

Expanding and Supporting the Primary Care Nurse Practitioner Workforce to Improve Health
Outcomes for Communities and Patients with Language Needs

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Abstract

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The population with language needs in the U.S. has grown substantially due to increased immigration, language diversification, and persistent structural barriers to education and employment that perpetuate linguistic isolation. This demographic shift pressures healthcare systems to adapt and provide more language-accessible care, as patients with language needs experience worse health outcomes than English-proficient patients. Primary care involves continuous, coordinated healthcare services that range from preventive, routine, and chronic disease care management. Access to primary care services prevents unnecessary acute care utilization and promotes health equity for underserved populations, including those with language needs. However, increasing demands, workforce shortages, and unsupportive care environments within primary care practices serving patients with language needs challenge the delivery of high-quality primary care.

Nurse Practitioners (NPs) are a fast-growing workforce of primary care providers who provide safe, high-quality care, especially to patients residing in underserved areas. Therefore, the NP workforce is well-positioned to help meet the increasing demand for primary care for those with language needs and make primary care more accessible in communities with language needs. When NPs work in supportive care environments, patients receive higher-quality care and have improved health outcomes; however, most NPs work in poor care environments, which may limit their ability to meet the language needs of communities and individuals.

To our knowledge, no study has explored patient outcomes in NP primary care practices in communities with language needs or assessed how NP care environments influence differences in patient outcomes related to caring for patients with language needs. The dissertation aimed to address these gaps by evaluating the effectiveness of NPs as primary care providers for communities with language needs and identifying ways to best support NPs caring for patients with language needs to reduce health disparities. *The overall purpose of this dissertation is to produce evidence on expanding and supporting the primary care NP workforce to improve health outcomes for communities and patients with language needs.*

In Chapter 1, we provide an overview of the unique healthcare needs of patients and communities with language needs and the role of NPs and supportive work environments in improving access to primary care and reducing reliance on acute care services.

In Chapter 2, existing evidence on the impact of primary care service delivery on acute care utilization (emergency department (ED) visits, hospitalizations, and readmissions) and access to care for patients with LEP was synthesized. Nine studies met the inclusion criteria. Primary care services (i.e., interpreters, language-concordant providers, and telehealth) reduced ED utilization and readmissions for patients with LEP, but did not significantly impact hospitalizations. During the COVID-19 pandemic, patients with LEP faced disparities in access to care. Our synthesis suggests that ensuring reliable access to language services in primary care practices is essential to meet the needs of patients with LEP and to reduce health disparities.

In Chapter 3, we performed a secondary data analysis of an existing cross-sectional dataset containing information on Medicare beneficiaries, including demographic characteristics, ED and hospitalization use, and data on the percentage of households with LEP in communities where primary care practices are located. This was a merged dataset of Medicare data with

American Community Survey data, resulting in a sample of 506,516 Medicare beneficiaries receiving primary care services at 895 NP-employing practices located in communities with varying percentages of households with LEP, ranging from 0.0% to 72.4%. We assessed whether the percentage of households with LEP in communities where NP primary care practices are located is associated with ED use and hospitalization among older adult patients receiving care at these practices. We found that receiving care at NP practices located in communities with a higher percentage of households with LEP was associated with a significantly lower incidence of ED visits and a marginally significantly lower incidence of hospitalizations among older adults. Our findings suggest that the NP workforce is essential to increasing access to primary care in LEP communities and reducing reliance on acute care services.

In Chapter 4, we assessed how the NP work environment moderates the relationship between the likelihood of primary care practices caring for non-English speaking (NES) patients and ED visits and hospitalizations. Across 596,677 Medicare beneficiaries receiving care in 1,042 primary care practices, we found that as the NP work environment improved, the positive association between practices reporting a higher likelihood of caring for NES patients and higher acute care use weakened. Our findings provide novel evidence that improved NP work environments can significantly weaken or eliminate health disparities related to caring for NES patients.

In Chapter 5, we conclude with a summary of the findings and provide practice, policy, and research implications aimed at enhancing the accessibility of health services to communities and patients with language needs and fostering more supportive NP care environments for safe and high-quality care. We also discuss the strengths and limitations of this dissertation.

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Dedication

To nurses: we make the world go round.

For Marina Valerjevna Tyurina, whose courage gave me the chance to have the most amazing
life.

Chapter 1: Introduction

Language and Health

Language is a social determinant of health (Federici, 2022; Feuerherm et al., 2021). It influences how we access and navigate healthcare systems, communicate with healthcare providers, and understand health information. The United States (U.S.) is one of the most linguistically diverse countries in the world, with over 350 languages spoken (Molina & Kasper, 2019). While English is the dominant language, in 2023, over 71.1 million people (22.5%) reported speaking a language other than English (U.S. Census Bureau, 2023a). Of these people, over 27.6 million (38.8%) report having limited English proficiency (LEP) (U.S. Census Bureau, 2023a). LEP is defined by the U.S. Department of Health and Human Services as not speaking English as a primary language and having limited ability to speak, read, write, or understand English (i.e., speaking English less than “very well”) (Office of Civil Rights, 2013). Limited proficiency in the dominant language of a health system and differences in language abilities indicate the presence of language needs. Unmet language needs lead to health disparities in access to care, the quality of care received, and health outcomes due to communication barriers (Al Shamsi et al., 2020; Gerchow et al., 2021). Furthermore, the relationship between patients, healthcare providers, and the healthcare system relies heavily on trust and a sense of support. When language differences between patients and providers hinder effective communication (i.e., a language barrier), the expression of needs and goals becomes increasingly difficult for patients (Slade & Sergent, 2024). This can lead to diminished trust and a breakdown in the patient-provider relationship, which may jeopardize health outcomes and engagement with health systems. As linguistic diversity continues to grow in the U.S., addressing language needs is becoming an increasingly urgent priority to advancing health equity.

The Increasing Population with Language Needs

The number of persons with language needs in the U.S. is increasing. The primary reason for the increase in people with language needs is the continued rise in immigration, as most people with LEP in the U.S. are foreign-born and immigrate from non-English speaking countries (Twersky et al., 2024). Immigration in the U.S. is at an all-time high and has rapidly increased since the 1970s due to economic developments and political instability around the world (Batalova, 2025). In 2023, there was a record high of over 47.8 million people who immigrated to the U.S., accounting for 14.3% of the population (Batalova, 2025). Among this immigrant population, nearly half reported having LEP, which accounts for 81% of the total 27.9 million population with LEP (Batalova, 2025). Language needs are more common among non-U.S. citizens (56%) and naturalized U.S. citizens (37%) compared to U.S.-born citizens (2%) (Haldar et al., 2023). Therefore, as increasing immigration patterns continue to influence the demographic composition in the U.S., the population with language needs is naturally increasing.

People who immigrate to the U.S. often settle and live in areas with others from the same country or region, known as “ethnic enclaves” (Lim et al., 2017; Tam, 2019). These areas often have existing linguistic and cultural ties related to their native language and country of origin (e.g., Chinatown in New York City). Most people who immigrate do so with their family members and live together, increasing the number of households with LEP in the U.S. (Schumacher et al., 2023). Over 5.7 million households (4.4%) in the U.S. are considered LEP households, where all members 14 years or older have difficulty with English (U.S. Census Bureau, 2023c). These networks provide social support and cultural familiarity that reinforce the use of native languages. The growing LEP population is geographically concentrated in certain parts of the U.S., providing a large population base for forming LEP communities. These

communities are mainly concentrated on the west, east, and southern coasts, with most located in California (25%), Texas (14%), Florida (9%), and New York (9%) (Haldar et al., 2023).

Therefore, LEP communities form through immigration patterns that create linguistically different enclaves that preserve non-English native languages and cultural practices.

Linguistic diversity is also contributing to the rising population with language needs. Since a majority of immigrants arrive from non-English-speaking countries, this increases the number of people speaking languages other than English in the U.S. (Krampe et al., 2022). In fact, number of people who speak a language other than English at home has nearly tripled from 23.1 million in 1980 to over 71.1 million people (22.5%) in 2019 (Dietrich & Hernandez, 2022; U.S. Census Bureau, 2023b). This growth in non-English language use at home underscores the ongoing preservation of native languages by first-generation immigrants and their children, creating a multilingual society. The most common languages spoken by people with LEP are Spanish (63%), Chinese (7%), Vietnamese (3%), Arabic (2%), and Tagalog (2%); the remaining 23% speak other languages (Haldar et al., 2023). The increasing diversity of languages spoken in the U.S. and the resulting rise in those with LEP presents challenges for people with language needs to access language support and healthcare services.

LEP contributes to and results in limited access to education and employment opportunities. Individuals with LEP face structural barriers to educational attainment that delay or inhibit their ability to obtain English language skills, deepening linguistic isolation.

As a result, those with LEP are over five times more likely to have less than a high school education than English-proficient people (Haldar et al., 2023). Lower educational attainment restricts access to well-paying jobs, as people with LEP are also more likely to have lower incomes than those with English proficiency (Rao et al., 2024). Educational and employment

disadvantages contribute to economic insecurity, with nearly one in five people with LEP having a family income below 200% of the federal poverty level (Halдар et al., 2023). Further, workplace discrimination, including receiving lower pay or being underpaid for the amount of time they work and having undesirable working hours, is more common among people with LEP (Rao et al., 2024). Together, these barriers restrict access to opportunities to develop, practice, and improve English language skills, reinforcing linguistic isolation and perpetuating the cycle of unmet language needs among communities and individuals.

Challenges and Health Disparities Related to Language Needs

The growing LEP population is putting pressure on healthcare systems to adapt to provide language-accessible healthcare. People with LEP face significant challenges in accessing quality healthcare that meets their language needs (Al Shamsi et al., 2020; Krampe et al., 2022). Unequal access to healthcare services not only leads to poorer health outcomes for people with LEP but also contributes to widening health disparities.

Title VI of the Civil Rights Act of 1964 protects patients with LEP from discrimination, and healthcare practices receiving federal funding must “take reasonable steps to provide meaningful access to LEP individuals” (Civil Rights Act of 1964; U.S. House of Representatives, Office of the Legislative Counsel [U.S. House], 2010). However, despite this legal protection, many patients with LEP still encounter language barriers that hinder access to care and negatively impact health outcomes. Language barriers in healthcare most commonly occur when patients and providers do not share the same language, creating obstacles to communication (Slade & Sergent, 2024). Language barriers challenge the navigation of the healthcare system, communication with healthcare providers, and understanding of information for LEP patients (Al Shamsi et al., 2020; Gerchow et al., 2021; Martinez et al., 2021).

Compared with English-proficient patients, those with LEP report having fewer healthcare visits (86% vs. 95%), are over three times more likely to be uninsured (33% vs. 7%), and are less likely to have a usual source of care other than the emergency department (ED) (74% vs. 88%) (Gonzalez-Barrera et al., 2024; Haldar et al., 2023; Lu & Myerson, 2020). LEP patients also face challenges scheduling appointments and experience higher rates of delayed and forgone health care than English-proficient patients (Chang et al., 2024; Uscher-Pines et al., 2023). Even when patients with LEP access healthcare, they continue to experience disparities due to the lower quality of care delivered, mainly attributable to a lack of proper interpreter service use (Heath et al., 2023; MacFarlane et al., 2020; Wiles et al., 2023). Only 29% of ambulatory care providers reported using interpreter services regularly (Schulson & Anderson, 2022). When language barriers are not addressed in healthcare encounters, patients with LEP have decreased patient satisfaction and experience threats to their safety (Al Shamsi et al., 2020; Gerchow et al., 2021). Miscommunications also increase when language barriers are not addressed, leading to poorer quality of care received, delays in treatment, and unmet care needs among those with language needs (Espinoza Suarez et al., 2021; Sharkiya, 2023). These language-related challenges directly lead to poorer health outcomes for LEP patients, who experience higher rates of hospital readmissions, ED visits, adverse events, longer hospital stays, and increased risk of death (Abedini et al., 2022; Chandrashekar et al., 2022; Jacobs et al., 2020; Sliwinski et al., 2024b; Squires et al., 2022).

Evidence is clear that patients with LEP experience significant disparities and face challenges in accessing quality healthcare. Language barriers also uniquely challenge providers' ability to deliver high-quality, safe care to patients with LEP. Clinicians encountering language barriers when caring for patients with LEP report an incomplete understanding of patient needs,

leading to higher workplace stress and impediments to high-quality care delivery (Al Shamsi et al., 2020; Slade & Sergent, 2024; Squires, 2017). Therefore, language barriers affect both patients and clinicians.

Language Needs Among Older Adults

Over 5.2 million older adults (i.e., individuals 65 years and older) in the U.S. have LEP (U.S. Census Bureau, 2023a). Older adults with language needs face multiple, compounding structural barriers that impact their access to care, including more limited access to nearby care, increased difficulty contacting providers after hours, and lower rates of advanced care planning compared to English-proficient older adults (Abedini et al., 2022; Ramirez et al., 2023). Health literacy, especially digital health literacy, is also lower among older adults with language needs than among younger adults with language needs, creating additional obstacles to navigating healthcare systems (Medrano et al., 2023). Associated age-related barriers (e.g., hearing and vision impairments, memory loss, mobility issues, etc.) also increase the difficulty of using digital and non-digital health and language resources, like interpreter services (Krishnaswami et al., 2020). Poorer access to language-accessible, quality care for older adults with language needs results in worse health outcomes, including higher rates of ED visits, hospital readmissions, and in-hospital death compared to English-proficient older adults (Abedini et al., 2022).

As the U.S. population ages, these challenges among older adults with language needs will become more urgent. The older adult population is projected to increase by 64% (from 58 million to 88 million by 2060), significantly raising the primary care demand (Health Resources and Services Administration, 2023). Medicare, the single largest payer of healthcare services in the U.S., plays a critical role in caring for individuals and communities with language needs. As

of 2024, Medicare enrollment has reached 67.7 million people, with nearly 90% of enrollees being older adults (Centers for Medicare & Medicaid Services, 2024b). Importantly, the Centers for Medicare & Medicaid Services (CMS) are legally required to protect beneficiaries' rights to language-accessible care (Civil Rights act of 1964; U.S. House, 2010; Centers for Medicare & Medicaid Services, 2024b). With the percentage of Medicare beneficiaries with language needs increasing from 8% in 2017 to 11.7% in 2021, the growing demand for language-accessible primary care is becoming increasingly relevant (Centers for Medicare & Medicaid Services, 2024b). These trends call for a linguistically responsive primary care workforce that provides language-accessible care for individuals and communities with language needs.

Primary Care Practices for Individuals and Communities with Language Needs

For individuals and communities with language needs, the availability and proximity of language-accessible healthcare services strongly influence where and how patients seek healthcare. Research shows that patients with language needs forgo local healthcare facilities and travel longer distances to reach specific healthcare facilities where they know their language needs will be met (Sliwinski et al., 2024a; Squires et al., 2023). Despite traveling farther to find language-accessible care, patients often receive lower-quality care at these facilities, reflected in higher 30-day hospital readmission rates (Sliwinski et al., 2024a). Furthermore, those with language needs are less likely to report having a usual source of care other than the emergency room compared to English speakers (74% vs 88%) (Gonzalez-Barrera et al., 2024). This pattern exposes a significant gap in the healthcare system for those with language needs: when language-accessible care is unavailable nearby, those with language needs are less likely to engage with primary care services.

Primary care is the only sector of the healthcare system shown to improve health outcomes (National Academies of Sciences & Medicine, 2024; National Academies of Sciences et al., 2021). Traditionally, as the entry point to the healthcare system for patients, primary care makes healthcare accessible near where patients live (Institute of Medicine Committee on the Future of Primary, 1996). The purpose of primary care is to manage and address patients' health needs at an early stage to keep patients out of hospitals (Shi, 2012; Starfield et al., 2005). This central role not only ensures the delivery of healthcare nearby but also increases access to essential services for underserved populations, promoting health equity (Starfield et al., 2005). Primary care services are ongoing and comprehensive, including usual care, preventative care, and chronic disease management (Friedberg et al., 2010; Shi, 2012; Starfield et al., 2005). Higher access to primary care is associated with increased preventative care, chronic disease management, and lower ED and urgent care use (Hostetter et al., 2020; Timmins et al., 2020; Wilkinson et al., 2021). Therefore, strengthening the presence and capacity of primary care for communities and individuals with language needs is critical to addressing gaps in access and improving health outcomes.

The demand for primary care is growing across the U.S., driven by major policy and public health changes. The Affordable Care Act of 2010 expanded healthcare coverage to 31 million Americans (Bazemore et al., 2024). More recently, the COVID-19 pandemic increased reliance on primary care telehealth services (Dhaliwal et al., 2021; Newton et al., 2021). While these factors increase demand in all communities, it is especially urgent in populations with language needs, who already experience barriers to accessing care. Geographically, many LEP communities are concentrated along the U.S. West, East, and Southern coasts, where the demand for primary care is especially high due to large populations with language needs in these regions

(Health Resources and Services Administration, 2023). Further, the rise in the number of Medicare beneficiaries with language needs is also increasing the demand for primary care services to be language-accessible (Centers for Medicare & Medicaid Services, 2024b). Hence, a well-distributed workforce is essential to meet the growing demand for primary care, especially for individuals and communities with language needs.

The primary care workforce faces significant challenges in meeting increasing demands for care (Health Resources and Services Administration, 2023; Bazemore et al., 2024). By 2036, the shortage of full-time primary care physicians is projected to exceed 68,000 (Health Resources and Services Administration, 2023). These shortages are not evenly distributed, and they are most severe in already underserved areas where access to care is limited and patient need for primary care is the highest. In 2023, over 8,000 primary care practices were located in a Health Professional Shortage Area (HPSA) and nearly 101 million residents lived in an HPSA (National Academies of Sciences & Medicine, 2024). Limited access to care in these regions is linked to worse health outcomes (Hostetter et al., 2020; National Academies of Sciences & Medicine, 2024; Timmins et al., 2020; Wilkinson et al., 2021). Primary care provider shortages are more likely in communities occupied by minoritized and vulnerable populations, including LEP communities (Jindal et al., 2023). Patients in LEP communities already face barriers in accessing healthcare. When compounded by primary care provider shortages, these barriers result in further delays in treatment, less preventative care, and worse health outcomes (Hostetter et al., 2020; Timmins et al., 2020; Wilkinson et al., 2021). To better meet the growing demand and close gaps in access to care for those with language needs, the primary care system must expand and support its workforce.

Nurse Practitioner Primary Care Workforce in LEP Communities

The nurse practitioner (NP) workforce is becoming increasingly crucial in addressing the workforce challenges and meeting increased primary care demands (Adams et al., 2024). As registered nurses with advanced training, NPs offer a broad range of services, including diagnosing and treating acute and chronic conditions, ordering and interpreting diagnostic tests, prescribing medications, and educating patients (American Association of Nurse Practitioners, 2024b). The NP workforce is the fastest-growing workforce of primary care providers and is expected to grow by 45% between 2022 and 2032 (U.S. Bureau of Labor Statistics, 2023). Over 88% of NPs are educated to be primary care providers, and more than 70% deliver primary care (American Association of Nurse Practitioners, 2024a). As the physician shortages intensify, particularly in rural, low-income areas, NPs are expanding access to care in underserved areas (Arredondo et al., 2023; Kueakomoldej et al., 2022; O'Reilly-Jacob et al., 2025).

NPs deliver safe, cost-effective primary care to underserved communities (Auerbach et al., 2020; Kueakomoldej et al., 2022; O'Reilly-Jacob et al., 2025). NP care is associated with comparable or improved quality of care and reduced or similar ED utilization, hospitalizations, and costs compared to physician-based care or no NP involvement (Barnett et al., 2022; Liu et al., 2020; McMenamin et al., 2023). Further, NPs are more likely than physicians to practice in rural and underserved areas, and are key providers of primary care in community health centers (Barnes et al., 2018; Kueakomoldej et al., 2022; Morgan et al., 2015). Evidence shows that the NP workforce has a high capacity to deliver culturally competent care, which is critical when caring for individuals and communities with language needs (Liu et al., 2022). With appropriate organizational support, the growing NP workforce is well-suited to meet the increasing demands in primary care and expand access to care to help reduce health disparities for communities and individuals with language needs.

