abstracts were screened by two independent reviewers (S.C and J.Y. L) for assessment against the inclusion and exclusion criteria for the review.

Screening

Potentially relevant sources were retrieved in full, and their citation details imported into Covidence (Veritas Health Innovation, Melbourne, Australia), a web-based collaboration software platform that streamlines the production of systematic, scoping, and other literature reviews.²⁸ The full text of selected citations was assessed in detail against the inclusion criteria by two independent reviewers (S.C. and J.Y.L). Any disagreements that arose between the reviewers at each stage of the selection process were resolved through discussion. Reasons for exclusion of full text articles that did not meet the inclusion criteria were recorded and reported. The results of the search and the study inclusion process are presented in the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagrams (**Figure 1**).²⁹

Critical Appraisal

Consistent with scoping review guidelines, critical appraisal of the included documents was not performed.³⁰

Data Charting and Analysis

Data was extracted from papers that met eligibility criteria by two independent reviewers (S.C. and J.Y.L.) using a data extraction template developed on Covidence.²⁸ The following data was extracted: author(s), year of publication, study location, methodology and methods, language(s) of concern, study populations, aims of the study, important relevant results. Extracted data was entered into a charting form developed in Covidence. Both the first and the second authors validated the charted data. A thematic analysis of the following outcomes was compiled by both reviewers: the current landscape of medical student interpretation, the interpretation training programs developed for medical students, the advantages and disadvantages of medical student interpretation, and the legal and ethical implications.

Results

Search Results

The initial search resulted in a total of 3476 articles. After removing 1619 duplicates, 1857 records were reviewed for abstract screening. We removed 1840 of these and agreement between the two reviewers was strong (*Cohen's k* = 0.81).³¹ After independently assessing study titles and abstracts for inclusion and exclusion criteria, 13 articles fulfilled the criteria and were deemed relevant to include in this review.

Details about the screening process are presented in the PRISMA chart (**Figure 1**)

Characteristics of the Review Sample

Table 1 summarizes the characteristics of studies included in the current review.

In terms of methodologies, 9 of the retained articles (69%) were qualitative research studies and 4 (31%) were opinion pieces. The 13 articles came mainly from English-speaking countries, including the United States (US; n=9), Australia (n=2), the United Kingdom (UK; n=1), and New Zealand (n=1). Across these 13 articles, it was found that medical student interpretation services were provided in over 35 languages. Five studies (38%) described and evaluated the content, assessment, and effectiveness of interpretation training programs targeted at medical students that speak a language other than English. One article (7.7%) introduced an initiative which connects multilingual medical students with patients in need of translation services. Three articles (23%) surveyed graduating medical school cohorts to determine the frequency at which students acted as untrained ad hoc interpreters during their clinical rotations. In the four opinion articles (31%), authors expressed their perspectives on using medical students as ad hoc interpreters in various clinical settings. Most included studies (70%) discussed both advantages and disadvantages of medical students acting as interpreters. Interestingly, five studies (38%) emphasized the legal and ethical concerns associated with this issue. The experiences of hospital staff, patients, and medical students have also been documented in 7 of the articles (54%).

Thematic Analysis

Question 1. What is the Current Landscape of Medical Student Interpretation?

1.1 Medical students are frequently asked to interpret in the clinical setting. During the clerkship phase of training, medical students become active members of the healthcare treating team and interact closely with patients. The literature shows that bilingual medical trainees frequently act as interpreters for patients with limited language proficiency and with whom they share a common language. This was found to be especially true in the United States, where most bilingual (English- and Spanish-speaking) students in a single graduating class (84%) reported being asked to interpret at some point during their clinical rotations (**Table 1**).³² A similar trend has been found for other languages by Vargas Palaez et al, who surveyed fully bilingual first to third year medical students (speaking 21 languages) in Pennsylvania and reported that 55% of them had interpreted in community/healthcare organizations, and 79% had interpreted for family/friends.²¹ Similar data was reported in New Zealand and in Australia, where 50% and 34% of bilingual students respectively reported having acted as ad-hoc interpreters during their clinical training.^{25, 33} In most instances, students were involved for brief information relaying or interpretation of patients' conditions and treatments. However, several studies have also reported student involvement during complex procedures, critical care situations, and emotionally sensitive clinical encounters.^{25, 33, 34} It is also worth mentioning that the majority of medical students (>95%) surveyed in the above studies had no formal interpreting training or qualifications.