The Nurse Practitioner Work Environment

As primary care systems increasingly rely on the growing NP workforce to meet rising demands, fostering favorable NP work environments will play a critical role in supporting NP care for communities and individuals with language needs. The NP work environment encompasses organizational attributes reported by NPs about their practice setting, including 1) the relationship, communication, and teamwork between NPs and physicians, 2) the resources and support that NPs have for their independent practice (e.g., staff support), 3) NPs' visibility within the organization (e.g., representation on essential committees), and 4) the relationships, collaboration, and communication between NPs and practice administrators (Poghosyan et al., 2017; Poghosyan et al., 2019). Supportive NP work environments in practices (e.g., collegiality and access to care management resources) reduce health disparities in vulnerable populations, as they are associated with improved patient outcomes, including lower ED utilization and hospitalizations (Poghosyan et al., 2022; Poghosyan et al., 2024; Poghosyan et al., 2024). Favorable work environments also promote higher quality and more patient-centered care, an especially critical factor in serving those with language needs (Carthon et al., 2020; Carthon et al., 2022). In practices with more favorable work environments, NPs may be better positioned to assess language needs, adapt care delivery sensitively, and better implement language resources that meet patient preferences to overcome language barriers and make care language-accessible (Heath et al., 2023; Kasten et al., 2020).

However, many NPs work in poor work environments, limiting their ability to deliver quality care (Poghosyan et al., 2020; Poghosyan et al., 2022). These unfavorable work environments not only compromise care delivery but also result in higher burnout, lower job satisfaction, and retention challenges among the NP workforce (Abraham et al., 2021; L.

Poghosyan, S. Kueakomoldej, et al., 2022). Unfavorable work environments may limit the ability of NPs to utilize and employ resources that make care language-accessible for communities and individuals due to organizational barriers like a lack of knowledge on effectively using these services, availability issues, time constraints, and workflow disruptions (Heath et al., 2023; Kasten et al., 2020; Tang et al., 2024; Wiles et al., 2023). These challenges are further exacerbated in practices located in LEP communities, as they are under-resourced and face persistent barriers that prevent providers from delivering quality care, such as limited interpreter service availability, bilingual staff, and other access to dual language resources (Betancur et al., 2020; Stephen et al., 2023; Twersky et al., 2024). As a result, patients with language needs experience more communication shortfalls and worse health outcomes (Lu & Myerson, 2020; Ramirez et al., 2023; Twersky et al., 2024).

Even when language resources, such as interpreters or bilingual staff, are available, their access alone may not be sufficient to promote improved outcomes for communities and patients with language needs. Variability in the quality, timeliness, and ease of integration into care delivery limits their effectiveness (Heath et al., 2023; Kasten et al., 2020; Tang et al., 2024; van Lent et al., 2025; Wiles et al., 2023). Without recognizing the critical role of supportive work environments for NPs and other primary care providers, the full potential of language services to improve care cannot be realized. Strengthening work environments not only improves NP workforce outcomes (i.e., burnout, job satisfaction, retention) but may be critical to reducing disparities in access to care and health outcomes related to language needs.

1.1 Overall Aim

The overall purpose of this dissertation is to produce evidence on expanding and supporting the primary care NP workforce to improve health outcomes for communities and patients with

language needs. This dissertation includes three independent studies developed as separate manuscripts (Table 1.1). Study 1 is entitled “Primary Care Service Delivery and Acute Care Use and Access to Care among Patients with Limited English Proficiency: A Systematic Review”. Study 2 is entitled “Emergency Department Visits and Hospitalizations Among Patients Receiving Care in Nurse Practitioner Primary Care Practices in Communities with Limited English Proficiency”. Study 3 is entitled “The Influence of the Nurse Practitioner Work Environment on Emergency Department Visits and Hospitalizations in Primary Care Practices Caring for Non-English-Speaking Patients”.

1.2 Specific Aims and Study Designs

Study 1 | Chapter 2 Aim: To synthesize the existing evidence on the impact of primary care services for LEP patients on acute care utilization and access to care. *Study Design:* This systematic review followed the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Aromataris E, 2020; Page et al., 2021). The review protocol is published with PROSPERO (ID=CRD42023448619).

Study 2 | Chapter 3 Aim: To assess whether the percentage of households with LEP in communities where NP primary care practices are located is associated with ED use and hospitalization among older adult patients receiving care at these practices. *Study Design:* We performed a secondary analysis of Medicare claims data from 2018, merged with American Community Survey data on the percentage of households with LEP in communities where NP primary care practices are located. We used multilevel regression to determine the association between the percentage of households with LEP in communities and ED use and hospitalization.

Study 3 | Chapter 4 Aim: To assess how the NP work environment moderates the relationship between the likelihood of primary care practices caring for non-English speaking (NES) patients and ED visits and hospitalizations. *Study Design:* We performed a secondary analysis of Medicare claims data, merged with NP Survey data on work environments. We used multilevel regression to assess whether the NP work environment moderated the association between the mean score for the practices caring for NES patients and ED visits and hospitalizations among older adults.

1.3 Conceptual Frameworks

The Donabedian Quality of Care framework guided Study 1, which aimed to evaluate the impact of primary care services on acute care utilization and access to care for patients with LEP (see Figure 1.1). This model posits that the *structure* of the organizations influences the *processes* and *outcomes* of care (Donabedian, 1966). This review analyzed evidence on the effectiveness of primary care practices (i.e., *structure*) in providing health care services to patients with LEP (i.e., *process*) on their impact on acute care utilization and access to care (i.e., *outcomes*).

The Andersen Model of Health Service Utilization guided Study 2 and Study 3. This model shows that *predisposing* and *enabling* factors may influence a person's health service utilization (Andersen, 1995). Health service utilization was measured by acute care utilization (i.e., ED use and hospitalizations). *Predisposing factors* refer to biological or social characteristics (i.e., age, sex, race, ethnicity, percentage of households with LEP in communities where NP practices are located, practices caring for NES patients) that may predispose an individual to use health services. In Study 2, the percentage estimate of households with LEP among all households was the predisposing factor. Specifically, Study 2 will test for an

association between the percentage of households with LEP in communities where NP primary care practices were located and acute care utilization (Figure 1.2). In study 3, the predisposing factor was the practice-level mean score of caring for NES patients. *Enabling factors* include those that enable or impede the use of health services (e.g., the NP work environment). NP-physician relations, independent practice and support, professional visibility, and NP-administration relations will measure the NP work environment. Study 3 will test for a moderating effect of the NP work environment on the relationship between practice-level mean score of caring for NES patients and ED visits and hospitalizations (Figure 1.3).

1.4 Gaps and Contributions

Study 1 is the first systematic review to synthesize evidence on the impact of primary care services for LEP patients on acute care utilization and access to care. Researchers have previously synthesized the evidence on differences in outcomes between patients with LEP and English-speaking patients; however, these reviews did not focus on primary care and were mostly conducted in hospital-based settings (Al Shamsi et al., 2020; Sliwinski et al., 2024b; Woods et al., 2022). This review is the first to contribute evidence on how primary care services influence acute care utilization and access to care among patients with language needs. Primary care is critical to improving health among individuals and communities with language needs, as it provides continuous, coordinated, and preventative care (Friedberg et al., 2010; Shi, 2012; Starfield et al., 2005). Findings from this review offer critical insights to inform future policy, practice, and research on strengthening primary care's role in promoting improved patient outcomes for those with language needs.

There was a significant gap in the literature found in Study 1, as only two studies focused on acute care utilization outcomes among patients with language needs. NPs are employed in

over half of primary care practices across the country (O'Reilly-Jacob et al., 2025). Yet, no study has assessed how the presence of NP practices in communities with language needs impacts acute care utilization. Study 2 addressed the need for more robust studies focusing on the effectiveness of primary care in reducing unnecessary acute care use by examining whether the percentage of households with LEP in communities where NP primary care practices were located was associated with ED use and hospitalization among older adult patients receiving care at these practices.

In Study 3, we assessed whether the NP care environment moderates the relationship between the likelihood of primary care practices caring for NES patients and ED visits and hospitalizations. While much of the existing literature focuses on language service interventions, such as interpreter services, as solutions to improving care outcomes for language needs, there is a lack of evidence that considers the broader organizational context that impacts the success of these interventions (Sliwinski et al., 2024b; van Lent et al., 2025). By addressing this gap, our study is among the first to investigate how the NP work environment may mitigate health disparities for patients with language needs.

1.5 Institutional Review Board Approval

Institutional Review Board approval has been obtained from Columbia University Irving Medical Center (IRB-AAAV2764), ensuring compliance with federal human subject regulations before the start of and throughout the dissertation work. This dissertation involved one systematic review and two empirical manuscripts with a secondary data analysis of existing Medicare beneficiary claims data, NP survey data, and American Community Survey data (R01MD011514 PI: Poghosyan). All data used in this study were kept confidential, deidentified, and accessed only by the IRB-approved research team. Publications or presentations will not

include identifiable information (patient, provider, or practice level). We also obtained a dissertation data use agreement from the Centers for Medicare and Medicaid Services (RSCH-2025-71148) on January 28th, 2025.

1.6 Conclusions

The population with language needs is significantly growing in the U.S, placing pressure on primary healthcare systems to adapt and provide more language-accessible care. Patients with language needs experience worse health outcomes than English-proficient patients, highlighting the urgent need for more equitable primary care. The NP workforce is well-positioned to help meet the increasing demand for primary care for those with language needs and make primary care more accessible. This dissertation proposes to 1) evaluate the impact of primary care services on acute care utilization and access to care for patients with LEP, 2) examine differences in acute care utilization among Medicare beneficiaries in NP primary care practices across LEP communities, and 3) explore how the NP care environment moderates these outcomes. Findings aim to inform practice, policy, and research to enhance accessibility to health services in LEP communities by identifying the importance of supportive NP care environments for safe and high-quality care delivery for patients with language needs.

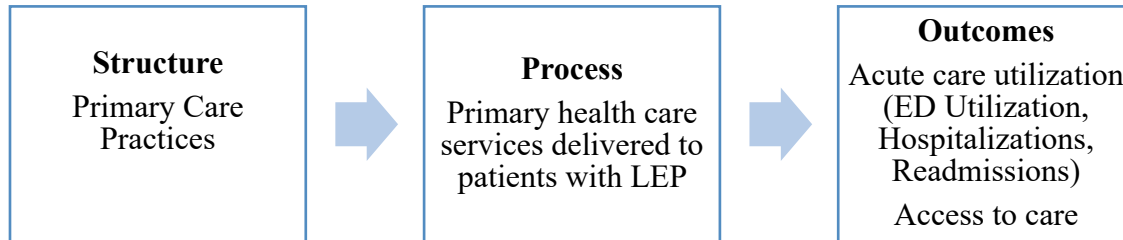
Table 1.1*Dissertation Studies, Titles, Aims, and Study Designs*

Study	Title	Aims	Study Design
1	Primary Care Service Delivery and Acute Care Use and Access to Care among Patients with Limited English Proficiency: A Systematic Review	To synthesize the existing evidence on the impact of primary care services for LEP patients on acute care utilization and access to care.	Systematic Review
2	Emergency Department Visits and Hospitalizations Among Patients Receiving Care in Nurse Practitioner Primary Care Practices in Communities with Limited English Proficiency	To assess whether the percentage of households with LEP in communities where NP primary care practices are located is associated with ED use and hospitalization among older adult patients receiving care at these practices	Multilevel Logistic Regression
3	The Influence of the Nurse Practitioner Work Environment on ED visits and Hospitalizations in Primary Care Practices Caring for Non-English-Speaking Patients	To assess how the NP work environment moderates the relationship between the likelihood of primary care practices caring for NES patients and ED visits and hospitalizations	Multilevel Logistic Regression with Moderation Analysis

Note. LEP: Limited English Proficiency; ED: Emergency department; NP: Nurse practitioner; NES: Non-English Speaking.

Figure 1.1

Adapted Donabedian's Quality of Care Model: Theoretical Framework Guiding Study 1



Note. LEP: Limited English Proficiency, ED: Emergency Department

Figure 1.2

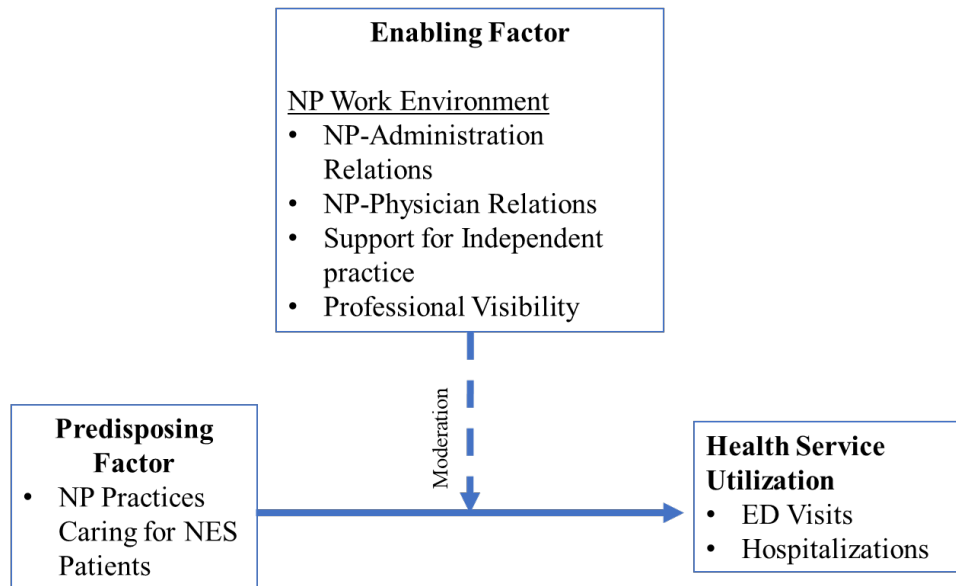
Adapted Anderson Model of Health Service Utilization Model: Theoretical Framework Guiding Study 2



Note. LEP: Limited English Proficiency; ED: Emergency Department.

Figure 1.3

Adapted Anderson Model of Health Service Utilization Model: Theoretical Framework Guiding Study 3



Note. NES: Non-English Speaking; NP: Nurse Practitioner; ED: Emergency Department.

Chapter 2: Primary Care Service Delivery and Acute Care Use and Access to Care among Patients with Limited English Proficiency: A Systematic Review

Over 27.6 million people in the United States (U.S.) have limited English proficiency (LEP) (U.S. Census Bureau, 2023b). LEP refers to individuals who do not speak English as a primary language and have limited ability to speak, read, write, or understand English (i.e., speaking English less than “very well”) (Office of Civil Rights, 2013). The LEP population in the U.S. is growing due to increased immigration from non-English speaking countries (Batalova, 2025; Haldar et al., 2023; Institute, 2023), increased diversity of languages spoken (Haldar et al., 2023), and persistent barriers to educational and employment opportunities that contribute to linguistic isolation (Haldar et al., 2023; Rao et al., 2024). LEP patients are more likely to be uninsured, covered by Medicaid, Latino or Asian, and concentrated geographically in a few states in the U.S, such as California (18%), New York (13%), and Texas (13%) (Haldar et al., 2023). Under Title VI of the Civil Rights Act of 1964, patients with LEP are protected from discrimination, and all healthcare practices that receive federal funding must deliver language-accessible care (Civil Rights Act of 1964; U.S. House, 2010). Despite this legal protection, many patients still encounter language barriers (i.e., when patients and providers do not share a primary language) that inhibit effective communication (Slade & Sergent, 2024). This results in patients with LEP experiencing unequal access to healthcare services and worse health outcomes (Al Shamsi et al., 2020; Gonzalez-Barrera et al., 2024; Sliwinski et al., 2024b; Twersky et al., 2024). Therefore, healthcare systems need to adapt by improving language accessibility to meet the needs of the growing LEP population.

Patients with LEP experience a multitude of challenges when navigating the healthcare system. These include difficulty completing forms, enrolling in public health insurance programs

they may be eligible for, communicating with staff, understanding instructions, and initiating follow-up care (Gonzalez-Barrera et al., 2024). Healthcare providers also face challenges when caring for patients with LEP, including an incomplete understanding of patient needs, complications with decision-making, and higher workplace stress, all of which compromise high-quality care delivery and threaten patient safety (Al Shamsi et al., 2020; Betancur et al., 2020; Gerchow et al., 2021) .

As a result of these communication challenges, access to care for patients with LEP declines (Chang et al., 2024; Gonzalez-Barrera et al., 2024; Haldar et al., 2023; Lu & Myerson, 2020; Uscher-Pines et al., 2023). Even when patients with LEP access and engage in healthcare, they often receive low-quality care due to improper use of interpreter services, which perpetuates challenges in navigating the health system (Heath et al., 2023; MacFarlane et al., 2020; Wiles et al., 2023). These challenges result in emergency departments (EDs) being the first point of contact, rather than appropriate primary care settings (Heath et al., 2023; MacFarlane et al., 2020; Wiles et al., 2023). Unmet language needs during healthcare encounters also decrease patient satisfaction, reduce the quality of care, and pose a threat to the safety of patients with LEP (Al Shamsi et al., 2020; Gerchow et al., 2021). Consequently, they experience higher rates of ED visits, hospital readmissions, adverse events, longer hospital stays, and increased risk of death (Chandrashekar et al., 2022; Sliwinski et al., 2024b; Squires et al., 2022). These disparities in outcomes among patients with LEP are directly related to reduced access to care and compromised quality of care received. Therefore, it is critically important to understand how effective primary care services might address these persistent inequities for patients with LEP.

Primary care is designed to be the first point of contact for patients in the healthcare system, providing essential healthcare near where patients live and improving access for

underserved populations (Institute of Medicine Committee on the Future of Primary, 1996; Rajan et al., 2024; Stange et al., 2023; Starfield et al., 2005). These services ideally are ongoing and comprehensive, encompassing usual care, preventative care, and chronic disease management (Friedberg et al., 2010; Shi, 2012; Starfield et al., 2005). Improved access to primary care is associated with better patient outcomes, such as increased preventative care, chronic disease management, and lower acute care utilization (Hostetter et al., 2020; Timmins et al., 2020; Wilkinson et al., 2021). By addressing health needs early, primary care services intend to keep patients out of the hospital and reduce acute care utilization (Shi, 2012; Starfield et al., 2005)

Accessing primary care is challenging for patients with LEP. Those with LEP often prioritize seeking care at healthcare facilities where they know their language needs will be met, even if it requires traveling farther (Sliwinski et al., 2024a; Squires et al., 2023). However, patients with LEP often experience lower-quality care even when they do travel farther to receive language-accessible care (Sliwinski et al., 2024a). Effective patient-provider communication is central to managing and coordinating primary care, but patients with LEP often experience miscommunications and unmet language needs that lower the quality of care received (Al Shamsi et al., 2020; Gerchow et al., 2021). These findings underscore the vital need for primary care to be fully accessible, tailored, and effectively utilized, as well as equipped with effective language services (e.g., interpreter services, multilingual staff) to meet the language needs of patients with LEP (National Academies of Sciences & Medicine, 2024; National Academies of Sciences et al., 2021). Ensuring that primary care practices have these resources to meet the needs of patients with language barriers is essential to address the gaps in access to care, care quality, and health outcomes.

Previous reviews have synthesized evidence on the impact of various services to address language needs and differences in health outcomes related to having LEP; however, they were mostly based on hospital-based care (Al Shamsi et al., 2020; Sliwinski et al., 2024b; Woods et al., 2022). While primary care provides a solid opportunity to address the disparities in access to care and health outcomes faced by those with LEP, knowledge about the current capacity of primary care systems to meet the language needs of this population is limited. Therefore, this review synthesizes the existing evidence on the impact of primary care services for LEP patients on acute care utilization and access to care, and addresses the gaps in the literature on the extent to which primary care is evolving to meet the needs of patients with LEP.

2.2 Methods

Search Strategy

A comprehensive systematic literature review was completed following the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Aromataris E, 2020; Page et al., 2021). This review has a published protocol with PROSPERO (ID= CRD42023448619). The search strategy was developed in consultation with a librarian with expertise in systematic review methods, and a comprehensive search for keywords and subject headings specific to each database was conducted. The primary author performed the search using the following keywords: “limited English proficiency,” “non-English speaking,” “language preference other than English,” “primary care,” “acute care utilization,” “emergency department,” “hospitalization,” “readmissions,” and “access to care.” In June 2024, we searched PubMed, CINAHL, EMBASE, Scopus, and COCHRANE with no date restrictions for the published studies and conducted a backward search of the reference lists of retrieved studies and relevant literature review articles.

Inclusion and Exclusion Criteria

This review included peer-reviewed quantitative studies published in English and conducted in the U.S. with no date restrictions. Studies needed to include adult patients (18 years or older) with LEP, which was defined as the patient's primary language being other than English or different than that of the provider, a language preference other than English, an indication of the need for interpreter services, non-English speaking patients, or language spoken at home being different from English. Studies needed to have participants receiving primary care services in primary care settings, including home-based primary care. Primary care services were identified as aspects of care delivery aimed at improving acute care utilization and access for patients with LEP. Outcomes included acute care utilization (i.e., emergency department visits, hospitalizations, readmissions) and access to care. We used the Levesque et al. 2013 definition of access to care: “the opportunity to reach and obtain appropriate health care services when there is a perceived need for care” (Levesque et al., 2013). This definition recognizes that the utilization of health care services is realized access (i.e., access to care is measured by type and frequency of visits) (Aday & Andersen, 1974; Andersen, 1995; Levesque et al., 2013). Therefore, realized access to primary care services was used to measure access to care outcomes.

Exclusion Criteria

Grey literature was excluded due to the lack of peer review. Studies with participants under the age of 18 were excluded. Studies with patients treated in healthcare settings other than primary care settings were excluded, since the purpose is to synthesize evidence on primary care services for patients with language barriers. Studies that did not focus on the outcomes of interest (i.e., emergency department visits, hospitalizations, readmissions, and access to care) were considered out of scope.

Screening Process

Articles resulting from the database searches were uploaded to the online review software *Covidence* to remove duplicates (Covidence, 2024). Two independent reviewers screened titles and abstracts, followed by a full-text review, to select articles meeting the *a priori* inclusion criteria. An independent third author resolved disagreements on the inclusion and exclusion of articles.

Data Extraction

Two authors independently extracted data on *Covidence*, and a third resolved any disagreements that occurred. Informed by the JBI Guidelines, data extraction included author details, purpose of the study, study design, sample size and characteristics, setting, definition of the language barrier, primary care services received, outcomes and their measurement, comparators, analytic methods, key results, funding sources, and conflicts of interest. A narrative data synthesis approach was used to report extracted data from included articles.

Critical Appraisal

The quality of each study was assessed using critical appraisal checklists developed by the JBI for cohort and cross-sectional study designs. These checklists assess sources of bias and determine if they have been adequately addressed within the study's design, conduct, and analysis (Aromataris E, 2020). Responses to items on the checklists are *yes*, *no*, *unclear*, or *not applicable* (Aromataris E, 2020). Since the JBI itself has not developed a numeric scoring system to assess the quality of studies, the scoring criteria employed in published studies using the JBI checklists were used (Ancheta et al., 2021; Lam et al., 2019; Melo et al., 2018). If an item on the checklist received a “yes,” one point was awarded, with all other response options receiving no points. For each study, the number of points due to “yes” responses was divided by the total

number of checklist items for an overall quality percentage score. Risk of bias was rated low ($\geq 70\%$), moderate (50%–69%), or high ($\leq 49\%$) (Ancheta et al., 2021; Lam et al., 2019; McMenamin et al., 2023; Melo et al., 2018; Turi et al., 2023). Disagreements in quality appraisal scoring were resolved by consensus using a third author. However, studies were not excluded from the review based on their critical appraisal.

2.3 Results

Literature Search

The search yielded 2,609 studies, with 525 duplicates removed by the *Covidence* software. The titles and abstracts of the remaining 2,083 were screened; 2,034 did not meet the inclusion criteria. The remaining 49 articles underwent full-text review. Of these, 40 were excluded for the following reasons: not peer reviewed (n=11), outcomes not meeting the inclusion criteria (n=7), intervention not focused on primary care service delivery (n=8), setting not in primary care (n=6), study design not appropriate (e.g., literature reviews that were screened and did not have relevant articles; n=6), and population not meeting inclusion criteria (e.g., pediatric patients; n=2). Nine studies met the inclusion criteria (Figure 2.1).

Study Characteristics

Among the nine studies included in this review, five had cohort study designs (Eberly et al., 2020; Hacker et al., 2012; Nouri et al., 2023; Parameswaran et al., 2023; So et al., 2024), and four had cross-sectional designs (Hsueh et al., 2023; Sachs et al., 2021; Squires et al., 2023; Weber et al., 2023). Dates of publication ranged from 2012 to 2024. A summary of the included studies is presented in Table 2.1.

Across the studies, LEP was defined as patients having a preferred language other than English (Eberly et al., 2020; Hacker et al., 2012; Nouri et al., 2023; Parameswaran et al., 2023;

Sachs et al., 2021), speaking a primary language that was not English (So et al., 2024; Squires et al., 2023; Weber et al., 2023), and using an interpreter during the visit (Hsueh et al., 2023; Parameswaran et al., 2023). Languages other than English identified in these studies were Spanish, Chinese, Russian, Korean, Portuguese, Haitian Creole, Cantonese, Mandarin, Vietnamese, Punjabi, Hindi, Farsi, Burmese, Hmong, Kareem, Karenni, Nepali, Oromo, and Somali (Hacker et al., 2012; Hsueh et al., 2023; Nouri et al., 2023; Sachs et al., 2021; So et al., 2024; Squires et al., 2023). Four studies had cohorts where all participants had LEP (Hacker et al., 2012; Hsueh et al., 2023; So et al., 2024; Squires et al., 2023), while five studies evaluated and compared outcomes among patients with LEP to English-speaking patients (Eberly et al., 2020; Nouri et al., 2023; Parameswaran et al., 2023; Sachs et al., 2021; Weber et al., 2023). All studies were conducted in primary care-affiliated settings, including academic health systems (Eberly et al., 2020; Nouri et al., 2023; Parameswaran et al., 2023; Sachs et al., 2021), integrated health systems with primary care services (Hacker et al., 2012; Hsueh et al., 2023), a safety-net system providing primary care (Nouri et al., 2023), an urban primary care clinic (So et al., 2024), a Federally Qualified Health Center (Weber et al., 2023), and an urban home health care agency affiliated with a primary care provider (Squires et al., 2023).

Primary care services identified in the studies were language services (i.e., language concordant providers, formal interpretation) (Hacker et al., 2012) and telehealth services (Eberly et al., 2020; Hsueh et al., 2023; Nouri et al., 2023; Parameswaran et al., 2023; Sachs et al., 2021; So et al., 2024; Weber et al., 2023). Language concordance occurred when patients and providers shared the same language. For outcomes, one study reported ED utilization (Hacker et al., 2012), one reported hospitalizations (Hacker et al., 2012), one reported readmissions (Squires et al.,

2023), and seven reported access to care (Eberly et al., 2020; Hsueh et al., 2023; Nouri et al., 2023; Parameswaran et al., 2023; Sachs et al., 2021; So et al., 2024; Weber et al., 2023).

Critical Appraisal

Quality assessments of the included studies were completed using the JBI Cohort and Analytical Cross-Sectional appraisal tools; Tables 2.2 and 2.3 display the full quality appraisal. All four cross-sectional studies had a low risk of bias (Hsueh et al., 2023; Sachs et al., 2021; Squires et al., 2023; Weber et al., 2023). The studies conducted by Hsueh et al. (2023) and Squires et al. (2021) received full scores (8/8). The studies by Sachs et al. (2021) and Weber et al. (2023) each lost a point for unclear inclusion criteria. Weber et al. (2023) lost an additional point for not specifying the strategies employed to deal with confounding factors.

Four cohort studies were rated as having a low risk of bias (Eberly et al., 2020; Hacker et al., 2012; Nouri et al., 2023; Parameswaran et al., 2023), and one had a moderate risk of bias (So et al., 2024). None of the studies received points for addressing incomplete follow-up, and four studies lost a point for reporting whether follow-up was completed (Eberly et al., 2020; Hacker et al., 2012; Parameswaran et al., 2023; So et al., 2024). Additionally, So et al. (2024) lost two more points for failing to identify confounding factors and not specifying strategies to deal with them.

Acute Care Utilization

Two studies reported acute care utilization outcomes. Hacker et al. (2012) evaluated ED visits both related and unrelated to Type II diabetes and diabetes-related hospitalizations among patients with LEP, while Squires et al. (2023) reported readmissions among home healthcare patients with LEP.

Hacker et al. (2012) categorized patients into seven exposure groups based on the type and amount of language services received during primary care visits (i.e., language concordant providers, formal interpretation, and no language services) (Hacker et al., 2012). In multivariate models that adjusted for age, gender, language, insurance, co-morbidities, primary care visits, HgbA1c level, and the main primary care site, non-diabetes-related ED visits were not significantly associated with language service categories ($p=0.18-0.81$). However, diabetes-related ED visits were significantly associated with certain language service categories (Hacker et al., 2012). Receiving 100% of visits with language-concordant providers was associated with 72% lower odds of diabetes-related ED visits compared to receiving no language services (odds ratio [OR]=0.28, 95% confidence interval [CI]: 0.17-0.46, $p<0.001$) (Hacker et al., 2012). Similarly, having 1–49% of visits with formal interpretation and no visits with a language-concordant provider was associated with 63% lower odds of a diabetes-related ED visit (OR=0.37, CI: 0.20-0.69, $p<0.001$) (Hacker et al., 2012). The other language services categories with different ranges of interpreter services and language concordant providers were not significantly associated with diabetes-related ED visits ($p=0.21-0.90$) (Hacker et al., 2012). Language service categories were not significantly related to diabetes-related hospitalizations ($p=0.25-0.67$) (Hacker et al., 2012). Therefore, having language concordance and using interpreter services results in lower ED utilization among patients with LEP.

Squires et al. (2023) examined the impact of language concordance during home healthcare visits on hospital readmissions among patients with LEP. Patients were categorized into four groups based on whether they had high or low language concordance with their provider (Squires et al., 2023). Squires et al. (2023) found that patients with high language concordance had significantly lower odds of readmissions compared to patients with low

concordance, particularly when continuity of care was also high (OR =0.71, 95% CI: 0.62–0.80, $p < 0.001$). However, high language concordance alone did not significantly reduce readmission risk when continuity of care was lacking (OR =1.04, 95% CI: 0.86–1.26, $p = 0.672$) (Squires et al., 2023). While language concordance is important, improvement in acute care utilization outcomes for patients with LEP may also be related to other quality care factors, such as continuity of care.

Access to Care

Seven studies evaluated access to care among patients with LEP receiving primary telehealth services during the COVID-19 pandemic. Visit frequency and completion were primarily used as measures for access to care outcomes. Three studies examined the role of language concordance (Hsueh et al., 2023) and interpreter services (Parameswaran et al., 2023; So et al., 2024) on access to care. Four studies compared in-person visits to telehealth visits among patients with LEP and English-speaking patients (Nouri et al., 2023; Parameswaran et al., 2023; Sachs et al., 2021). Three studies also assessed whether telehealth modality (telephone versus video) impacted access to care, given that video visits may suggest improved health literacy or access to technology and may provide insights into structural barriers to accessing telehealth primary care (Eberly et al., 2020; Nouri et al., 2023; Sachs et al., 2021; Weber et al., 2023).

Language services (i.e., interpreter services, language-concordant providers) influenced access to care among those receiving telehealth primary care services. Parameswaran et al. (2023) found that patients with LEP using interpreter services had higher odds of using telehealth over in-person visits for both new visits (OR 1.83, 95% CI: 1.41, 1.83, $p < 0.1$) and return visits (OR 1.19, 95% CI: 1.10, 1.28, $p < 0.1$) (Parameswaran et al., 2023). This suggests that interpreter

services facilitate better access to telehealth primary care for patients with LEP. So et al. (2024) compared follow-up visit rates among patients with LEP using in-person versus virtual interpreter services, finding potentially beneficial impacts of in-person interpreters on access to care. Follow-up rates were higher for patients with in-person interpreters (73.1%) compared to those with virtual interpreters (64.7%); however, the difference was not statistically significant ($p=0.31$) (So et al., 2024). Similarly, time to follow-up was shorter for patients with in-person interpreters (mean=33.9 days, standard deviation=26.2) compared to those with virtual interpreters (mean=34.7 days, standard deviation=33.2), but this difference was not statistically significant ($p=0.90$) (So et al., 2024). Hsueh et al., 2023 assessed the association between language concordance and telehealth modality, finding that those with language-concordant providers were less likely to use video visits over telephone compared to those with language-discordant providers after adjusting for patient demographics, technology access, and familiarity (OR=0.86 CI:0.80–0.93, $p<.001$) (Hsueh et al., 2023). This suggests that patients with LEP may have a greater preference for telephone visits when language needs are directly met. Therefore, having language concordance and reliable interpreter services may improve accessibility to telehealth services and influence comfort with certain modalities (video versus telephone) among patients with LEP.

Four studies compared the frequency of telehealth and in-person visits between those with LEP and English-speaking patients. Across these studies, patients with LEP consistently had lower access to telehealth services than English speakers. Sachs et al. (2021) found that patients with LEP had lower odds of telehealth visits compared to English speakers (OR=0.63-0.76 CI: 0.59–0.83, $p<.001$) (Sachs et al., 2021). Similarly, Parameswaran et al. (2023) found that patients with LEP used telehealth less frequently for new visits than did English speakers

(Spanish: OR 0.60, 95% CI: 0.44, 0.81, $p < 0.1$ | Mandarin: OR 0.74, 95% CI: 0.56, 0.98, $p < 0.1$) (Parameswaran et al., 2023). While Eberly et al. (2020) found patients with LEP had slightly lower odds of completing a telehealth visit, this difference was not statistically significant (adjusted OR= 0.98, 95% CI: 0.88-1.08, $p=0.64$) (Eberly et al., 2020). Nouri et al. (2023) compared total encounters for in-person visits, telehealth visits, and between-visit interactions across pre-pandemic and pandemic periods. Patients with LEP had significantly fewer total encounters than English speakers before and during the pandemic ($p < 0.05$) (Nouri et al., 2023). Disparities in between-visit interactions (i.e., phone calls or patient portal messages with providers) also persisted, as patients with LEP had fewer between-visit interactions both before and during the COVID-19 pandemic compared to English speakers ($p < 0.05$) (Nouri et al., 2023). These results indicate gaps in access to care for patients with LEP, which are sustained beyond scheduled appointments. Collectively, these findings underscore persistent barriers to accessing primary care for patients with LEP, even amid the expansion of telehealth services during the pandemic.

Three studies examined differences in telehealth modality (video versus telephone) among patients with LEP, exposing a preference for telephone over video visits. Sachs et al. (2021) found that patients with LEP were less likely to use video visits compared to telephone visits when compared to English speakers (OR=0.20-0.41, CI: 0.17–0.48, $p < 0.001$) (Sachs et al., 2021). Similarly, Weber et al. (2023) found that patients with LEP were more likely to use telephone visits than video visits compared to English speakers ($p < 0.001$) (Weber et al., 2023). Although Eberly et al. (2020) reported higher odds of using video than telephone for telehealth visits among those with LEP, the difference was not statistically significant (adjusted OR=1.05,

95% CI:0.91-1.22, p=0.48) (Eberly et al., 2020). The evidence shows a reliance on telephone over video for telehealth services among patients with LEP.

2.4 Discussion

This systematic review synthesizes evidence on how primary care services—including interpreter use, language concordance, and telehealth—impact acute care utilization and access to care for patients with LEP. Interpreter services and language concordance between the patient and the providers were associated with reduced ED use and hospital readmissions among patients with LEP. Despite the expansion of primary care through telehealth, disparities in access to care among patients with LEP persisted. However, interpreter services and language-concordant providers improved access to care outcomes. Findings of the reviewed studies demonstrated that patients with LEP rely on the telephone over video for telehealth services, exposing potential barriers to digital access. These findings align with the literature reporting the disparities among patients with LEP compared to those who are English-speaking, and add synthesized evidence demonstrating that reliable, accessible, and properly implemented language services during primary care delivery can improve acute care utilization and access to care outcomes for patients with LEP (Al Shamsi et al., 2020; Diamond et al., 2019; Gulati & Hur, 2022; O'Donoghue et al., 2024; Ramirez et al., 2023).

Only two studies evaluated the effect of primary care services on acute care utilization (Hacker et al., 2012; Squires et al., 2023). Interpreter services and language-concordant providers improved acute care utilization outcomes, particularly by reducing ED utilization and readmissions. Evidence shows that effective use of language services enhances the quality of care for patients with LEP (Heath et al., 2023), perhaps preventing unnecessary use of acute care services. However, continuity of care emerged as a stronger predictor of improved patient

outcomes (Squires et al., 2023). These findings highlight that, while language services play a crucial role, continuity of care is also a critical aspect of primary care delivery for patients with LEP. The challenges in accessing reliable language services, such as interpreters, in resource-constrained settings (Khatri et al., 2023; Tang et al., 2024) demonstrate the need for primary care delivery to integrate a combination of language support and consistent providers for patients with LEP. This aligns with previous research showing that continuity of care particularly benefits vulnerable populations by improving acute care utilization (Facchinetti et al., 2020). Future research must prioritize building robust evidence on the effectiveness of primary care services in reducing acute care use among patients with LEP, given the limited number of studies in this review that evaluated these critical outcomes.

Consistent with prior research, this review found that access to care worsened for patients with LEP during the COVID-19 pandemic, underscoring the challenges of delivering high-quality care to patients with LEP under strained healthcare conditions (Diaz et al., 2023). Differences in how telehealth is delivered (i.e., video versus telephone) and how language services are integrated (i.e., in person versus virtually) demonstrate the importance of patient-centered approaches that prioritize choice and accommodate individual preferences to improve telehealth accessibility for patients with LEP (Melgoza et al., 2025). For example, patients may prefer video visits because they feel that visual cues can help alleviate language barriers, and evidence shows that communication outcomes improve with video interpreters (Khoong et al., 2021). Further, findings from this review indicated a preference for telephone visits over video visits among patients with LEP. This may be related to structural barriers, including a lack of access to technology and increased privacy concerns about patient information collected, which impede access to telehealth care for patients with LEP (Tan-McGrory et al., 2022). This

highlights the importance of ensuring that telehealth options are flexible and responsive to patient preferences and technological access.

Ensuring that language services align with patient preferences is essential to making primary care more effective for those with LEP. While interpreter services and language-concordant providers are essential, their effectiveness depends on how they are delivered and whether patients can meaningfully access them. Offering different types of language services (e.g., in-person vs. virtual interpreter, language concordant provider) allows patients to choose and better ensure their language preferences are met, leading to better engagement in health encounters. When language needs are met in a way the patient prefers, satisfaction improves for both patients and providers, as does the quality of healthcare delivery and patient safety (Al Shamsi et al., 2020; Gerchow et al., 2021). These findings demonstrate the complexity of providing equitable access to care for patients with LEP.

Most studies included in this review were published between 2020 and 2024, with only one dating back to 2012, despite the search having applied no date restrictions. This trend, as shown in more studies published in recent years, demonstrates the growing urgency to address and improve primary healthcare delivery for patients with LEP. Notably, this review is the first to synthesize evidence on the impact of primary care services on outcomes for patients with LEP. This review addresses a critical gap in the literature in understanding the effectiveness of primary care for patients with LEP and provides a foundation for future practice, policy, and research improvements.

Implications for Practice, Policy, and Research

This review's findings have implications for practice, policy, and research. Language services, such as interpreter services, are necessary for language-accessible healthcare delivery,

and this review's results show that access to them improves outcomes. However, primary care practices experience difficulty in having reliable access to interpreter services and making telehealth accessible to patients with LEP (MacFarlane et al., 2020). Therefore, ensuring that practices have reliable access to language services and are adequately equipped to meet the needs of patients with LEP is essential to reducing health disparities. Training providers on properly using and implementing language services is crucial to delivering high-quality language-accessible care. Policymakers should prioritize the expansion of reimbursement policies, such as Medicare and Medicaid coverage for interpreter services, and establish funding mechanisms that support access to multiple interpreter options (i.e., in-person, video, and phone) to better align with patient preferences and ensure more tailored primary care.

Given the various measures for LEP found in this review, standardizing how we measure LEP is necessary to avoid framing language needs in ways that emphasize limitations or reflect ethnocentric assumptions. Similarly, standardizing methods and systems for collecting language data at both the healthcare system and government level helps address the issue of multiple, inconsistent language barrier measures. Therefore, future research should focus on standardizing methods for measuring LEP and language abilities to improve the accuracy and consistency of measuring language needs. Future research should also explore the impact of the current lack of standardized measures for language needs on the understanding of the magnitude of LEP and the ability to accurately estimate the size and impact of the population with LEP. Policies that require standardized data collection on patient language preference and LEP status as part of quality care reporting and monitoring could address the persistent inconsistency of how language needs are identified.