1.2 Training programs in medical interpretation have been developed for medical students. This review identified five medical interpretation training programs developed for medical trainees.^{15, 21, 34-36} The existing training programs vary in structure, duration, content, and assessment/evaluation. Information on these five training programs has been summarized in **Table 2**. All programs include theoretical foundation on the ethics of interpretation, as well as practical sessions where students participate in role-play activities or sample

clinical scenarios. In terms of evaluation and assessment for official certification, these programs include either formal assessment via an examination, or direct observation during an interpretation session. These methods can be compared to current competency-based evaluations in medical curricula. Assessments and observations are performed by professional interpreters or bilingual physicians^{15, 35, 36} Moreover, additional certification in medical interpretation upon completion of the standard training is offered as an option to pursue by two of the programs.^{15, 21} None of the studies measured transfer of learning, which is defined as one's capacity to apply learned skills in a new setting.³⁷ Finally, all training programs are optional for medical students.

The effectiveness of the above training programs has been demonstrated through student self-assessments and/or feedback from healthcare teams and patients. Upon completion of training, most students reported an improvement in interpreting comfort, understanding of the interpreter's role, interpretation skills, and empathy towards LLP patients.^{21, 34, 36} In two of the studies, student trainees were rated highly by hospital staff, professional interpreters, and patients.^{34, 35}

1.3 Limitations of medical interpretation training programs. Several limitations have been identified for the training programs. Vargas et al has pointed that medical students often find it difficult to participate in prolonged training programs due to their busy schedules. It was suggested that programs should be modified to reduce time commitment.²¹ The lack of objective comparison with control group of untrained students has also been identified as a major challenge when assessing training effectiveness.^{21, 34} Moreover, though most programs collected self-assessments from participants, many lacked objective third-party assessment.^{21, 34, 36}

Question 2. What are the Advantages of Medical Student Interpretation?

The literature reveals several advantages of medical student interpretation, which can be classified into 2 categories: advantages for patients and healthcare institutions, and advantages for student education.

2.1 Medical student interpretation is beneficial for patients and healthcare institutions. In healthcare institutions, student interpreters help expand the pool of interpreters, which was found to reduce the stress on staff, reduce wait time, and help maintain quality of care.^{15, 33, 38} They contribute to increasing in-person interpreter availability, which is often preferred over virtual means and leads to greater patient and physician satisfaction.¹⁵ Furthermore, medical students may often spend more time with patients than staff physicians and can contribute to their team's care of LLP patients by gathering additional information.^{33, 39} Students who share the same language with patients were also found to be in a better position to notice cultural subtleties and to provide culturally concordant explanations, which overall support the promotion of patient-centered care.^{33, 39} Hospital staff and patients were found to be grateful for interpretation services provided by medical students, who were noted to be conscientious and demonstrate good judgement about when to seek help.³⁵ According to Diaz et al, participants in the respective training program were highly rated by healthcare providers.³⁴ Some physicians also found it helpful to have even untrained medical students interpreting in certain clinical encounters.³⁹ Finally, permitting students to serve as interpreters has been suggested to contribute to building a future workforce of culturally competent physicians, and heighten the awareness of cultural sensitivity among healthcare providers.^{15, 38}

2.2 Medical student interpretation is beneficial for students' education. While it was advantageous for both patients and healthcare institutions to have medical students as interpreters, students themselves also benefited from this relationship. They were found to gain a better multidisciplinary perspective through working with different members of the healthcare team and to learn about the interpersonal and technical dimensions of healthcare.^{15, 35, 39, 40} Furthermore, with exposure to a diverse population of various cultural backgrounds, students had the opportunity to build their cultural competency skills and prepare themselves to serve a diverse patient population.^{15, 34, 39, 41} Even when medical students served as ad hoc interpreters without prior training, they reported the experience to be positive overall. In these cases, students highlighted that they connected with patients in meaningful ways, and that they enjoyed making a valuable contribution to patient care.^{25, 33, 35} The experience also contributed to the formation of their identity as professional heal-