Given the higher use of phone rather than video calls for telehealth visits, future research should also investigate whether specific privacy concerns exist for patients with LEP (Houser et al., 2023; Tukur et al., 2023). Further research is needed to identify other factors affecting primary care access and preferred utilization modalities (e.g., in-person versus telehealth, video versus phone) to develop targeted strategies to address health disparities for patients with LEP. A better understanding of barriers to access to health insurance and healthcare system navigation skills is also key to closing healthcare access gaps between patients with and without LEP.

Limitations

This systematic review has limitations. All included studies were either cohort or cross-sectional studies; therefore, the findings from these studies are only associations and do not establish a causal relationship between LEP in primary care and acute care utilization and access to care outcomes. The studies used various measures to assess LEP, including patients having a preferred language other than English, a primary language spoken not being English, and utilizing interpreter services during a healthcare visit. This variability in measurement limits consistency in how LEP is defined and understood, affecting the generalizability of these findings related to language needs and communication abilities. The studies used several measures to capture various aspects of LEP, yet they may contain inconsistencies, particularly if self-reported. For example, a patient who may prefer a non-English language may still speak English fluently, which differs from a patient who needs an interpreter service to receive care.

Additionally, the language service categories created by Hacker et al. (2012) make it challenging to interpret the impact of primary care services on acute care utilization. The wide ranges (e.g., 1–49% of visits with formal interpretation or language-concordant providers) may obscure differences, as 1% of visits with language services likely differ from 49%, but they are

categorized together. This broad categorization may not fully capture the impact of language services on acute care utilization. Because only studies available in English and conducted in the U.S. were included, the generalizability of the findings is limited to U.S. healthcare settings. Finally, given that most studies were conducted during the COVID-19 pandemic, authors may not have accounted for the rapid evolution of telehealth services and their implications for LEP. Therefore, the results may not apply to post-pandemic contexts, which also limits their generalizability.

2.5 Conclusion

This systematic review synthesized evidence on the impact of primary care services on acute care utilization and access to care for patients with LEP. Primary care services reduced ED utilization and readmissions for patients with LEP, but the effects on hospitalizations were not statistically significant. Patients with LEP experience disparities in access to care during the COVID-19 pandemic. Access to interpreter services, language-concordant providers, and continuous care is essential for language-accessible healthcare. To improve healthcare delivery, future research should explore how to standardize the measurement of LEP and explore additional factors that affect access to primary care for patients with LEP.

Table 2.1*Summary of Review Articles*

Author and Year	Aim	Design	Sample	LEP Definition	Setting	Primary Care Service(s)	Outcomes and Measurements	Main Results
Eberly et al. 2020	To evaluate whether inequities are present in telehealth use and video visit use for telehealth visits during the COVID-19 pandemic	Cohort Study	n=73,765 English speaking patients; 2,076 non-English speaking patients	Preferred non-English language	Primary care telehealth visits at a large academic health system	Telehealth Services	<u>Access to care:</u> completion of a telehealth visits and video use (vs telephone use)	Patients with language barriers had fewer completed telehealth visits (adjusted OR, 0.84 [95% CI, 0.78-0.90])
Hacker et al. 2012	To determine whether the amount and type of language services received during primary care visits had an impact on diabetes-related outcomes in limited English proficient patients	Cohort Study	n=1,425	Preferred language other than English, interpreter service use	Primary care visits at Cambridge Health Alliance, an integrated public health system in Massachusetts	Language Services	<u>ED Utilization, Hospitalization:</u> 1) hospitalizations related to diabetes, 2) emergency department (ED) visits related to diabetes, 3) ED visits not related to diabetes compared among various language services groups	Patients who received 100% of their visits with language-concordant providers were less likely to have an ED visit related to diabetes compared to patients receiving no language services (0.28, (0.17-0.46, p<0.001). The odds of an ED visit related to diabetes were also 63% less for patients with 1–49% of their visits with formal interpretation and no visits with a language-concordant provider (0.37, 0.2-0.69, p<0.001). Non-diabetes-related ED visits were not

Author and Year	Aim	Design	Sample	LEP Definition	Setting	Primary Care Service(s)	Outcomes and Measurements	Main Results
								significantly related to language service categories.
Hsueh et al. 2023	To examine the association of patient language with telehealth visit type (video versus telephone)	Cross Sectional	n=13,764	Need for a language interpreter, which was used as a proxy for limited English proficiency	Primary care telehealth visits within Kaiser Permanente Northern California (KPNC), an integrated healthcare system	Language Services, Telehealth Services	<u>Access to care:</u> video visit or telephone visit	Language-concordant visits (33.0%) had lower odds of video visits compared to language-discordant visits (36.2%, p <0 .001)
Nouri et al. 2023	To evaluate rates of change over time in visits (in-person, telehealth) and between-visit interactions (telephone calls, patient portal messages)	Cohort Study	n=6,223 non-English, n=8,925 English	Preferred non-English language as Spanish, Chinese, or other	University of California San Francisco (UCSF; academic tertiary care center, has 4 primary care practices) or the San Francisco Health Network (SFHN; safety-net health system, has 14 primary care practices)	Telehealth Services	<u>Access to Care:</u> mean number of encounters per patient per month evaluated at 3 distinct time periods defined by health systems' responses to Covid-19 public health emergency (PHE): pre-PHE (April 2019 to March 2020 at UCSF; September 2019 to March 2020 at SFHN), strict PHE shelter-in-place (PHE-SIP;	UCSF: No differences by language in any outcome in the pre-PHE period (p>0.05). Patients with a preferred language other than English, Spanish, or Chinese had fewer total encounters in the hybrid-PHE period compared with English speakers (p<0.05). SFHN: pre-PHE period-Chinese speakers had fewer total encounters and between-visit interactions compared with English speakers (p<0.05). Spanish speakers had fewer between-visit interactions in the pre-PHE period,

Author and Year	Aim	Design	Sample	LEP Definition	Setting	Primary Care Service(s)	Outcomes and Measurements	Main Results
							April to June 2020), and hybrid-PHE (July 2020 to March 2021)	but this difference was no longer significant in hybrid-PHE (p>0.05)
Parameswaran et al. 2023	To examine the contribution of patient, clinician and visit factors in explaining variation in in-person versus telehealth use across primary care clinics at a large academic medical center during the first two years of the COVID-19 pandemic	Cohort Study	Non-English N=14,846 English N=213,477 Interpreter Needed: 11,251 Not needed= 217,054	Preferred non-English language, Interpreter needed	Large academic medical center in the California Bay Area	Language Services, Telehealth Services	<u>Access to Care:</u> visit modality (in-person vs telehealth) for new and return visits	Patients who reported Spanish as their preferred language used less telehealth for new (OR 0.60, 95% CI [0.44, 0.81]) and return (OR 0.70, 95% CI [0.63, 0.77]) visits (no p values provided). Patients who reported Mandarin as their preferred language used less telehealth for new (OR 0.74, 95% CI [0.56, 0.98]) and more telehealth for return (OR 1.04, 95% CI [0.95, 1.14]) visits (no p values)

Author and Year	Aim	Design	Sample	LEP Definition	Setting	Primary Care Service(s)	Outcomes and Measurements	Main Results
								provided). Patients using interpreter services used more telehealth for new (OR 1.83, 95% CI [1.41, 1.83]) and return visits (OR 1.19, 95% CI [1.10, 1.28]) (no p values provided)
Sachs et al. 2021	To examine the impact of the pandemic and telehealth expansion on disparities in access and utilization for ambulatory care	Cross Sectional Study	Spanish n=3931 Other language n=2156 English=128, 207	Preferred non-English language as Spanish or other	Ambulatory clinics at Oregon Health & Science University (OHSU)	Telehealth Services	<u>Access to care:</u> patient counts from ambulatory provider-led visits, defined as outpatient visits with physicians, nurse practitioners, or physician assistants. Visit modalities included in-person, video, or telephone	Among telehealth users (video or telephone visits), video participation was less likely in patients who prefer Spanish or another non-English language (p<0.001): Adjusted odds of video versus telephone-only utilization, limited to Primary Care Visits (p<0.001): Spanish 0.37 (0.28-0.48) Other Language 0.42 (0.32-0.55) English 1 (Reference)
So et al. 2024	To evaluate the impact of interpreter format (in person vs virtual) on clinical diabetes outcomes in NELP patients	Cohort Study	n= 137	Required an interpreter, Language spoken other than English	Urban primary care clinic in a Midwestern state	Language Services, Telehealth Services	<u>Access to Care:</u> in person vs virtual interpreter services on continuity (follow-up visit rate and time to follow-up visit)	Higher absolute follow-up rate for patients with in-person as opposed to virtual interpreters (p = 0.31). Slightly fewer average days to follow-up visit among patients with in-person interpreters compared to those with virtual interpreters (p = 0.90).

Author and Year	Aim	Design	Sample	LEP Definition	Setting	Primary Care Service(s)	Outcomes and Measurements	Main Results
Squires et al. 2023	To examine the relative effectiveness of both continuity of care and language concordance with skilled nursing services in home health care as alternative or complementary interventions to improve health outcomes of people with LEP	Cross-Sectional Study	n= 22,103	Primary language of “Spanish,” “Korean,” “Chinese,” or “Russian”	Large urban home health care agency in the New York City Area	Language Services	<u>Hospital Readmission:</u> readmission either causing the end of home health services, or the services ending without readmission	Patients with high nursing continuity of care and high concordance had lower odds of readmissions compared with those with low nursing continuity of care and concordance [OR =0.71, 95% CI: 0.62–0.80, P <0.001, AME= –4.95%]. Compared with those with low nursing continuity of care and concordance, patients with high continuity of care and low concordance had lower odds of readmission (OR =0.80, 95% CI: 0.74–0.86, P <0.001, AME = –3.26%). Those with low continuity of care and high concordance did not significantly differ in odds of readmission compared with those with low nursing continuity of care and concordance (OR =1.04, 95% CI: 0.86–1.26, P = 0.672, AME =0.64%)
Weber et al. 2023	To explore overall trends as well as racial/ethnic	Cross Sectional Study	n=15,713 non-English	Primary language Non-English	A single, large FQHC network in New York	Telehealth Services	<u>Access to care:</u> Behavioral Health and Family Practice	Non-English patients had significantly higher telephone visits than video visits for Family

Author and Year	Aim	Design	Sample	LEP Definition	Setting	Primary Care Service(s)	Outcomes and Measurements	Main Results
	disparities in utilization of different telehealth modalities (telephone vs. televideo) at federally qualified health centers during the COVID-19 pandemic		n= 96,384 English n= 8,974 unknown language		City and the Mid-Hudson Valley		visits per month occurring in-person, by telephone, or by video	Practice and Behavioral health Visits ($p < 0.001$)

Table 2.2*JBI Quality Appraisal for Cross-Sectional Studies*

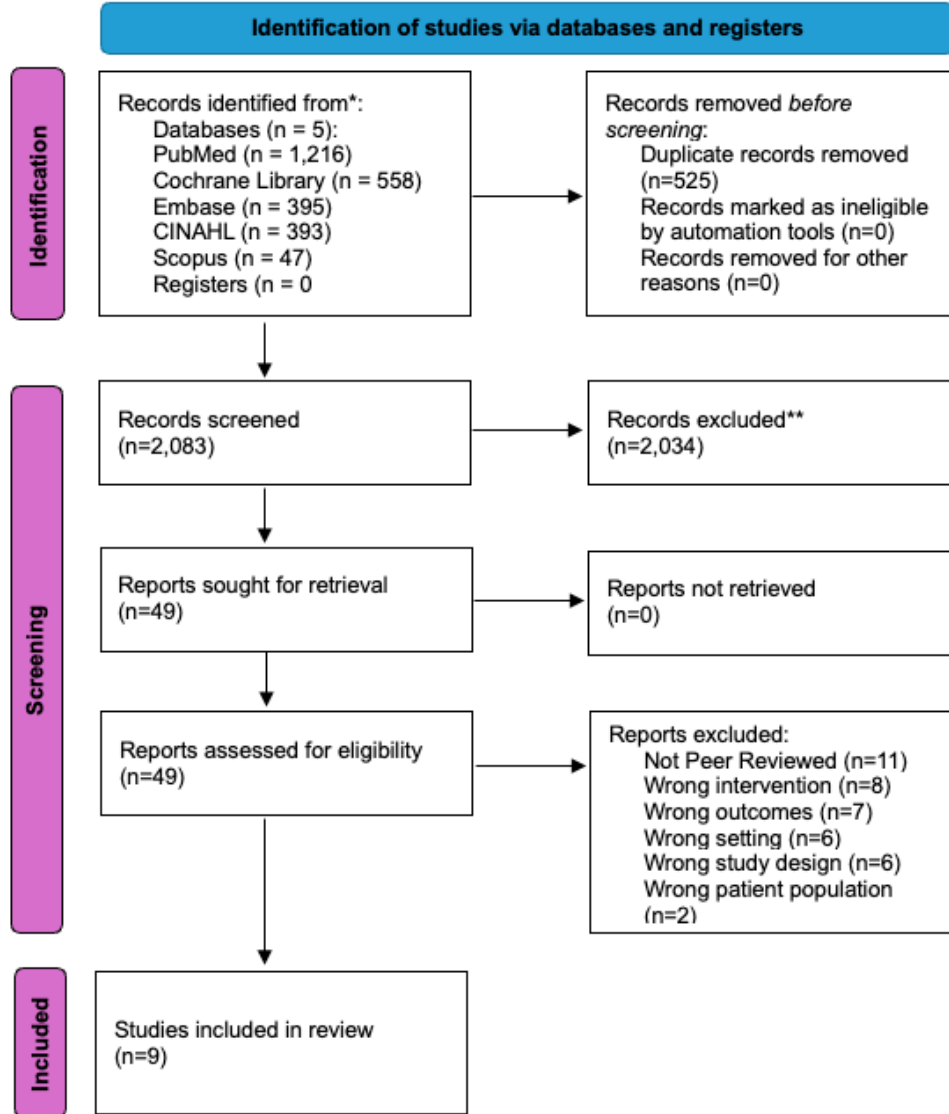
Item	Hsueh et al., 2023	Sachs et al., 2021	Weber et al., 2023	Squires et al., 2021
1. Were the criteria for inclusion in the sample clearly defined?	Yes	No	No	Yes
2. Were the study subjects and the setting described in detail?	Yes	Yes	Yes	Yes
3. Was the exposure measured in a valid and reliable way?	Yes	Yes	Yes	Yes
4. Were objective, standard criteria used for measurement of the condition?	Yes	Yes	Yes	Yes
5. Were confounding factors identified?	Yes	Yes	Yes	Yes
6. Were strategies to deal with confounding factors stated?	Yes	Yes	No	Yes
7. Were the outcomes measured in a valid and reliable way?	Yes	Yes	Yes	Yes
8. Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes
Overall Score (of 8)	8	7	6	8
Percentage (%)	100%	87.5%	75%	100%
Risk of Bias	Low	Low	Low	Low

Table 2.3*JBI Quality Appraisal for Cohort Studies*

Item	Eberly et al., 2020	Hacker et al., 2012	Nouri et al., 2023	Parameswaran et al., 2023	So et al., 2024
1. Were the two groups similar and recruited from the same population?	Yes	Yes	Yes	Yes	Yes
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?	Yes	Yes	Yes	Yes	Yes
3. Was the exposure measured in a valid and reliable way?	Yes	Yes	Yes	Yes	Yes
4. Were confounding factors identified?	Yes	Yes	Yes	Yes	No
5. Were strategies to deal with confounding factors stated?	Yes	Yes	Yes	Yes	No
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	No	Yes	Yes	Yes	Yes
7. Were the outcomes measured in a valid and reliable way?	Yes	Yes	Yes	Yes	Yes
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?	Yes	Yes	Yes	Yes	Yes
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	N/A	Unclear	Yes	N/A	Unclear
10. Were strategies to address incomplete follow up utilized?	N/A	Unclear	N/A	N/A	Unclear
11. Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes
Overall Score (of 11)	8	9	10	9	7
Percentage (%)	72.7%	81.8%	90.9%	81.8%	63.6%
Risk of Bias	Low	Low	Low	Low	Moderate
<i>Note.</i> N/A= not applicable.					

Figure 2.1

PRISMA Flow Diagram



Note. From “An Updated Guideline for Reporting Systematic Reviews,” by M.J. Page et al., 2021, *Journal of Clinical Epidemiology*, 134, p. 178-189. (<https://doi.org/10.1016/j.jclinepi.2021.03.001>).

Chapter 3: Emergency Department Visits and Hospitalizations Among Patients Receiving Care in Nurse Practitioner Primary Care Practices in Communities with Limited English Proficiency

The number of people in the United States (U.S.) with Limited English proficiency (LEP) is growing, with over 27.6 million people identified as having LEP in 2023 (U.S. Census Bureau, 2023b). LEP is defined by the U.S. Department of Health and Human Services as speaking English less than “very well”, which limits effective communication and access to services, particularly in healthcare encounters (Office of Civil Rights, 2013). The increasing population with LEP is primarily driven by increased immigration, as most people with LEP in the U.S. are foreign-born and arrive from non-English-speaking countries (Twersky et al., 2024). In 2023, the total number of immigrants rose to over 47 million, a significant increase from 9.6 million in 1970 (Batalova, 2025). Among them, over 5 million are older adults (i.e., 65 years and older) who immigrated when at a younger age for educational and career opportunities and have since aged into Medicare Eligibility (Camarota & Zeigler, 2021; U.S. Census Bureau, 2023b). The number of older adults with LEP is expected to continue rising due to family unification and refugee relocation, with the number of immigrants 60 years and older predicted to increase sixfold to 20 million by 2050 (Mizoguchi et al., 2019). Older adults with LEP who have a usual source of care face greater barriers than English-proficient older adults, including difficulty reaching their care provider after hours and longer travel to care facilities (Ramirez et al., 2023), which may result in increased ED use and hospitalizations. Therefore, as this population continues to grow, understanding how to meet the unique healthcare needs of older adults with LEP is essential to improving access, reducing acute care utilization, and advancing health equity in LEP communities.

Immigration patterns also influence the formation of LEP communities (i.e., communities with higher concentrations of LEP individuals). Many immigrants settling and living in areas with others from the same country or region, known as “ethnic enclaves,” where people with LEP maintain stronger linguistic and cultural connections to their native language and country of origin (Lim et al., 2017; Tam, 2019). Further, most people immigrate with their family members, which reinforces the use of native languages at home as a means of preserving cultural familiarity and social support (Schumacher et al., 2023). As a result, the number of LEP households continues to grow, most recently estimated at over 5.7 million, further contributing to the formation and rise of LEP communities across the U.S. (U.S. Census Bureau, 2023c) These LEP communities are unevenly distributed across the U.S., primarily located in California (25%), Texas (14%), Florida (9%), and New York (9%) (Halдар et al., 2023). Given the wide variation in LEP population concentrations and their geographic distribution across U.S. communities, it is critical to examine how community demographics and healthcare infrastructure in these areas influence access to care, service utilization, and health outcomes in LEP communities.

As one of the largest insurers in the U.S., the Centers for Medicare & Medicaid administers Medicare for those 65 years and older and has a legal obligation to ensure equitable, language-accessible healthcare (Civil Rights act of 1964; U.S. House, 2010). This responsibility is becoming increasingly urgent as the older adult population with LEP continues to rise. Yet, despite this legal protection, health disparities persist for patients with LEP due to a lack of language-accessible care (Al Shamsi et al., 2020; Twersky et al., 2024). For example, patients with LEP experience higher rates of ED utilization and hospital readmission, adverse events, prolonged hospital stays and increased mortality (Abedini et al., 2022; Chandrashekar et al.,

2022; Jacobs et al., 2020; Sliwinski et al., 2024b; Squires et al., 2022). A major contributing factor to these health disparities is the lack of proper interpreter service use during the health care encounters, which results in miscommunication, unmet language needs and lowers quality of care delivered (Heath et al., 2023; MacFarlane et al., 2020; Wiles et al., 2023). In fact, only 29% of ambulatory care providers reported using interpreter services regularly (Schulson & Anderson, 2022). This gap in language-accessible care leads to lower patient satisfaction, increased safety risks, miscommunications, treatment delays, and unmet healthcare needs among patients with LEP (Al Shamsi et al., 2020; Espinoza Suarez et al., 2021; Gerchow et al., 2021; Sharkiya, 2023).

These disparities are further compounded for older adults with LEP, who experience low levels of health literacy and digital health literacy, and other age-related barriers (e.g., hearing and vision impairments, memory loss, mobility issues, etc.) that increases the difficulty of engaging with health systems. Together, these challenges lead to worse health outcomes for older adults with LEP, including higher rates of ED use, hospitalizations, and in-hospital deaths (Abedini et al., 2022). Addressing these health disparities related to LEP requires enhancing primary care and examining community-level factors, such as the concentration of individuals with LEP and the resulting influx of language needs, to better understand their impact on care delivery and improve healthcare access and outcomes.

Primary care is the entry point into the healthcare system, traditionally delivering healthcare near where people live and work to reduce reliance on hospital-based care (Institute of Medicine Committee on the Future of Primary, 1996; World Health Organization, 2024). It plays a critical role improving population and community health by providing services involving usual care, preventative care, and chronic disease management (Friedberg et al., 2010; Shi, 2012;

Starfield et al., 2005), while also expanding access to essential services for underserved populations by integrating healthcare within communities (Starfield et al., 2005). Greater access to primary care results in increased preventive care and chronic disease management and lower ED and urgent care use (Hostetter et al., 2020; Timmins et al., 2020; Wilkinson et al., 2021). Therefore, a stronger presence of primary care within LEP communities is crucial to close gaps in access to care and improve health outcomes. However, the growing demands for primary care, driven by aging and rising chronic disease burden (Health Resources and Services Administration, 2023; Bazemore et al., 2024), are surpassing the supply of primary care providers. A national shortage of primary care physicians is projected to exceed 68,000 by 2036 (Health Resources and Services Administration, 2023). This strain on the primary care system is particularly concerning for LEP communities, where provider shortages are more likely to occur (Jindal et al., 2023), given percentage of older adult Medicare beneficiaries with LEP increased from 8% in 2017 to 11.7% in 2021 (Centers for Medicare & Medicaid Services, 2017; Centers for Medicare & Medicaid Services, 2024a).

Primary care practices increasingly rely on the Nurse Practitioner (NP) workforce to meet the demand and address primary care provider shortages. As of 2023, over half of primary care practices in the U.S. employ NPs (O'Reilly-Jacob et al., 2025). Between 2023 and 2033, the NP workforce is projected to grow by 45% (U.S. Bureau of Labor Statistics, 2023). NPs deliver safe, cost-effective primary care and increasingly provide care in underserved communities (Auerbach et al., 2020; Kueakomoldej et al., 2022; O'Reilly-Jacob et al., 2025). NP-delivered primary care is associated with improved or similar quality of care and reduced or similar ED utilization, hospitalizations, and costs compared to outcomes at practices without NPs (Barnett et al., 2022; Liu et al., 2020; McMenamain et al., 2023). Additionally, NPs are well-trained to deliver

culturally competent care (Liu et al., 2022), a crucial aspect of quality of primary care delivery in LEP communities. Yet, no study has evaluated how having NP primary care practices in LEP communities impacts acute care utilization. This study assessed whether the percentage of households with LEP in communities where NP primary care practices are located is associated with ED use and hospitalization among older adult patients receiving care at these practices.

3.2 Methods

Study Design

This study was a secondary data analysis of an existing cross-sectional dataset from 2018 to 2019 (R01MD011514 PI: Poghosyan). The dataset contained information about Medicare beneficiaries, including demographic characteristics, ED and hospitalization use, and data on the percentage of households with LEP in communities where primary care practices are located. The sample included data from five states (e.g., California, Texas, Washington, Arizona, and Pennsylvania), which represented a diverse range of LEP population concentrations, from some states with the highest LEP population concentrations (i.e. California, Texas) to among those with the lowest in the U.S (i.e., Washington, Pennsylvania, Arizona) (Haldar et al., 2023). This study received approval from the Columbia University Institutional Review Board (IRB-AAAV2764).

Data Sources

Medicare Claims Data. The parent study dataset contained Medicare claims data for beneficiaries 65 and older who received care in primary care practices employing at least one NP. The 2018 Medicare Master Beneficiary Summary Files, inpatient files (Part A), and outpatient files (Part B) were used to obtain data on patient-level characteristics, ED, and hospitalization use. Primary care practices were defined as those in which more than half of the

physicians held specialties in family practice, general practice, geriatrics, internal medicine, preventive medicine, or pediatrics (Harrison et al., 2021; Poghosyan, Liu, Turi, et al., 2024). The study employed a common approach (Mehrotra et al., 2010) to first attribute patients to clinicians based on the provider's National Provider Identifier (NPI) and then to the primary care practices where they received care. This was done by calculating the percentage of primary care evaluation and management (E&M) paid amounts provided to a beneficiary by each clinician, including NPs and physicians who submitted at least one claim for that beneficiary in the target year (2018). Beneficiaries were assigned to a provider (NP or physician) who provided the highest proportion of E&M paid amounts above 30%. Then, beneficiaries were attributed to the practice where the dominant provider worked based on the IQVIA OneKey database. IQVIA OneKey is a healthcare industry database that collects healthcare provider and practice data across the U.S. (IQVIA, 2020). Onekey includes data from IMS Health, Healthcare Data Solutions, and SK&A. All patient data, regardless of whether the dominant provider was an NP or physician, was included in the parent study dataset since NPs' contribution to interdisciplinary primary care is usually obscured in claims-based data due to incident-to-billing practices, where NP care is billed under physicians' NPI to gain a higher reimbursement rate (Medicare Payment Advisory Commission, 2019).

American Community Survey Data. We used the American Community Survey to gather data on the percentage of households with LEP in communities where NP primary care practices are located. The American Community Survey is an ongoing survey that delivers annual data on the U.S. population and housing, supporting the planning of investments and services (U.S. Census Bureau, 2024a). In this study, communities were defined by census tract, which are small geographic areas used by the U.S. Census Bureau and are an effective area-based measure

for identifying patients' community characteristics (Bhattacharya et al., 2024; U.S. Census Bureau, 2024b). Census tracts have populations ranging from 1,200 to 8,000 people, with an average of approximately 4,000 inhabitants (U.S. Census Bureau, 2024b). We obtained American Community Survey data for the five states sampled from the parent study by using 2018 5-year estimates. Specifically, we extracted the percentage of limited English-speaking households (i.e., households with LEP) among all households within each census tract (U.S. Census Bureau, 2018). A household with LEP was defined as one where no household member aged 14 years or older either 1) speaks only English or 2) speaks a non-English language and also speaks English "very well" (i.e., all members 14 years and older have at least some difficulty with English) (U.S. Census Bureau, 2023c). We downloaded and used the calculated percentage estimate of households with LEP among all households within each census tract for our independent variable (U.S. Census Bureau, 2018).

Data Merging

We merged Medicare data with American Community Survey data. We began with a dataset from the parent study that included Medicare beneficiary data linked to the primary care practice where they receive care. To incorporate community-level language data, we merged in American Community Survey data by cross-walking 9-digit zip codes to the census tracts where each primary care practice is located, and where patients receive care (Din & Wilson, 2020). This allowed us to attribute each practice a percentage of households with LEP value based on the concentration of households with LEP in its corresponding census tract. We then attributed the percentage of households with LEP value to all Medicare beneficiaries receiving primary care at each practice.

Study Sample

The final sample comprises 506,516 Medicare beneficiaries aged 65 years or older receiving primary care services at 895 NP-employing practices located in 891 communities with varying percentages of households with LEP, ranging from 0.0% to 72.4%. Only four practices were located in the same community. Medicare beneficiaries were included if they had at least one Medicare claim filed by at least one of the providers (i.e., NPs, physicians) from the practices and were community-dwelling (i.e., did not reside in a nursing home for more than 100 days in 2018).

Measures

Percentage of Households with LEP. The independent variable was the percentage of households with LEP in each census tract where NP-employing primary care practices were located. The percentage of households with LEP was a continuous measure ranging from 0.0% to 72.4%.

Acute Care Utilization. The two dependent variables were all-cause ED visits and hospitalizations, both measured as continuous count variables. ED utilization was defined as the number of visits for patients seen in the ED but not hospitalized. Hospitalizations were defined as the number of inpatient admission records with a length of stay of more than one day. ED and hospital visits were measured separately at the beneficiary level.

Covariates. We controlled for patient- and practice-level characteristics. Patient-level characteristics included biological sex (binary: male or female), age (continuous), Race/Ethnicity (categorical: non-Hispanic White, Black, Hispanic, Asian/Pacific Islander, American Indian/Alaska Native, and another racial/ethnic category), provider type (e.g., NP or physician), and the number of chronic conditions as a measure of patients' comorbidity. Practice-level characteristics included practice size (continuous: the number of providers in the clinic), practice

type (e.g., physician's office, hospital-based outpatient clinics, etc.), urbanicity (e.g., urban vs rural), and state location of practice (e.g., California, Texas, Washington, Arizona, and Pennsylvania).

Statistical analysis

We conducted descriptive statistics of patient- and practice-level characteristics. The multicollinearity of the data was assessed using the variance inflation factor (VIF), and no concerns about multicollinearity were indicated as all VIF values were less than 5 (James et al., 2013). Missing data was <5% overall. We then used multilevel negative binomial regression models to determine the association between the percentage of households with LEP in communities where primary care practices are located and ED use and hospitalization. This approach was chosen since the percentage of households with LEP was not normally distributed, and negative binomial distribution accounts for this. The multilevel regression models accounted for the clustering effect of patients nested within practice and practices nested within census tracts. The two levels of the sample were patients and practices. Our independent variable was the percentage of households with LEP in communities where NP practices are located. The percentage of households with LEP was treated as a practice-level variable since only four NP practices were in the same census tract. The percentage of households with LEP was rescaled by dividing the percentage by 10 to enhance interpretability and facilitate more accurate effect size estimation. Rescaling allows the results to be interpreted as a 10-percentage-point increase in households with LEP rather than a one-percentage-point increase, which makes effect sizes more meaningful. The outcome variable was the number of all-cause ED visits and hospitalizations at the patient level. Adjusted incident risk ratios (IRRs), 95% confidence intervals (CIs), and p-values (alpha level of 0.05) were estimated to assess the strength and direction of the relationship between increasing percentage of households with LEP and ED use and hospitalization,

controlling for patient and practice-level covariates. To evaluate the robustness of our findings, we conducted a sensitivity analysis by excluding observations where the percentage of households with LEP was zero (i.e., English-speaking communities) and reran our multilevel negative binomial regression models. This sensitivity analysis enabled us to determine whether the presence of practices in English-speaking communities affected our results. All analyses were completed in SAS 9.4 software (SAS Institute, Inc., Cary, NC).

3.3 Results

Patient and Practice Characteristics

The final sample consisted of 506,516 older adults from 895 NP-employing primary care practices. **Table 3.1** presents the characteristics of our patient sample. The patients were predominantly female (58.39%) and non-Hispanic White (81.99%). The average age of the patients was 75.22 years. On average, patients had 2.83 chronic conditions and had a physician as their primary provider (85.61%). Over 134,400 patients (26.54%) had an all-cause ED visit, and 80,864 patients (15.94%) had an all-cause hospitalization.

Table 3.2 shows the characteristics of the NP practices serving Medicare beneficiaries. Among the 895 NP-employing practices, practices had 6.14 physicians and 2.92 NPs on average. Practices were mostly physician practices (44.36%), located in Pennsylvania (26.93%), California (24.92%), and Texas (21.56%), and in urban areas (84.80%). The average percentage of households with LEP in communities where NP practices were located was 5.95%, ranging from 0.0%-72.4%. Most practices (75.31%) were located in communities with a low percentage of households with LEP (i.e., percentage of households with LEP greater than 0% but less than 15.5%), followed by 14.64% being in English-speaking communities (i.e., percentage of households with LEP=0%) and 10.06% of practices were located in communities with a high

percentage of households with LEP (i.e., percentage of households with LEP greater 15.5% through the maximum 72.40%).

Percentage of Households with LEP and ED Use and Hospitalizations

Tables 3.3 and **3.4** provide the results of our inferential analysis for both ED use and hospitalization outcomes. After adjusting for covariates, there was a statistically significant negative association between the percentage of households with LEP and ED visits (IRR=0.938; 95% CI: 0.901-0.976, p=0.0016). For every 10% increase in the percentage of households with LEP in a community, there was a 6.2% decrease in the incidence of ED visits. This suggests that receiving care at NP practices located in a community with a higher percentage of households with LEP was associated with lower ED utilization among patients. These results remained consistent in the sensitivity analysis (IRR=0.933; 95% CI: 0.896–0.973, p=0.0011), indicating that including practices located in English-speaking communities in our sample did not influence the observed association between a higher percentage of households with LEP and lower incidence of ED visits.

The association between the percentage of households with LEP and hospitalizations was also negative but marginally significant when adjusting for covariates (IRR=0.968; CI: 0.937-1.000, p=0.0532). A 10% increase in the percentage of households with LEP in a community was associated with a 3.2% lower incidence of hospitalizations. This suggests that receiving care at NP practices located in a community with a higher percentage of households with LEP was associated with lower hospitalizations, though the significance was marginal. However, in the sensitivity analysis, the association weakened (IRR=0.976, 95% CI: 0.944–1.010, p=0.1682), indicating that including practices in English-speaking communities in our sample influenced the association between higher percentages of households with LEP and lower incidence of

hospitalizations. Effect estimates for covariates remained similar between the adjusted models and the sensitivity analysis, supporting the robustness of these findings.

3.4 Discussion

We examined the relationship between the percentage of households with LEP in communities where NP primary care practices are located and ED use and hospitalizations among older adult patients receiving care at these practices. We found that receiving care at NP practices located in communities with a higher percentage of households with LEP was associated with a significantly lower incidence of ED visits and a marginally significantly lower incidence of hospitalizations among older adults. To our knowledge, this is the first study to demonstrate lower ED utilization among patients receiving care at NP practices located in LEP communities. These findings underscore the critical role of the NP workforce in underserved areas, including LEP communities, to ensure access to care (Barnes et al., 2018; Kueakomoldej et al., 2022; Mileski et al., 2020; O'Reilly-Jacob et al., 2025) and in potentially reducing avoidable acute care use (McMenamin et al., 2023; Smith et al., 2020). Our study highlights the need to further investigate how NP primary care can be leveraged to improve health outcomes in LEP communities.

Our findings may indicate that having NP primary care practices in LEP communities may reduce unnecessary acute care use. Previous research has demonstrated that those with LEP lack a regular source of care and experience lower rates of ambulatory care utilization than those who are English speaking (Himmelstein et al., 2022; Ramirez et al., 2023; Twersky et al., 2024). As the NP primary care workforce continues to grow across the U.S., NPs increasingly expand access and provide care in underserved areas (Barnes et al., 2018; Naylor et al., 2019; O'Reilly-Jacob et al., 2025). For LEP communities, this expansion of the NP workforce may contribute to

more accessible, consistent, and community-based care. Primary care delivery by NPs is associated with vulnerable patients having fewer ED visits and hospitalizations (Liu et al., 2020; McMenamin et al., 2023; Mileski et al., 2020; Osakwe et al., 2020). Therefore, our findings align with evidence previously linking NP-primary care with improved access and reduced acute care outcomes, and extend it by demonstrating lower ED utilization among patients at NP practices within LEP communities.

Several factors may contribute to the beneficial impact of receiving care at NP practices in LEP communities. NPs are increasingly recognized for providing culturally competent, patient-centered care that meets local community health needs and increases the quality of care delivered (Adams et al., 2024; Barnett et al., 2022; Carthon et al., 2020; Liu et al., 2022). Their education and training are centered on the holistic health of patients, and NPs understand the influence of individual, community, and environmental factors on health promotion and disease prevention (Association of Nurse Practitioners, 2024a). Therefore, NPs caring for patients in LEP communities may provide more patient-centered care beyond treating clinical symptoms, which may improve patient understanding and adherence to treatment, reducing acute care needs. LEP communities often face higher rates of poverty, lower educational attainment, and lower health literacy (Haldar et al., 2023), characteristics that align with the communities typically served by NP practices, as they are more likely to be located in socioeconomically disadvantaged areas (O'Reilly-Jacob et al., 2025). By delivering high-quality, patient-centered care, NPs may be particularly effective in bridging gaps in communication and promoting health literacy among these vulnerable populations (Cafiero, 2013; Nock et al., 2023), an important aspect when serving LEP communities. NP efforts can enhance engagement with preventative services and ultimately reduce reliance on acute care services, patterns that are supported by our findings.

In addition to individual NP competencies, organizational and practice-level factors likely play a role in outcomes among patients receiving care at NP practices in LEP communities. Better work environments have been shown to improve disparities in ED outcomes (Muir et al., 2025) and reduce hospital readmissions among patients with LEP (Sliwinski et al., 2025c). For NPs, more favorable work environments expand their capacity to provide more patient-centered, high-quality care (Carthon et al., 2020; Carthon et al., 2022), particularly in resource-constrained settings. Further, better NP work environments contribute to reducing disparities in ED use and hospitalizations among vulnerable populations (Poghosyan et al., 2022; Poghosyan et al., 2024). Therefore, the NP work environment may be an influential factor in lower ED visits among patients receiving primary care in LEP communities. Yet, there is a lack of evidence on the influence of the NP work environment on outcomes for patients and communities with language needs. Understanding how organizational factors (i.e., the work environment) enable NPs to meet the language needs of LEP communities and patients is essential for primary care delivery to be effective and equitable.

Implications for Practice, Policy, and Research

The results from this study have critical practice, policy, and research implications for improving access to care and health outcomes among patients in LEP communities. For primary care practices, partnerships with community-based organizations have promising potential to enhance the organizational capacity of primary care systems and providers to deliver more tailored, preventive care that may reduce avoidable acute care use among patients (Etz et al., 2008; Gonzalez-Barrera et al., 2024; Guilamo-Ramos et al., 2024; Seifert et al., 2024; Wagner et al., 2022; Wijayanti, 2024). To realize this potential, primary care practice administrators serving LEP communities should proactively build and sustain cross-sector partnerships that support

access to local care for those with language needs. Additionally, practices should leverage the leadership skills of NPs, who are well-positioned to form and maintain these community partnerships (Adams et al., 2024; Lamb et al., 2018).

Policymakers should prioritize investments in recruiting and retaining primary care NPs in LEP communities to strengthen care delivery and reduce avoidable acute care utilization. Synthesized research has shown that efforts to recruit and retain NPs in underserved areas are effective when NPs receive education tailored to the specific needs of the vulnerable population and when NPs have personal experience living in similar communities (Kueakomoldej et al., 2022). Therefore, policy and funding initiatives should focus on expanding pathways for individuals from LEP communities to enter the nursing workforce and return to serve LEP communities. This includes not only recruiting NPs from LEP communities but also developing educational programs that increase the number of multilingual NPs and enhance providers' capacity to meet the language needs of patients and communities.

Future research should investigate how NP-delivered primary care leads to lower acute care utilization outcomes among patients receiving care in LEP communities. This may include understanding whether factors that directly meet language needs, such as access to interpreter services, language concordance, care coordination, or cultural competence, are implemented by NPs and how they impact the quality of care delivery. In fact, the implementation of language-concordant care has increased the number of clinical and preventative services received and reduced ED visits, hospitalizations, and mortality (Michael et al., 2024; Twersky et al., 2024). Further, future research should address the gap we identified in understanding how organizational factors related to NP primary care may shape health outcomes of communities and patients with language needs.

Limitations

This study has several limitations. Given the cross-sectional study design, we could not test for causality. However, we controlled for numerous covariates and used large data sources. Another limitation of this study is the use of community-level LEP data rather than individual-level LEP data, as individual-level LEP measures would allow for a more granular analysis of how LEP impacts ED visits and hospitalizations. Even though half of primary care practices in the U.S. employ NPs (O'Reilly-Jacob et al., 2025), our sample was limited to NP-employing practices, which may differ from care delivered in non-NP-employing primary care practices. Finally, this study relied on data collected before the COVID pandemic, limiting the applicability of the findings to post-pandemic healthcare delivery contexts. Despite these limitations, this study was essential in producing novel evidence on expanding the NP workforce to deliver primary care in growing LEP communities in the U.S.

3.5 Conclusions

This study assessed the association between the percentage of households with LEP in communities where NP primary care practices were located and ED use and hospitalization among older adult patients who received care at these practices. Receiving care at NP practices located in communities with a higher percentage of households with LEP was associated with fewer ED visits and hospitalizations among patients. NP-employing primary care practices may improve access to care in LEP communities and, in turn, reduce reliance on acute care. There is a need to better understand the impact of NP care in LEP communities and how to best support NPs in serving patients with LEP to reduce health disparities related to language.