thcare providers.^{25, 41} Preclinical students benefited greatly by gaining early exposure to patient care.^{15, 36} Moreover, medical students who participated in an interpretation training program reported becoming better informed about medical interpretation and being more comfortable in that role.^{21, 34, 36} They also improved their communication skills by gaining insight into the ways both verbal and nonverbal forms of communication can influence a patient encounter.^{21, 34} It was also found that by attending interpretation training, students became more empathetic towards patients with limited English proficiency.^{21, 40, 41}

Question 3. What are the Disadvantages of Medical Student Interpretation?

Despite its benefits, interpretation by medical students has also been found to carry certain disadvantages.

3.1 Medical student interpretation carries disadvantages for students themselves. A potential disadvantage reported in the literature was that during an encounter, students may focus more on interpretation than clinical learning, especially in high-stakes or complex situations.^{25, 33, 41} Furthermore, medical students have demanding schedules which limit their availability to participate in an interpretation training program. Students also reported not having formal medical terminology training in their mother tongues.⁴¹ The literature shows that students without formal training frequently found themselves in uncomfortable scenarios where they had to interpret sensitive and/or critical information while feeling unprepared.^{32, 39, 41} Moreover, attending physicians are often not aware of students' interpretation skills and linguistic limitations, possibly increasing the burden for students who are hesitant to refuse the task.^{32, 41} In fact, a significant proportion of students encountered challenging situations where they felt uncomfortable yet obligated to interpret.^{32, 33}

3.2 Medical student interpretation carries disadvantages for patients and healthcare teams. Concerns were identified for patients and healthcare teams, often in the context of untrained medical students, focusing specifically on insufficient medical vocabulary, lack of fluency, and poor cultural competency.^{32, 33, 41} These issues may lead to misinterpretation, omission, and truncated patient responses.³⁵ Another disadvantage for ad hoc student interpretation is the possible trivialization of the importance of language concordance: while students help address the demand for more interpretation services, their lack of training and qualifications may be regarded as devaluing professional medical interpretation.^{19, 32} Bilingual students did demonstrate an interest in acquiring training in medical interpretation, however maintenance of qualifications is also an important concern.³³ Ambiguity regarding the medical student's role was also expressed. For example, challenges exist for students, patients, and physicians in distinguishing between students' clinical and interpretation roles, increasing the risk of interpretation errors.^{8, 15, 33, 41}

Question 4. What are the Legal and Ethical Implications of Medical Student Interpretation?

Ethical challenges have been raised regarding the use of medical students as interpreters. Hospital staff and policymakers were concerned about students' lack of knowledge in the ethical principles and professional conducts of interpreting.³³ A key requirement of professional interpreters is maintaining professional detachment and impartiality. This can be challenging for medical students who are learning to be part of the healthcare team. The literature shows that students may see themselves as "patient helpers", which reflects principles of patient-centered care taught in their education, but is inappropriate in the context of interpretation (due to inability to maintain professional detachment).⁴² Another ethical concern raised was the possibility of students working beyond the limits of their capacity. The power imbalance makes it difficult for students to refuse staff physicians' requests. As a result, students may feel pressured to interpret even in situations which are not appropriate for their skill levels, especially when no other resources are available.^{25, 32} Furthermore, Yang et al emphasized the need for patients to be fully informed and to give consent for the medical student to interpret. Finally, hospital stakeholders have raised the question of determining in which situations students should be allowed to interpret. Some expressed that they should not interpret in situations involving sensitive discussions about mental or sexual health.³⁵ Variables such as the student's fluency, patient's comfort level, and unexpected questions could all add burden to the team.³³ Certain supervisors proposed that students should interpret during emergencies when professional interpreters are not available, while others suggested student involvement in low-risk situations where only simple messages are relayed.²⁵

Discussion

Language barriers in healthcare are apparent and their negative consequences are widely recognized. This scoping review is the first to provide a qualitative synthesis of the literature on the potential of medical students in bridging the language barrier in academic healthcare centers by engaging as interpreters.