Table 3.1*Characteristics of Medicare Beneficiaries (n=506,516)*

Characteristics	Value
Age – mean (SD)	75.22 (7.51)
Gender – n (%)	
Female	295,772 (58.39%)
Male	210,744 (41.61%)
Race/Ethnicity – n (%)	
Non-Hispanic White	415,284 (81.99%)
Hispanic	38,276 (7.56%)
Black	19,981 (3.94%)
Asian	17,442 (3.44%)
All Other	15,533 (3.07%)
Number of Chronic Conditions – mean (SD)	2.83 (2.02)
Provider Type – n (%)	
Patients with an MD as Primary Provider	433,608 (85.61%)
Patients with an NP as Primary Provider	72,908 (14.39%)
Number of ED Visits – mean (SD)	0.44 (1.16)
Number of Hospitalizations – mean (SD)	0.24 (0.68)
Patients with an all-cause ED visit– n (%)	134423 (26.54%)
Patients with an all-cause Hospitalization– n (%)	80864 (15.96%)

Note. LEP, Limited English Proficiency; SD, standard deviation; MD, medical doctor; NP, nurse practitioner; ED, emergency department.

Table 3.2*Characteristics of NP Practices Serving Medicare Beneficiaries (n=895)*

Characteristics	Value
Number of MDs at Practice – mean (SD)	6.14 (15.23)
Number of NPs at Practice – mean (SD)	2.92 (3.86)
Practice Type – n (%)	
Physician Practice	397 (44.36%)
Other/Unsure	212 (23.69%)
Hospital-based Clinic	73 (8.16%)
Federally Qualified Health Center	177 (19.78%)
Rural Health Center	36 (4.02%)
Practice State Location – n (%)	
Pennsylvania	241 (26.93%)
Texas	193 (21.56%)
Washington	134 (14.97%)
California	223 (24.92%)
Arizona	104 (11.62%)
Urbanicity – n (%)	
Urban	759 (84.80%)
Rural	136 (15.20%)
Community-Level LEP percentage – mean (SD)	5.95% (8.40%)
Range of Community-Level LEP percentage- low-high	0% – 72.40%
Number of Practices by Community Level LEP percentage– n (%)	
English Speaking communities (LEP=0%)	131 (14.64%)
Low LEP Communities (0%> to <15.5%)	674 (75.31%)
High LEP Communities (\geq 15.5%)	90 (10.06%)

Note. LEP, Limited English Proficiency; SD, standard deviation; MD, medical doctor; NP, nurse practitioner

Table 3.3

Relationship between the Percentage of Households with LEP in Communities where NP Practices are Located and All-Cause ED Use among Medicare Beneficiaries (n=506,516)

Variable	Adjusted Model			Sensitivity analysis				
	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value
<i>Independent Variable</i>								
Community-level LEP	0.938	0.901-0.976		0.0016	0.9334	0.896	0.973	0.0011
<i>Covariates</i>								
Age	1.01319	1.011769	1.014707	<.0001	1.01308	1.011566	1.014707	<.0001
Race/Ethnicity (referent= White)								
Black	1.62645	1.544345	1.71275	<.0001	1.63428	1.547746	1.725643	<.0001
Hispanic	1.24645	1.191246	1.304344	<.0001	1.24583	1.188747	1.305779	<.0001
Asian	0.84375	0.779814	0.912835	<.0001	0.83937	0.774142	0.91001	<.0001
All other	1.17786	0.99561	1.393613	0.0564	1.19662	0.9998	1.432183	0.0503
Sex (referent = male)	1.11918	1.102081	1.136553	<.0001	1.12199	1.103625	1.140652	<.0001
Chronic Conditions	1.30474	1.298877	1.310751	<.0001	1.30421	1.297968	1.31062	<.0001
Provider Type (referent = MD)	1.08817	1.040082	1.138601	0.0002	1.09417	1.040082	1.151194	0.0005
Number of MDs in the Practice	1.0012	0.9997	1.002804	0.1195	1.0011	0.9995	1.002704	0.1676
Number of NPs in the practice	1.00391	1.001501	1.006421	0.0015	-1.00411	1.001401	1.006924	0.003
Clinic type (referent = physician practice)								
Federally qualified health center	1.71635	1.540951	1.911714	<.0001	1.6991	1.508476	1.914009	<.0001
Hospital-based Clinic	1.28531	1.180573	1.399339	<.0001	1.27392	1.16451	1.393613	<.0001
Rural health clinic	1.26668	0.980983	1.635584	0.0698	1.27112	0.965219	1.673973	0.0876
Other/Unsure	1.20707	1.130206	1.289301	<.0001	1.19638	1.115832	1.282614	<.0001
Urbanicity (referent = urban)	-1.00391	0.91631	1.099989	0.933	0.96889	0.873105	1.0753	0.5522
Practice State (referent =Pennsylvania)								
Arizona	1.15917	1.072186	1.2532	0.0002	1.18661	1.084805	1.297838	0.0002
California	1.13406	1.052112	1.22238	0.001	1.17798	1.085999	1.277877	<.0001
Texas	1.05138	0.982063	1.125582	0.15	1.09626	1.011971	1.187559	0.0244
Washington	0.97103	0.883998	1.066626	0.5389	1.02092	0.926631	1.124907	0.6752

Note. LEP, Limited English Proficiency; ED, emergency department; MD, Medical Doctor; NP, Nurse practitioner;

Table 3.4

Relationship between the Percentage of Households with LEP in Communities where NP Practices are Located and All-Cause Hospitalizations among Medicare Beneficiaries (n=506,516)

Variable	Adjusted Model			Sensitivity Analysis				
	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value
<i>Independent Variable</i>								
Community-level LEP	0.968	0.937 -1.00		0.0532	0.976481	0.944027	1.01005	0.1682
<i>Covariates</i>								
Age	0.997703	0.996506	0.998901	0.0001	0.997802	0.996506	0.999	0.0004
Race/Ethnicity (referent= White								
Black	1.012781	0.959349	1.069082	0.6468	1.010151	0.954565	1.068868	0.7275
Hispanic	0.939037	0.895565	0.98462	0.0093	0.944405	0.899964	0.990941	0.0199
Asian	0.790729	0.720795	0.867534	<.0001	0.785763	0.713766	0.865022	<.0001
All other	0.884087	0.840129	0.930345	<.0001	0.88568	0.839121	0.934821	<.0001
Sex (referent = male)	0.874153	0.860364	0.888163	<.0001	0.872668	0.858301	0.887364	<.0001
Chronic Conditions	1.583757	1.576016	1.591696	<.0001	1.582491	1.574126	1.591059	<.0001
Provider Type (referent = MD)	1.079826	1.029219	1.132809	0.0017	1.070794	1.019793	1.124457	0.0061
Number of MDs in the Practice	1.001601	1.001001	1.002303	<.0001	1.001601	1.0009	1.002403	<.0001
Number of NPs in the practice	1.0002	0.998202	1.002202	0.8314	1.0005	0.998501	1.002503	0.6108
Clinic type (referent = physician practice)								
Federally qualified health center	1.333224	1.223114	1.453246	<.0001	1.279411	1.165675	1.404386	<.0001
Hospital-based Clinic	1.132695	1.050851	1.220914	0.0011	1.147746	1.057809	1.245454	0.0009
Rural health clinic	1.543728	1.337497	1.781757	<.0001	1.569724	1.339237	1.839879	<.0001
Other/Unsure	1.148665	1.091988	1.208162	<.0001	1.141907	1.081123	1.205989	<.0001
Urbanicity (referent = urban)	1.005113	0.947906	1.065773	0.8646	1.018876	0.947432	1.095707	0.6142
Practice State (referent =Pennsylvania)								
Arizona	0.924872	0.862776	0.991536	0.0279	0.927465	0.859246	1.001101	0.0535
California	0.90538	0.849591	0.964833	0.0022	0.908737	0.848742	0.972972	0.006
Texas	0.954565	0.902759	1.009343	0.1027	0.948096	0.890119	1.009848	0.0979
Washington	0.94535	0.883822	1.011162	0.1019	0.93763	0.868663	1.012072	0.0985

Note. LEP, Limited English Proficiency; MD, Medical Doctor; NP, Nurse Practitioner;

Chapter 4: The Influence of the Nurse Practitioner Work Environment on Emergency Department Visits and Hospitalizations in Primary Care Practices Caring for Non-English-Speaking Patients

Over 27.6 million people in the United States (U.S.) in 2023 reported speaking English less than “very well”, identifying them as non-English speaking (NES) (Office of Civil Rights, 2013; U.S. Census Bureau, 2023b). NES patients often experience miscommunications with their provider due to the lack of a shared primary language (i.e., language barrier), which can compromise patient safety, decrease patient satisfaction, and lower the quality of care received (Al Shamsi et al., 2020; Gonzalez-Barrera et al., 2024; Slade & Sergent, 2024; Twersky et al., 2024). As a result, NES patients persistently have worse health outcomes and experience health disparities compared to their English counterparts, including lower access to care, higher risk of preventable acute care use, and increased mortality (Abedini et al., 2022; Al Shamsi et al., 2020; Chandrashekar et al., 2022; Jacobs et al., 2020; Sliwinski et al., 2024b; Squires et al., 2022; Twersky et al., 2024).

Interpreter services are the most commonly implemented strategy to mitigate language barriers in healthcare (van Lent et al., 2025). Although using interpreter services improves patient care, satisfaction, and outcomes (Al Shamsi et al., 2020; Heath et al., 2023), organizational-level barriers inhibit providers’ ability to use them effectively and consistently to address language barriers (Sliwinski et al., 2024b). Key barriers to implementing interpreter services include a lack of availability, long wait times, and providers not feeling adequately trained to integrate interpreter services during care delivery (Gerchow et al., 2021; Tang et al., 2024). Improving care for NES patients requires more than relying on and prioritizing the use of interpreter services to ensure high-quality care and improve outcomes among NES patients.

While evidence supports their effectiveness (van Lent et al., 2025), interpreter services cannot be fully effective without first addressing the organizational barriers that limit their use and impact care delivery. Therefore, it is critical to examine the broader work environment, as it influences the context in which high-quality, patient-centered, language accessible care can be delivered.

NES patients are more likely to rely on emergency rooms as a source of usual care compared to English-speaking patients (Gonzalez-Barrera et al., 2024). This exposes a gap in access to primary care among NES patients. Primary care is often the first point of contact in the healthcare system (Institute of Medicine Committee on the Future of Primary, 1996; World Health Organization, 2024). For NES patients, primary care is essential, as it expands access to care nearby where patients live and its services help manage chronic conditions (Friedberg et al., 2010; Shi, 2012; Starfield et al., 2005), which can prevent avoidable acute care utilization (Hostetter et al., 2020; Timmins et al., 2020; Wilkinson et al., 2021). Therefore, strengthening access to primary care can decrease reliance on acute care services among NES patients.

The primary care system faces increasing pressure from workforce shortages (Health Resources and Services Administration, 2023) and increasing demands for services, influenced by the aging population and an increasing number of patients with chronic diseases (Health Resources and Services Administration, 2023; Bazemore et al., 2024). These system-wide challenges are further compounded by language barriers that limit providers' ability to effectively care for NES patients. Primary care providers often experience misunderstandings of patient needs due to language barriers when caring for NES patients, resulting in increased stress and lower capacity to deliver high-quality care (Al Shamsi et al., 2020; Slade & Sergent, 2024; Squires, 2017). While interpreter services are a recommended strategy to address language barriers, less than 30% of primary care providers routinely use interpreter services when working

with NES patients, and 40% reported never using them due to organizational barriers, mainly a lack of availability (Schulson & Anderson, 2022). These challenges not only compromise care quality and put patients at higher risk for adverse outcomes, but they also perpetuate structural, organizational inequities within primary care settings that reinforce health disparities among NES patients (Sliwinski et al., 2024b). Therefore, primary care can reduce avoidable acute care utilization among NES patients, but only when organizational factors are addressed.

Nurse Practitioners (NPs) are essential in delivering primary care, as over half of primary care practices in the U.S. employ NPs (O'Reilly-Jacob et al., 2025). As the fastest-growing sector of the primary care workforce, expected to grow by 45% between 2022 and 2032 (Statistics), NPs help to meet the increasing demands for primary care and expand access to care for underserved populations (Barnes et al., 2018; Bazemore et al., 2024; O'Reilly-Jacob et al., 2025). NP-care is safe, cost-effective, and monumental to increasing access to primary care in underserved areas (Auerbach et al., 2020; Kueakomoldej et al., 2022; O'Reilly-Jacob et al., 2025). Patients cared for by NPs experience optimal health outcomes, most notably reduced ED utilization and hospitalizations (Barnett et al., 2022; Liu et al., 2020; McMEnamin et al., 2023). Therefore, NPs are well-positioned to improve health disparities among NES patients, if they are supported adequately within their practice organizations.

To utilize NPs to their full capacity to care for NES patients, it is necessary to examine the work environment in which they practice and its influence on care delivery and patient outcomes. Among NES patients, better work environments are associated with improved ED utilization and hospitalization outcomes (Muir et al., 2025; Sliwinski et al., 2025c). Favorable work environments allow NPs to deliver more patient-centered, high-quality care (Carthon et al., 2020; Carthon et al., 2022) and have been shown to reduce disparities in ED use and

hospitalizations among vulnerable populations, such as those with chronic illness (Poghosyan et al., 2022; Poghosyan et al., 2024). To date, there is no evidence on the impact of the NP work environment on acute care utilization among practices that care for NES patients. This study assessed how the NP work environment moderates the relationship between the likelihood of primary care practices caring for NES patients and ED visits and hospitalizations.

4.2 Methods

Study Design

This study is a secondary data analysis of an existing cross-sectional dataset with NP survey data collected in 2018-2019, which was previously merged with 2018 Medicare claims data in the parent study (R01MD011514 PI: Poghosyan). NP survey data included information on how often practices care for NES patients and data on the work environment. Medicare claims data included demographic information, ED visits, and hospitalization use among Medicare beneficiaries. The Columbia University Institutional Review Board approved this study (IRB-AAAV2764).

Data Sources

NP Survey Data. NPs completed a survey sharing information about their work environments and how often they care for patients within their practices whose primary language is not English (Harrison et al., 2021). Data were collected in 2018-2019. Primary care NPs were recruited from the healthcare industry database IQVIA OneKey for survey participation. The IQVIA database contains data on healthcare providers and practice data across the U.S., including names, practice locations, contact information, and National Provider Identifiers (NPIs) (IQVIA, 2020). Primary care practices were defined as those having 50% or more physicians holding specialties in family practice, general practice, geriatrics, internal medicine,

preventive medicine, or pediatrics (Barnes et al., 2018; Harrison et al., 2021; Poghosyan, Liu, Turi, et al., 2024). Practices were then selected if they employed at least one NP.

A Dillman approach, an established design for mix-mode surveys, guided the data collection and was employed to maximize the response rate (Dillman et al., 2014; Harrison et al., 2021). Each NP had a unique individual identifier and received three paper surveys via mail, two postcard reminders, and an online link included in the mail to allow NPs to complete the survey online or on paper (Harrison et al., 2021). The respondent sample included 1,244 NPs from 1,109 primary care practices (Harrison et al., 2021). The parent study had a 21.9% response rate (Harrison et al., 2021), comparable to previous large-scale nurse surveys (Carthon et al., 2020; Lasater et al., 2019). More information on the survey methodology is described elsewhere (Harrison et al., 2021; Poghosyan et al., 2022; Poghosyan et al., 2023).

Medicare Claims Data. Medicare claims data contained information for patients 65 and older who received care in primary care practices employing at least one NP. The 2018 Master Beneficiary Summary Files provided data on the beneficiaries' demographics and comorbidities (i.e., race, ethnicity, sex, age, and chronic conditions). Medicare Part A (inpatient acute care) and Part B (outpatient clinician services) were used to identify ED utilization and hospitalizations. 2018 Medicare inpatient files (Part A) for hospitalized patients and outpatient files (Part B) for patients seen in the ED but not hospitalized were used to determine ED utilization.

Data Merging and Attribution

In the parent study, NP survey data was merged with Medicare Claims data. Patients were first attributed to clinicians based on the provider's National Provider Identifier (NPI) and then to primary care practices where they received care, a commonly employed approach (Mehrotra et al., 2010). The proportion of primary care evaluation and management (E&M) paid

amounts provided to a beneficiary by each clinician, including NPs and physicians who submitted at least one claim for that beneficiary in the target year (2018), was calculated. Then, beneficiaries were assigned to a provider (NP or physician) who provided the highest proportion of E&M paid amounts above 30%. After this, beneficiaries were attributed to the practice where the dominant provider worked based on the IQVIA OneKey database. All patient data were retained in the parent study dataset, regardless of whether the dominant provider was an NP or physician, since NPs' contribution to interdisciplinary primary care are often masked in claims-based data. This is largely due to incident-to-billing practices, in which NP-provided care is billed under physicians' NPIs to obtain higher reimbursements (Medicare Payment Advisory Commission, 2019).

Study Sample

The final sample for the current study included 596,677 Medicare beneficiaries receiving care in 1,042 primary care practices. These practices employed NPs to provide care. Patients included Medicare beneficiaries 65 years of age and older who had at least one Medicare claim filed by at least one of the providers (i.e., NPs, physicians) from the practices and were community-dwelling (i.e., did not reside in a nursing home for more than 100 days in 2018). Primary care practices from six linguistically diverse states were included in the parent study: Arizona, California, New Jersey, Pennsylvania, Texas, and Washington, reflecting a broad range of NES populations (Haldar et al., 2023).

Measures

Caring for NES Patients. The independent variable was the practice-level likelihood of caring for NES patients. Each NP was asked to complete a single survey item, "How often do you provide care to patients whose primary language is not English?". Responses were measured

on a 5-point ordinal scale, ranging from 1 to 5 (i.e., “1” indicating never to “5” indicating very frequently). To create a practice-level measure, individual NP responses were averaged within each practice to calculate a mean score, with higher scores indicating a higher reported likelihood of practices caring for NES patients. This variable was treated as continuous, consistent with the literature supporting that ordinal variables with five or more categories can be appropriately analyzed as continuous measures without harming the validity of statistical analyses (Johnson & Creech, 1983; Norman, 2010; Sullivan & Artino, 2013; Zumbo & Zimmerman, 1993).

NP Work Environment. The moderating variable was the practice-level NP work environment score, measured by the Nurse Practitioner Primary Care Organizational Climate Questionnaire (NP-PCOCQ). NPs completed the NP-PCOCQ in the survey (Poghosyan et al., 2019), which is a validated instrument with 29 items across four subscales: 1) NP-Physician Relations, 2) Independent Practice and Support, 3) Professional Visibility, and 4) NP-Administration Relations (Poghosyan et al., 2017). The NP-PCOCQ has high internal consistency with Cronbach’s alphas ranging from 0.87 to 0.95 (Poghosyan et al., 2013) and has established construct, discriminant, and predictive validity (Poghosyan et al., 2017). NPs responded survey items on about the work environment using a 4-point Likert scale from “*strongly agree*” to “*strongly disagree*.” Subscale mean scores were first computed at the individual NP level, which were then averaged to a single global composite NP-level work environment score. Individual NP global work environment scores were then aggregated to the practice level, since the work environment is an organizational characteristic (Lake, 2007). Thus, the practice-level global NP work environment score was utilized in the analysis, with higher

mean scores indicating a more favorable NP work environment (Poghosyan et al., 2017; Poghosyan et al., 2019; Poghosyan et al., 2013).

Acute Care Utilization. All-cause ED visits and hospitalizations by Medicare beneficiaries were the two dependent variables measured separately at the beneficiary level. The number of visits for patients seen in the ED but not hospitalized during 2018 defined ED utilization. The number of inpatient admission records with a length of stay of more than one day during 2018 measured hospitalizations.

Control Variables. We controlled for patient-level characteristics: biological sex (binary: male or female) and age (continuous); Race/Ethnicity (categorical: non-Hispanic White, Black, Hispanic, Asian/Pacific Islander, American Indian/Alaska Native, and another racial/ethnic category); provider type (e.g., NP or physician); and the number of chronic conditions as a measure of patients' comorbidity. We also controlled for practice-level characteristics: practice size (continuous: the number of providers in the clinic); practice type (e.g., physician's office, hospital-based outpatient clinics, etc.); urbanicity (e.g., urban vs rural); and state location of practice (e.g., California, Texas, Washington, Arizona, and Pennsylvania) to account for state-level differences.

Statistical analysis

All analyses were conducted using Statistical Analysis System (SAS) 9.4 (SAS Institute, Inc., Cary, NC). We conducted descriptive statistics of patient-level and practice-level characteristics. Missing data was <5% overall. No concerns about multicollinearity were indicated in our assessment, as all variance inflation factors were less than 5 (James et al., 2013). Multilevel negative binomial regression models were used to determine the association between how often primary care practices care for NES patients and ED visits and hospitalizations.

Negative binomial distribution accounts for over-dispersion, defined as the variance (i.e. standard deviation squared) being greater than the mean value, in count outcomes of ED visits (variance = 1.28; mean = 0.43) and hospitalization counts (variance = 0.46; mean = 0.24). There were two levels of the sample: patients and practices. Thus, a multi-level version of these models was used to account for the clustering effects of 596,677 patients nested within 1,042 practices and adopted a 2-sided alpha level of 0.05. The independent variable was the practice-level mean score of caring for NES patients. The two outcome variables were the number of all-cause ED visits and hospitalizations at the patient level. We estimated adjusted incident risk ratios (IRRs), 95% confidence intervals (CIs), and p-values (alpha level of 0.05) to assess the strength and direction of the association of practices caring for NES patients with ED use and hospitalization, controlling for patient and practice-level covariates.

After assessing the relationship between the practice-level mean score of caring for NES patients and ED visits and hospitalizations, we performed a moderation analysis. The potential moderator was the NP work environment (practice-level average NP-PCOCQ score). These models assessed whether the NP work environment moderated the association between the mean score for the practices caring for NES patients and ED visits and hospitalizations among older adults. We hypothesized that a supportive NP work environment can reduce disparities in ED visits and hospitalizations among older adults due to caring for NES patients. Similar multilevel negative binomial regression models were used for the moderation analysis. Interaction terms between the practice-level mean score of caring for NES patients and the NP work environment were included to assess the statistical significance of the moderation effect. The work environment score was centered around its mean for meaningful interpretation of the models. We then estimated the IRRs of each outcome at the four different levels of work environment

practice-level score (from a reported minimum score of 1.32 to the maximum score of 4, at increments of 1). This approach demonstrated the moderating effect of the work environment by examining how differences in the ordinal ranking of work environment were associated with changes in patient outcomes (ED visits and hospitalization) per one-unit increase in the practice-level mean score of caring for NES patients. The exponentiated regression coefficient of the interaction term in a negative binomial regression is called the ratio of IRRs, as it measures the relative change in the IRR associated with the interaction between two variables, beyond their individual main effects.

4.3 Results

Patient and Practice Characteristics

Table 4.1 presents the descriptive statistics for the patient-level characteristics. The patient sample included 596,677 older adults (58.61% female) with a mean age of 75.26 years. Among the older adult patients, 488,972 (81.95%) were non-Hispanic White, 44,042 (7.38%) were Hispanic, followed by 25,009 (4.19%) were Black, 20,353 (3.41%) were Asian, and 18,301 (3.07%) were of All Other races. On average, patients had about three chronic conditions. Most patients had a physician as their primary care provider (85.88%). Among all patients, 155,857 (26.12%) patients had an all-cause ED visit, and 94,313 patients (15.81%) had an all-cause hospitalization during one year.

The descriptive statistics of practice-level characteristics are reported in **Table 4.2**. Among the 1,042 primary care practices in the sample, practices where patients received care were predominantly physician practices (46.74%) and located in urban areas (85.41%). Most practices were located in Pennsylvania (24.09%), California (22.26%), and Texas (19.77%). On average, practices employed 5.84 physicians and 2.81 NPs. The average practice-level likelihood

score of caring for NES patients, on a scale of 1 (“Never”) to 5 (“Very Frequently”), was 3.3, indicating that, on average, NP practices reported occasionally to frequently providing care to NES patients. For descriptive purposes, we categorized practices into three groups based on their aggregated practice-level mean scores, including practices that never/rarely (mean score 1-2), occasionally (mean score 3), and frequently/very frequently (mean score 4-5) care for NES patients. Based on these categories, 27.99% of practices were classified as never/rarely caring for NES patients, 29.32% as occasionally, and 42.70% as frequently/very frequently caring for NES patients.

NP practices commonly care for NES patients, as most practices (70.69%) reported at least occasionally to very frequently caring for NES patients. The average practice-level NP work environment score was 3.81 (on a scale of 1 to 4), suggesting that most practices were rated as having relatively favorable work environments for NPs.

Caring for NES Patients and ED Use and Hospitalizations

As shown in **Table 4.3**, higher practice-level mean scores of caring for NES patients were significantly associated with a higher incidence of ED visits among patients (IRR=1.0472; 95% CI: 1.0226-1.0724, p=0.0001), after adjusting for covariates. For every one-point increase in the practice-level mean score of caring for NES patients (on a scale of 1 to 5), there was a 4.72% increase in the incidence of ED visits. This suggests that patients receiving care at NP practices reporting a higher likelihood of caring for NES patients experienced higher ED utilization. The association between practice-level mean score for caring for NES patients and hospitalizations was not statistically significant when adjusting for covariates (IRR=1.0017; 95% CI: 0.9815-1.0025, p=0.869), indicating no meaningful difference in hospitalizations between

patients receiving care at NP practices reporting a higher likelihood of caring for NES patients versus those at practices reporting a lower likelihood of caring for NES patients.

Moderation Effects of NP Work Environment on the Association between Caring for NES Patients and ED Visits and Hospitalizations

We found that the NP work environment significantly moderated the association between the practice-level mean score for caring for NES patients and both ED visits (Ratio of IRR=0.957; 95% CI: 0.927–0.989, $p=0.0094$) and hospitalizations (Ratio of IRR=0.965; 95% CI: 0.936–0.995, $p=0.024$) (**Table 4.4**). For every one-point increase in the work environment score, the IRR of ED use decreased by 4.26% (1-IRR) and 3.50% for hospitalizations.

To demonstrate that higher work environment scores reduced disparities in ED visits and hospitalizations associated with increasing practice-level mean score for caring for NES patients, we estimated the IRRs of ED visits and hospitalizations at four different points of the work environment score (**Table 4.5**). When the NP work environment score was at its minimum observed value (i.e., 1.32, indicating the least favorable work environments), a higher practice-level mean score of caring for NES patients was associated with a 13.5% increase in the incidence of ED visits (IRR: 1.135; 95% CI: 1.063–1.211, $p = 0.0001$) and a 7.12% increase in the incidence of hospitalizations (IRR: 1.071; 95% CI: 1.007–1.140, $p = 0.030$). This association attenuated as the work environment score increased (i.e., improved work environments).

When the work environment score was 2, the incidence of ED visits decreased to from 13.5% to 10.2% (IRR = 1.102; 95% CI: 1.053–1.153, $p = 0.0001$), then to 5.5% at a work environment score of 3 (IRR = 1.055; 95% CI: 1.030–1.081, $p < 0.0001$), and was no longer statistically significant when the work environment was at its maximum score of 4 (i.e., most favorable work environments (IRR = 1.010; 95% CI: 0.974–1.047, $p = 0.588$). For

hospitalizations, the incidence decreased from 7.12% to 4.6% when the NP work environment score was 2 (IRR = 1.046; 95% CI: 1.002–1.091, $p = 0.041$), but was no longer statistically significant when the work environment score was 3 (IRR = 1.009; 95% CI: 0.988–1.031, $p = 0.407$) or at its maximum score of 4 (IRR = 0.974; 95% CI: 0.944–1.005, $p = 0.099$). When the work environment was at its maximum score, indicating most favorable work environments, there was no effect between NP practices caring for NES patients and ED visits and hospitalizations. However, when the work environment was at the minimum score, where practices had the least favorable environments, there was a positive effect between caring for NES patients and ED visits and hospitalizations. These findings suggest that more supportive work environments may eliminate the disparities in ED visits and hospitalizations associated with practices caring for NES patients.

4.4 Discussion

We tested the moderation effect of the NP work environment on the relationship between the likelihood of primary care practices caring for NES patients and all-cause ED visits and hospitalizations. First, we found that practices caring for more NES patients had significantly higher rates of ED utilization among patients, but no significant differences in hospitalization rates. We then found that the NP work environment moderates the association between practices' caring for NES patients and ED and hospitalization rates: as the NP work environment improved, the positive association between practices caring for NES patients and acute care use weakened. Our results show that improved NP work environments can significantly weaken or eliminate the positive association between practices caring for NES patients and increased ED visits and hospitalizations among older adults. These findings extend the existing literature by providing novel evidence that the NP work environment can mitigate disparities related to caring for NES

patients (Carthon et al., 2022; Muir et al., 2025; Poghosyan et al., 2025; Poghosyan et al., 2022; Poghosyan et al., 2024; Poghosyan et al., 2024; Sliwinski et al., 2025c). Therefore, organizational support for NPs and improving the NP work environment is critical for practices caring for NES patients.

The positive association between primary care practices caring for NES patients and higher acute care use confirms the ongoing disparities among this population noted in the literature. NES patients often experience lower satisfaction with care, delays in treatment, increased length of stays, and higher rates of hospital readmissions (Al Shamsi et al., 2020; Sliwinski et al., 2024b; Squires et al., 2022). A key driver of these disparities is the inconsistent use of interpreter services, often due to organizational barriers such as limited interpreter availability and long wait times (Heath et al., 2023; Sliwinski et al., 2024b; Tang et al., 2024). For the first time, our study demonstrated how organizational-level factors, specifically NP work environments, can mitigate health disparities related to caring for NES patients. These findings highlight the potential of creating more favorable work environments for NPs as a strategic approach to reducing disparities and underscore the need for targeted organizational interventions that extend beyond language services to improve patient outcomes.

Improving organizational factors, particularly fostering favorable NP work environments, is essential to improving access to and navigation of primary care for NES patients. A favorable NP work environment constitutes strong professional relationships among NPs, physicians, and managers of practices, as well as effective collaboration with shared resources, adequate staffing support, and open communication (Poghosyan et al., 2020; Poghosyan & Liu, 2016; Schirle et al., 2020). These environments support NPs in delivering higher-quality, patient-centered care, as evidenced by higher quality care ratings (Carthon et al., 2022) and greater integration of patient

preferences into their care (Carthon et al., 2020). High-quality and patient-centered care is essential for NES patients, who experience unique language-related barriers that may require more tailored and responsive approaches to care. In practices serving NES patients, favorable NP work environments may enable NPs to spend more time with patients, communicate effectively, collaborate within healthcare teams, and better tailor care to meet the cultural and language-related needs of NES patients, ultimately reducing disparities in unnecessary acute care use.

Investing in organizational factors to create more favorable NP work environments in practices that care for NES patients can have positive downstream effects, not only for improving patient outcomes but for the sustainability of the NP workforce. Supportive NP work environments are associated with lower risk of burnout (Abraham et al., 2021), higher job satisfaction (L. Poghosyan, S. Kueakomoldej, et al., 2022), and lower intent to leave jobs among NPs (L. Poghosyan, S. Kueakomoldej, et al., 2022). These workforce outcomes are especially important in the context of caring for NES patients, where providers frequently encounter communication barriers that result in an incomplete understanding of patient needs, challenges with decision-making, and higher workplace stress when caring for NES patients (Al Shamsi et al., 2020; Betancur et al., 2020; Gerchow et al., 2021). Therefore, these challenges in caring for NES patients not only inhibit providers' ability to deliver high-quality, patient-centered care and threaten patient safety, but also contribute to higher levels of burnout. Higher reported burnout among NPs has been associated with increased acute care utilization, demonstrating how workforce strain can directly compromise optimal patient outcomes (Poghosyan et al., 2023). Therefore, creating a more supportive NP work environment not only expands NPs' capacity to provide high-quality, patient-centered primary care, but also helps protect the NP workforce from the strain of practicing in high-demand settings by alleviating NP burnout and improving

retention. As the NES patient population continues to grow, investing in supportive NP work environments is a key strategy for sustaining the increasingly essential NP primary care workforce that helps close gaps in access to primary care in underserved areas and reduce reliance on acute care services.

Implications for Practice, Policy, and Research

This study has implications for practice, policy, and research. Given our finding that caring for NES patients was reported in over 70% of NP practices, it is vital to ensure practices are equipped with organizational support and resources to care for NES patients. This is especially urgent as NPs increasingly provide primary care in underserved communities (Barnes et al., 2018; Kueakomoldej et al., 2022; O'Reilly-Jacob et al., 2025), while the NES population is also growing, increasing the demand for language-accessible care. Therefore, practice administrators need to implement strategies that foster favorable work environments and help address language needs. Practice administrators can strengthen the NP work environment by ensuring adequate staffing and manageable workloads. These strategies not only support NPs to practice to the full extent of their training, but also help reduce burnout, an essential factor in retaining the NP workforce and promoting optimal patient outcomes (John et al., 2024). To target language needs directly, interventions such as language-concordant providers or interpreter services must be reliable, accessible, and easily integrated into care delivery. Further, healthcare providers need to be adequately trained to implement and utilize them effectively.

Policymakers should consider shifting reimbursement models to value-based care, as this may incentivize more favorable work environments that provide NPs the time and resources to deliver high-quality, language-accessible care to NES patients. Value-based payment models encourage health systems to prioritize patient-centeredness and preventive care over volume-

driven services (Barnes et al., 2025; O'Reilly-Jacob et al., 2021; Centers for Medicare & Medicaid Services, 2025). These models may particularly benefit NES patients, who may require more tailored and responsive care, which is not rewarded in fee-for-service payment models. By aligning payment structures with health-promoting care models, value-based care can motivate practices in creating conditions that better support NPs to care for underserved populations, including NES patients.

Finally, because our study relied on a practice-level indicator of caring for NES patients, future research should examine patient-level language data to more precisely examine how language abilities influence the delivery of care and patient outcomes. While we speculate that more favorable work environments may enhance NPs' ability to deliver more tailored care to NES, future research should explore the specific mechanisms by which more favorable NP work environments improve patient outcomes. This may include examining team-based care dynamics, quality of communication, and access to shared resources, which are essential attributes of a favorable work environment (Poghosyan et al., 2020; Poghosyan & Liu, 2016; Schirle et al., 2020).

Limitations

There are several limitations to this study. The main limitation was that this was a secondary data analysis; therefore, we were limited to the variables collected in the parent grant. Specifically, our independent variable collected data about how often practices care for non-English speaking patients, which may not fully capture the broader range of language abilities and patient population with language needs. For instance, some patients may report they speak English but can still face barriers in communicating due to their limited English proficiency. Further, the patient sample included all patients, despite provider type (i.e., physician or NP), since NP care and physician care are hard to distinguish in Medicare claims data due to "incident

to” billing, where NPs bill under a physician's identifier rather than their own (Patel et al., 2022). As a result, the findings cannot be attributed to patients who only received care from NPs, and we cannot isolate the direct impact of NP care on patient outcomes. However, our findings may imply that more supportive NP work environments can improve collaboration and the work environments for other healthcare providers within primary care practices. Although this study sampled from six geographically diverse states and varied the scope of practice regulations for NPs, the findings may not be generalizable nationwide. The study relied on self-reported measures from NPs in the survey; therefore, self-report bias may have affected the data. Finally, causality cannot be tested since it is a cross-sectional study. However, numerous covariates were controlled for, and large data sources were used to address this limitation.

4.5 Conclusion

The growing NES population often experiences worse health outcomes than English-speaking patients. This study is the first to examine how the NP work environment influences the relationship between the likelihood of primary care practices caring for non-English speaking (NES) patients and ED visits and hospitalizations. We found that more supportive NP work environments may reduce health disparities related to practices caring for NES patients, demonstrating the importance of organizational-level factors, including the work environment, in advancing health equity for NES patients. Future research should be centered around how to best support NPs in meeting the language needs of NES patients.

Table 4.1*Characteristics of Medicare Beneficiaries (n=596,677)*

Characteristics	Value
Age – mean (SD)	75.26 (7.52)
Gender – n (%)	
Female	349,700 (58.61%)
Male	246,977 (41.39%)
Race/Ethnicity – n (%)	
Non-Hispanic White	488,972 (81.95%)
Hispanic	44,042 (7.38%)
Black	25,009 (4.19%)
Asian	20,353 (3.41%)
All Other	18,301 (3.07%)
Number of Chronic Conditions – mean (SD)	2.84 (2.02)
Provider Type – n (%)	
Patients with an MD as Primary Provider	512,451 (85.88%)
Patients with an NP as Primary Provider	84,226 (14.12%)
Patients with an all-cause ED visit– n (%)	155,857 (26.12%)
Patients with an all-cause Hospitalization– n (%)	94,313 (15.81%)
Number of Annual ED Visits – mean (SD)	0.43 (1.13)
Number of Annual Hospitalizations – mean (SD)	0.24 (0.68)

Note. SD, standard deviation; MD, medical doctor; NP, nurse practitioner; ED, emergency department.

Table 4.2*Characteristics of Nurse Practitioner Practices Serving Medicare Beneficiaries (n=1,042)*

Characteristics	Value
Number of MDs at Practice – mean (SD)	5.84 (14.31)
Number of NPs at Practice – mean (SD)	2.81 (3.65)
Practice Type – n (%)	
Physician Practice	487 (46.74%)
Other/Unsure	241 (23.13%)
Hospital-based Clinic	84 (8.06%)
Federally Qualified Health Center	192 (18.43%)
Rural Health Center	38 (3.65%)
Practice State Location – n (%)	
Pennsylvania	251 (24.09%)
Texas	206 (19.77%)
Washington	141 (13.53%)
California	232 (22.26%)
Arizona	112 (10.75%)
New Jersey	100 (9.60%)
Urbanicity – n (%)	
Urban	890 (85.41%)
Rural	152 (14.59%)
Work Environment– mean (SD)	3.18 (0.57)
Practice-level Score of Caring for NES Patients-mean (SD)	3.31 (1.12)
Number of Practices Caring for NES Patients- n (%)	
Rarely/Never	274 (27.99%)
Occasionally	287 (29.32%)
Frequently/Very Frequently	418 (42.70%)

Note. NES, Non-English Speaking; SD, standard deviation; MD, medical doctor; NP, nurse practitioner

Table 4.3*Multilevel Regression Models Assessing the Relationship Between Caring for Non-English-Speaking**Patients with All-Cause ED Use and Hospitalizations among Medicare Beneficiaries (n=594,518)*

Variable	ED Visits			Hospitalizations				
	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value
<i>Independent Variable</i>								
Caring for NES Patients	1.047179	1.022551	1.072401	0.0001	1.001701	0.981474	1.022448	0.869

Note. NES, Non-English Speaking; ED, emergency department;

Table 4.4

Multilevel Regression Models Assessing the Moderation Effect of Work Environment on Associations of Practices Caring for NES patients with All-Cause ED Use and Hospitalizations among Medicare Beneficiaries (n=594,203)

Variable	ED Visits			Hospitalizations				
	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value	Incidence Risk Ratio	95% Confidence Interval (Lower bound- Upper bound)		p-value
<i>Independent Variable</i>								
Caring for NES Patients	1.046656	1.022346	1.071543	0.0001	1.002603	0.982554	1.023062	0.8015
<i>Moderating Variable</i>								
Work Environment	1.1057	0.986098	1.239862	0.0853	1.0781	0.972291	1.195542	0.1537
<i>Interaction Term</i>								
Caring for NES Patients x Work Environment	0.9574	0.926538	0.989357	0.0094	0.965026	0.935756	0.995311	0.024

Note. NES, Non-English Speaking; ED, emergency department;

Table 4.5

Incidence Risk Ratio of All-Cause ED Use and Hospitalizations among Medicare Beneficiaries at Practices with Caring for Non-English-Speaking Patients for Various Work Environment Scores (n=594,203)

WE Score	IRR	95% CI		p-value
		Lower	Upper	
Outcome: All-cause ED Visit				
1.32	1.135	1.063	1.211	0.0001
2	1.102	1.053	1.153	0.0001
3	1.055	1.030	1.081	<.0001
3.18	1.047	1.022	1.072	0.0001
4	1.010	0.974	1.047	0.588
Outcome: All-cause Hospitalization				
1.32	1.071	1.007	1.140	0.030
2	1.046	1.002	1.091	0.041
3	1.009	0.988	1.031	0.407
3.18	1.003	0.983	1.023	0.802
4	0.974	0.944	1.005	0.099

Note. WE, work environment; IRR, incidence risk ratio; CI, confidence interval; ED, emergency department;

Chapter 5: Conclusion

This chapter summarizes the findings of the studies included in this dissertation. In addition, implications for practice, policy, and research are presented. Finally, the strengths and limitations of the three studies are summarized and discussed.