In the context where access to medical interpretation services is often limited, students constitute a favorable alternative to other forms of ad hoc interpretation such as family and friends. Multilingual medical students are often asked to interpret in patient encounters and represent a valuable resource towards providing language-concordant care.^{20,24,33,34} Positive attitudes have been expressed surrounding this practice, especially in situations where students previously received interpretation training. Patients and providers have reported being grateful for student involvement, appreciating the additional availability for interpretation and rating their performance highly.^{32, 35} Students emphasized a positive educational value in receiving such training, noting improvement in communication skills, empathy, and cultural awareness. They also acknowledged their value as team members and developed their professional identity as patient advocates.^{20, 35, 40} Such training programs were also recognized to offload the demand for interpretation among health systems.^{20, 40}

However, most medical students receive no formal education regarding interpretation. Academic healthcare institutions and medical schools can optimize the potential of students as interpreters in the clinical setting by offering additional training. As existing programs have shown, students would benefit from a blend of interpretation theory and scenario-based activities. Post-training evaluation of students should include direct observation of a clinical encounter, ideally completed by a professional interpreter. The program format should be condensed to accommodate the workload and time constraints of medical students. Proposed funding models mainly consist of joined support from a medical school and one of its affiliated health centres.

Challenges raised surrounding this practice relate predominantly to ethical considerations. Students may be unaware of the professional implications of an interpreter, thus limiting the distinction with their role as a clinical learner.¹⁴ In addition, variation among students in fluency and knowledge of medical terminology in the concerned language may result in differences in interpretation quality. Measures have been taken to recognize and address these concerns. Existing training programs are provided by professional interpreters and cover the ethical-legal obligations of students in that role. Language fluency is assessed in the evaluation process and students reported increased confidence when asked to interpret following participation in a program.^{20, 35, 40}

Additional guidelines should be established to standardize the operationalization of student interpreters. There is currently a lack of clear policies surrounding this practice, which may be a reflection of the dearth of literature available to inform standards. Although some countries have established recommendations around medical interpreters, there is significant inconsistency across regulatory bodies and students are often not mentioned explicitly. In the United States, the Affordable Care Act requires all healthcare providers receiving federal assistance to provide LLP patients with a qualified interpreter, including on-site or video interpretation.⁴¹ To be qualified, an individual must complete a formal training program. In Canada, healthcare interpretation services are seen as ancillary services that are not universally ensured. However, there has been discussion on whether these services should be considered medically necessary.

It is also important to recognize that formal interpreters remain the gold standard in providing language-concordant care, and efforts should be made to improve access to these services.

Study limitations

The current study is limited by the fact that scoping reviews do not assess the quality of data when extracting information from studies, as compared to systematic reviews. However, our comprehensive search strategy developed via collaboration with a hospital librarian and our strict use of two independent reviewers throughout the study was critical in ensuring the rigour and systematicity of this review.

Conclusion

Multilingual medical students frequently play a role in enhancing language-concordant care for patients with LLP, through their educational background and their unique role in the healthcare team. Interpretation training programs are beneficial in improving student performance in this role and addressing professional considerations. There remains a lack of guidelines surrounding the scope of student interpreters, which is likely a reflection of the literature gap. In the absence of a universal solution for patients with LLP, this review highlights medical students as a favorable resource to be optimized in academic healthcare settings.

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Table 1. Current Literature on Medical Student Interpreters in the Healthcare Setting.

Author (year)	Title	Country of origin	Language of concern	Aim of study	Study design and main findings
Larson 1999 ³⁸	Using medical students in a translation service for the hospital	US	27 languages	To introduce and discuss the effectiveness of the Penn Med language link (PMLL).	PMLL has provided invaluable services to the hospital, ensuring that language barriers do not impede high quality care. Both number of participants and number of languages offered has increased over the years.
Monroe 2004 ³⁵	Challenging linguistic barriers to health care: students as medical interpreters	US	Mainly Spanish and Portuguese, also Thai	To review the development and implementation of the IAP (Interpreter's Aide Program) at Brown Medical School, a program to expand interpretation services through a service-learning partnership between academic institutions and health care organizations.	Mixed-methods study that found that the most common reasons students drop interpretation training programs were studying abroad, completed academic demands, and graduation.

Author (year)	Title	Country of origin	Language of concern	Aim of study	Study design and main findings
Yang 2008 ³³	Bilingual medical students as interpreters—what are the benefits and risks?	New Zealand	35 languages	To identify the frequency of medical students interpreting in healthcare settings and to explore the issues related to the use of non-professional interpreters.	Survey finding that over 50% of bilingual senior students act as ad hoc interpreters, and experiences are a mix of good, normal, and bad.
Vela 2016 ³²	Medical Students' Experiences and Perspectives on Interpreting for LEP Patients at Two US Medical Schools	US	Spanish, Chinese, Hindi, Arabic, German, Polish, Other Multilingual	To assess the frequency at which medical students act as interpreters, as well as students' perspectives on their experience as interpreters in the healthcare setting.	Survey finding that 40% of graduating medical students are bilingual; 84% had been asked to interpret; 12% had been comfortable doing so.
Diaz 2016 ³⁴	Interpreter training for medical students: pilot implementation and assessment in a student-run clinic	US	Spanish	To describe a training program for medical students fluent in Spanish and study the feasibility and efficacy of leveraging medical student volunteers to improve interpretation service	Four-year pilot study, where medical students got trained in interpretation, and increased in knowledge and felt more comfortable with the role of an interpreter.

Author (year)	Title	Country of origin	Language of concern	Aim of study	Study design and main findings
Vargas Pelaez 2018 ²¹	Implementing a medical student interpreter training program as a strategy to developing humanism	US	21 languages	To evaluate whether medical interpretation training program at Penn State College of Medicine had an impact on bilingual medical student's interpretation skills and humanistic traits.	Prospective study, where 80 bilingual medical students were trained in medical interpretation. 98% felt more comfortable interpreting, and 87% felt more empathetic towards patients with limited English proficiency.
Ryan 2019 ²⁵	Medical students as interpreters in health care situations: "... it's a grey area"	Australia	35 Languages	The prevalence and experience of medical students acting as ad hoc interpreters in Australia.	Survey finding that 73% of final year medical students speak a language other than English; 38% had been asked to interpret; 34% agreed; 0% had formal interpretation qualifications

Author (year)	Title	Country of origin	Language of concern	Aim of study	Study design and main findings
Carney 2019 ⁴²	Should medical students act as interpreters?	Australia	All languages.	An Australian doctor expressing his opinion on using medical students as ad hoc interpreters.	In this opinion article, the author described the ethical concerns associated with medical student interpretation and raised discussion about special circumstances where students should be allowed to interpret.
Aitken 2019 ¹⁵	Medical Students as Certified Interpreters	US	Spanish	To Introduce an interpreter certification program at Loyola University Chicago Stritch School of Medicine and discuss the benefits and risks of medical student interpretation	Three-year pilot study, where ten students got medical interpretation certification in two-years.

Author (year)	Title	Country of origin	Language of concern	Aim of study	Study design and main findings
Quesada 2020 ⁴¹	Student Medical Interpreters: A Double-Edged Sword	US	Spanish	To present a hypothetical scenario in which a bilingual medical student is asked to act as interpreter in the context of giving a life-altering diagnosis. To discuss the advantages and disadvantages of using bilingual medical students as ad hoc interpreters.	Case presentation and discussion. Bilingual medical students jeopardize their learning by dually functioning as interpreters and rotating otolaryngology students. Reform to student interpreter training and attending-to-student relationship will help maximize student learning for bilingual medical students interested in functioning as interpreters at the bedside and increase humanism.
Tehseen 2021 ⁴⁰	Medical student interpreter training schemes: an aid in post-COVID primary care?	UK	All languages	To discuss whether medical student interpreter training schemes are an aid in post-COVID primary care.	In this letter to editor, the author discussed the limitations with interpreter use which could potentially be ameliorated by integrating voluntary interpreter training into medical education.

Author (year)	Title	Country of origin	Language of concern	Aim of study	Study design and main findings
Bair 2021 ³⁹	Found in translation	US	Chinese	A medical student details his experience interpreting for a physician and his Chinese-speaking depression-afflicted patient.	In this opinion article, the author describes and reflects on the difficulties presented in cross-cultural interactions and examines lessons on how healthcare providers can more compassionately approach all patients.
Carlson 2022 ³⁶	Overcoming the language barrier: a novel curriculum for training medical students as volunteer medical interpreters	US	Spanish	To introduce a novel interpreter training program which was developed for medical students to serve as in-person interpreters at a charitable, resident continuity clinic so as to overcome the language barrier in the delivery of healthcare to LLP patients	Three-year pilot study, which resulted in an increased number of trained, Spanish-speaking interpreters. The MSITP (Medical Student Interpreter Training Program) is an effective model for training students as medical interpreters to ensure the delivery of quality healthcare for LLP patients.

Table 2. Medical Student Interpretation Training Programs.

Author (year)	Length (hours)	Languages	Year of study	Theoretical component	Practical component	Language assessment and other details
Carlson, E.S. (2022) ³⁶	4	Spanish	First, second	1 hour shadowing of professional interpreter	3 hours of training + practice	Alta language services level 2 proficiency+ constructive feedback from professional interpreters + interpreter training Pre-Test and Post-Test to assess students' understand- ing of ethics and techniques
Aitken, G. (2019) ¹⁵	9	Spanish	First, second	2 hours of pre-assessment + shadowing of professional interpreter	3 hours of training + practice	Alta language services level 2 proficiency, 4 hours of direct demonstration and final evaluation by interpreter
Vargas Pelaez, A. F. (2018) ²¹	8	21 languages	First-Third	Workshop with case studies	Role-play, small group activities	Constructive feedback + 15-20 hours of interpre- tation training; optional certification
Diaz, J. E. (2016) ³⁴	6	Spanish	First-Fourth (one module per year)	Four modules (Figure B3)	Scenarios, role-plays, practise sessions	No language assessment

Author (year)	Length (hours)	Languages	Year of study	Theoretical component	Practical component	Language assessment and other details
Monroe, A.D. (2004) ³⁵	Variable	Spanish, Portuguese	Any	4-6 hours of shadowing professional interpreter, two technical and cross- cultural seminars	Observation and assessment by professional interpreter	Oral and written examination to become interpreter's aides (IAs) + commitment to serve for a minimum of 4 hours/week

Figure Legends

Figure 1 . PRISMA flow diagram of included/excluded studies. Search results and the study inclusion processes of the first search (performed on January 25, 2022) and the extended search (performed on August 2, 2023) combined.

*The number of records identified from each database or register searched has been reported.

**All records were excluded by the two reviewers.

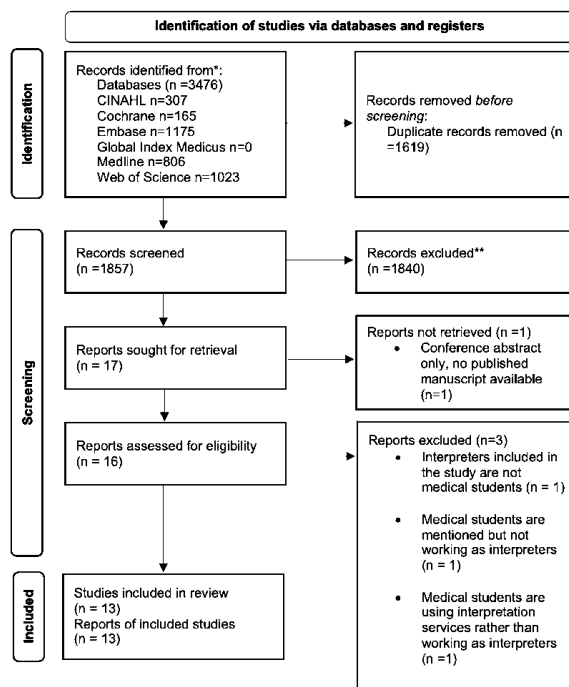


Figure 1. PRISMA flow diagram of included/excluded studies.