5.1 Summary of Findings

The overall purpose of this dissertation was to produce evidence on expanding and supporting the primary care Nurse Practitioner (NP) workforce to improve health outcomes for communities and patients with language needs. The studies in this dissertation: 1) synthesized evidence on the impact of primary care services for patients with limited English proficiency (LEP) on acute care utilization and access to care; 2) assessed whether the percentage of households with LEP in communities where NP primary care practices were located was associated with emergency department (ED) use and hospitalization among older adult patients receiving care at these practices; and 3) assessed how the NP work environment moderated the relationship between the likelihood of primary care practices caring for non-English speaking (NES) patients and ED visits and hospitalizations. A summary of the results for each chapter is further detailed below.

The first study of this dissertation was a systematic review of existing evidence on how primary care services impacted acute care utilization (ED visits, hospitalizations, and readmissions) and access to care among patients with LEP. This review followed the JBI and PRISMA guidelines for systematic reviews and evidence reporting (Aromataris E, 2020; Page et al., 2021). An *a priori* protocol was also published in PROSPERO. This review was guided by the Donabedian Quality of Care framework, which theorizes that the organizational *structure* of healthcare impacts the *processes* of care delivery, which affect *outcomes* of care (Donabedian,

1966). Primary care services identified in the studies included interpreters, language-concordant providers, and telehealth. Patients with LEP experienced worse access to care compared to English-speaking patients, even as telehealth services during the COVID-19 pandemic were expanded. When interpreter services were implemented and practices had language-concordant providers during primary care delivery, patients with LEP had lower ED utilization, hospital readmissions, and improved access to care. Our systematic review demonstrated the importance of having interpreter services and language-concordant providers in primary care delivery to patients with LEP. However, among nine studies that met the inclusion criteria, only two focused on acute care utilization outcomes. This indicated the need for robust research focused on the effectiveness of primary care in reducing unnecessary acute care use among patients with LEP, which the remaining two studies in this dissertation helped address.

This dissertation's second study examined the relationship between the percentage of households with LEP in communities where NP primary care practices are located and ED visits and hospitalizations among older adults receiving care at these practices. We merged American Community Survey data on the percentage of households with LEP in communities where practices are located with Medicare claims that contained data about patient demographic characteristics, ED, and hospitalization use. Multilevel regression models allowed us to assess the association between the percentage of households with LEP in communities where primary care practices are located and patient outcomes. We found that a 10% increase in the percentage of households with LEP in a community was associated with a statistically significant 6.2% decrease in ED visits and a marginally significant 3.2% decrease in hospitalizations. This study produced novel evidence showing a lower incidence of ED utilization among patients receiving care in NP practices located in LEP communities. Our findings suggest that having NP primary

care practices in LEP communities may improve access to primary care and, in turn, reduce acute care use. This underlines the need to better understand NP care delivery to patients with LEP and their communities and how to best support the NP workforce in expanding access to primary care and improving patient outcomes.

The final study of this dissertation assessed how the NP work environment moderates the relationship between the likelihood of primary care practices caring for NES patients and ED visits and hospitalizations. We utilized survey data from NPs and patient data from Medicare claims to conduct a multilevel regression to model the moderation analysis. We found that the NP care environment moderates the relationship between primary care practices caring for NES patients and ED use and hospitalizations. Specifically, for every one-point increase in the work environment score, there was a 4.26% decrease in ED visits and a 3.5% decrease in hospitalizations. Further, we also demonstrated that as NP work environments became more favorable, the positive association between the likelihood of practices caring for NES patients and acute care use attenuated. Our study suggests that more favorable NP work environments may mitigate the disparities in patient outcomes associated with the likelihood of practices caring for NES patients. Therefore, fostering favorable NP work environments in practices caring for NES patients is crucial, as they may promote higher quality of care and improve patient outcomes.

5.2 Implications for Practice, Policy, and Research

Implications for Practice

The findings from this dissertation have implications for primary care practices caring for patients with language needs. The systematic review found that using interpreter services and having language-concordant providers in primary care practices reduces acute care use and

improves access to care among patients with LEP. These synthesized findings imply that primary care practices should prioritize recruiting and retaining a multilingual primary care workforce and ensure reliable access to interpreter services. Having providers who speak multiple languages increases the opportunity to provide language-concordant care, which in turn fosters stronger patient-provider relationships by building trust and supporting culturally competent care (Daggett et al., 2023). Language concordance reduces the use of specialty, inpatient, and ED services, while increasing primary care service utilization among patients with language needs (Chandrashekar et al., 2022). Therefore, hiring multilingual providers may also benefit practices by reducing healthcare costs by shifting care from secondary healthcare services to encouraging primary care use for follow-up care and preventive care (Chandrashekar et al., 2022).

Despite evidence showing beneficial outcomes when interpreters are used (Heath et al., 2023) and legal requirements under Title VI mandating federally funded providers to make healthcare language accessible (Executive Order No. 13166, 2000), interpreter services remain underutilized by providers in ambulatory settings when caring for patients with language needs (Schulson & Anderson, 2022). Providers have reported several barriers to implementing interpreter services, including inadequate knowledge of proper implementation and organizational-level challenges such as high costs, long wait times, and limited availability (Gerchow et al., 2021; Jaeger et al., 2019; MacFarlane et al., 2020; Tang et al., 2024). These barriers demonstrate that while access to interpreter services is essential for patient safety, addressing organizational factors that shape care delivery is critical. Organizational factors (e.g., job demands, resource availability, administrative support, etc.) influence the overall work environment and can not only impact whether interpreter services are used, but can also impact the capacity for providers to deliver high-quality, patient-centered care to patients with language

needs. To improve outcomes for patients with language needs, practices must go beyond providing interpreter services and invest in improving organizational factors that foster good work environments for quality care delivery.

Study 3 found that better NP work environments are more protective against ED visits and hospitalizations among patients receiving care at practices more likely to report caring for NES patients. With this, practice administrators should prioritize improving the factors encompassing the NP work environment to ensure NPs are supported to deliver high-quality, patient-centered care to patients with language needs. Improving the NP work environment involves optimizing the care delivery process, enhancing interprofessional collaboration, and increasing visibility of NPs within their practices and communities (Poghosyan et al., 2017). Practice administrators should coordinate adequate workloads and staffing within primary care practices to promote NPs practicing at the full extent of their training. This effort strengthens the NP work environment and can also reduce burnout, positively impacting NP workforce retention and improving patient outcomes (John et al., 2024). Further, this can also promote more effective collaboration between NPs and physicians to provide primary care services to those with language needs. Practice administrators can also enhance the NP work environment by providing resources, such as linguistically appropriate education materials, appropriate time for patient encounters, and interpreter services, that allow for care management, which can better facilitate tailored care to patients with language needs. Finally, NPs are trained to provide patient-centered, holistic healthcare that facilitates shared decision making (American Association of Nurse Practitioners, 2022). Practices must leverage this fundamental role of NPs to promote leadership opportunities and community engagement to advocate for patients with language needs. Overall, hiring a linguistically diverse NP workforce, ensuring access to interpreter

services, and supporting the expansion of NP-primary care practices with more favorable work environments may improve access to care and patient outcomes for those with language needs.

Implications for Policy

The findings from this dissertation have critical policy implications related to caring for NES patients. On March 1st, 2025, English was officially designated as the official language of the U.S. (Executive Order No. 14224, 2025). This order revoked previous legal protection intended to improve access to services for patients with LEP (Executive Order No. 13166, 2000). The new executive order states that no direct service changes are required and defers decisions about language access to individual agencies (Executive Order No. 14224, 2025). The consequences of this directive are the reduced incentive and accountability for health organizations to provide language-accessible care. This further shifts the responsibility of promoting health equity for those with language needs to state governments and healthcare organizations. This policy shift reinforces the urgency of proactive strategies, including recruiting NPs to practice in LEP communities and adopting value-based payment systems that structurally support language-accessible, patient-centered primary care.

Studies 2 and 3 demonstrated that having NP practices in LEP communities and with favorable work environments improves patient outcomes. Leveraging the primary care NP workforce in LEP communities and best supporting NPs in caring for patients with language needs is a significant opportunity to reduce disparities in access to care and acute care use among this population. The NP workforce is shaping primary care in underserved areas, as the number practices employing NPs is increasing, and in turn improving access to care for vulnerable populations (Kilpatrick et al., 2023; O'Reilly-Jacob et al., 2025; Poghosyan & Carthon, 2017). Further, patients cared for by NPs have reduced acute care use, better control of chronic diseases,

and improved patient satisfaction (Barnett et al., 2022; Htay & Whitehead, 2021; Liu et al., 2020; McMenamin et al., 2023; Mileski et al., 2020). Our findings build on this body of evidence on the benefits of NPs in underserved communities, specifically in those with high numbers of LEP residents. Therefore, efforts should be made to strategically place NP-employing practices in LEP communities to increase access to primary care services.

Policymakers should incentivize expanding the NP-primary care workforce in LEP communities, as NPs strengthen the effectiveness of primary care by making it more accessible in underserved areas. Research shows that NPs who have personal experience living in similar communities are more likely to work and remain in practices located in these vulnerable areas (Kueakomoldej et al., 2022). Creating targeted funding initiatives that support individuals from LEP communities in pursuing nursing careers offers a sustainable policy change that may improve health delivery and engagement for those with language needs. This would increase the diversity among the nursing workforce, potentially recruiting multilingual individuals from LEP communities, which can improve the delivery of language-concordant and culturally responsive care to those with language needs. Further, policies to increase infrastructure investments that support the strategic placement of primary care facilities and services in areas with high concentrations of people with LEP may also help continue efforts in expanding access to primary care and reducing reliance on acute care use.

Policy changes to reimbursement strategies, such as Medicare and Medicaid coverage for interpreter services and shifting to value-based care, can promote the delivery of language-accessible care. Providing coverage for interpreter services and increasing funding support that allows practices to have multiple interpreter modalities (e.g., in-person, video, and phone) can allow patients to tailor their care to their preferences, reduce miscommunications that result from

persistent language barriers, and enhance their engagement with the health system at large. Further, value-based care is a model of care that reimburses providers based on the quality of care delivered and the impact on patient outcomes (Centers for Medicare & Medicaid Services, 2025). Since it does not center reimbursements on the quantity of services, this encourages the delivery of patient-centered care that is preventative and aimed at reducing acute care use (Barnes et al., 2025; O'Reilly-Jacob et al., 2021; Centers for Medicare & Medicaid Services, 2025). This model aligns well with NP-care delivery and may encourage organizations to invest in creating more favorable work environments. These policies may be critical for enabling NPs to deliver high-quality primary care to those with language needs and are strategic policy measures to counteract potential access gaps stemming from national policy changes that may disincentivize language access initiatives.

Implications for Research

This dissertation has several research implications. First, the different measures of language abilities across all studies demonstrate the need for a standardized measurement of language needs. Studies 2 and 3 operationalized language needs by identifying individuals and communities with LEP, which came from a widely used definition from the U.S. Department of Health and Human Services. Furthermore, even studies used in the systematic review (Study 1) used different measures to indicate language abilities. Study 4 relied on a survey item that captured how often NP primary care practices care for NES patients. None of these studies captured the full complexity of patients' language needs. For instance, while some patients may be able to speak English, they may prefer to receive care in a different language or may have difficulty understanding medical terminology in one language over the other. Therefore, research opportunities include developing and validating a measure of language needs encompassing the

many linguistic abilities that may be experienced. This measure should also account for how these needs may vary across different healthcare settings, such as primary care compared to hospital-based care. Studies 3 and 4 used community-level and practice-level indicators of language needs, exposing an important future research opportunity to collect patient-level data on language needs. This could offer a more robust and precise understanding of how patients' language needs influence their care delivery and health outcomes.

Engaging primary care health services with community-level resources presents a promising approach to providing language-accessible, culturally competent care to those with language needs. Research shows that patients with language needs often rely on neighborhood health centers and clinics for usual care (Gonzalez-Barrera et al., 2024). Experts have called for partnerships among primary care providers and community-based organizations to foster community-engaged healthcare, especially among vulnerable populations (Etz et al., 2008; Guilamo-Ramos et al., 2024; Seifert et al., 2024; Wijayanti, 2024). These collaborations can strengthen organizational capacities (Wagner et al., 2022), which may enable health systems to better tailor care to meet language needs and promote engagement in preventative services seeking rather than reliance on acute care services. Yet, there is a gap in the literature on how to integrate community-level resources with primary care services and how these resources can impact access to care and health outcomes for communities and patients with language needs. Therefore, researchers should develop rigorous studies to produce robust evidence on how this partnership can influence cultural competency during care delivery, an aspect demonstrated to be just as significant as having linguistically appropriate services (Betancur et al., 2020; Schiaffino et al., 2020). This research focus can simultaneously address community health needs and the needs of patients, and reduce health disparities related to language needs.

5.3 Strengths and Limitations

Strengths

This dissertation contributes novel evidence on NP primary care delivery among communities and patients with language needs. The studies included in this dissertation were sequential, addressing the gaps identified in the previous one, resulting in a building analysis of cohesive evidence. Study 1 explored how primary care services influence acute care utilization and access to care. Study 2 addressed the gap in limited evidence on the effectiveness of primary care on reducing acute care use outcomes by examining ED visits and hospitalizations among patients receiving primary care in LEP communities. Focusing on the community-level, Study 2 generated evidence on lower acute care use among patients receiving care at NP primary care practices located in more linguistically diverse communities. Finally, Study 3 investigated practice-level factors and found that favorable work environments for NPs help to mitigate disparities related to caring for NES patients. Together, this dissertation presents a multi-level perspective and body of evidence on improving care for patients with language needs through leveraging and supporting the NP primary care workforce.

All dissertation studies were guided by established theory and previous empirical research. Study 1 used a rigorous systematic review methodology, which included publishing an *a priori* protocol on PROSPERO and following the JBI and PRISMA guidelines (Aromataris E, 2020; Page et al., 2021). We consulted a health services research informationist to support our search strategy and had two independent reviewers screen all abstracts and full texts. They then independently extracted data and quality appraised all included studies. Advice from an expert biostatistician helped guide Studies 3 and 4, which used unique datasets that merged Medicare claims data with American Community Survey data and NP survey data from six states. The

diversity of states adds richness to our sample, as they include states with some of the highest concentrations of LEP communities, such as California, Texas, and New Jersey, as well as states with comparatively lower LEP populations, including Washington, Pennsylvania, and Arizona (Haldar et al., 2023). These datasets also had large sample sizes, which allowed us to detect small effect sizes. Both studies employed rigorous analytic methods, ensuring no issues with multicollinearity, normality, or missing data, and controlled for clustering of patients within practices. These rigorous methods allow us to draw strong conclusions regarding the impact of the NP workforce and their work environment on outcomes for communities and patients with language needs.

Limitations

This dissertation has limitations. Language needs were measured differently across all three studies. As explained in the implications for research, this demonstrates the importance of developing more multidimensional measures for language abilities to produce robust evidence to better inform practice and policy. Therefore, the measures utilized in this dissertation may not fully capture the complexity of language needs in healthcare settings. The use of community-level and practice-level measures of language needs also limits our findings, as we cannot determine if the patients included in the analyses had any language needs themselves.

Publication bias may have impacted the synthesis of evidence in Study 1 and could have missed informative results from studies published outside of the U.S. or in languages other than English. Further, our inclusion criteria only focused on adult patients, and therefore, pediatric populations were systematically excluded from our findings. All but one study included in the systematic review was published during the COVID-19 pandemic. Studies 2 and 3 relied on data collected before the pandemic. Therefore, the findings from this dissertation may not be

generalizable to post-pandemic healthcare contexts. In Studies 2 and 3, our sample of NP-primary care practices was limited to those from which at least one NP responded to the survey, and the survey had a 21.9% response rate (Harrison et al., 2021). As Harrison et al. (2021) explained, the non-response analysis found that NP survey respondents were more likely to be the only NP in their practice and practice in rural settings (Harrison et al., 2021). Therefore, our results may be biased by the characteristics of the NPs who responded to the survey, leaving out NPs who may work in more urban areas (Harrison et al., 2021). The findings may also have been influenced by self-report bias as NPs completed the surveys (Althubaiti, 2016). Finally, Studies 3 and 4 had cross-sectional study designs; therefore, we could not infer causality from our analysis. Despite these limitations, this dissertation contributes novel evidence on expanding and supporting the NP workforce to deliver care to communities and patients with language needs.

5.4 Conclusions

This dissertation aimed to produce evidence on expanding primary care delivery and enhancing the primary care NP workforce to care for communities and patients with language needs. We found that access and utilization of interpreter services and language-concordant providers improved access to care and reduced acute care utilization among patients with language needs. To address the identified gap in the literature on the effectiveness of primary care in reducing acute care use, we conducted empirical studies that, for the first time, demonstrated the benefit of having NP practices in language diverse communities and that favorable work environments for NPs mitigate disparities in ED use and hospitalizations related to caring for those with language needs. These findings provided insights that inform actionable steps that practice administrators, policymakers, and researchers can take to enhance NP primary care and better serve communities and patients with language needs.

References

- Abedini, N. C., Downey, L., Engelberg, R. A., Curtis, J. R., & Sharma, R. K. (2022). End-of-life healthcare utilization and palliative care use among older adults with limited English proficiency. *J Am Geriatr Soc*, 70(10), 2847-2857. <https://doi.org/10.1111/jgs.17913>
- Abraham, C. M., Zheng, K., Norful, A. A., Ghaffari, A., Liu, J., & Poghosyan, L. (2021). Primary care Practice Environment and Burnout among Nurse Practitioners. *J Nurse Pract*, 17(2), 157-162. <https://doi.org/10.1016/j.nurpra.2020.11.009>
- Adams, S., Komene, E., Wensley, C., Davis, J., & Carryer, J. (2024). Integrating nurse practitioners into primary healthcare to advance health equity through a social justice lens: An integrative review. *J Adv Nurs*, 80(10), 3899-3914. <https://doi.org/10.1111/jan.16093>
- Aday, L. A., & Andersen, R. (1974). A framework for the study of access to medical care. *Health Serv Res*, 9(3), 208-220.
- Al Shamsi, H., Almutairi, A. G., Al Mashrafi, S., & Al Kalbani, T. (2020). Implications of Language Barriers for Healthcare: A Systematic Review. *Oman Med J*, 35(2), e122. <https://doi.org/10.5001/omj.2020.40>
- Althubaiti, A. (2016). Information bias in health research: definition, pitfalls, and adjustment methods. *J Multidiscip Healthc*, 9, 211-217. <https://doi.org/10.2147/jmdh.S104807>
- American Association of Nurse Practitioners. (2022). *Standards of practice for nurse practitioners*. American Association of Nurse Practitioners. <https://www.aanp.org/advocacy/advocacy-resource/position-statements/standards-of-practice-for-nurse-practitioners>

- American Association of Nurse Practitioners. (2024a). *Nurse practitioners in primary care*. <https://www.aanp.org/advocacy/advocacy-resource/position-statements/nurse-practitioners-in-primary-care>
- American Association of Nurse Practitioners. (2024b). *What's a nurse practitioner (NP)?* <https://www.aanp.org/about/all-about-nps/whats-a-nurse-practitioner>
- Ancheta, A. J., Bruzzese, J.-M., & Hughes, T. L. (2021). The impact of positive school climate on suicidality and mental health among LGBTQ adolescents: A systematic review. *The Journal of School Nursing, 37*(2), 75-86.
- Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav, 36*(1), 1-10.
- Aromataris E, M. Z. E. (2020). *JBI Manual for Evidence Synthesis* (978-0-6488488-0-6). <https://synthesismanual.jbi.global/>
- Arredondo, K., Touchett, H. N., Khan, S., Vincenti, M., & Watts, B. V. (2023). Current Programs and Incentives to Overcome Rural Physician Shortages in the United States: A Narrative Review. *J Gen Intern Med, 38*(Suppl 3), 916-922. <https://doi.org/10.1007/s11606-023-08122-6>
- Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2020). Implications Of The Rapid Growth Of The Nurse Practitioner Workforce In The US. *Health Aff (Millwood), 39*(2), 273-279. <https://doi.org/10.1377/hlthaff.2019.00686>
- Barnes, H., Rambur, B., Black, L., Perloff, J., & O'Reilly-Jacob, M. (2025). Incorporating value-informed advanced nursing practice into APRN education. *Journal of Professional Nursing, 56*, 64-70. <https://doi.org/https://doi.org/10.1016/j.profnurs.2024.12.001>

- Barnes, H., Richards, M. R., McHugh, M. D., & Martsof, G. (2018). Rural And Nonrural Primary Care Physician Practices Increasingly Rely On Nurse Practitioners. *Health Aff (Millwood)*, 37(6), 908-914. <https://doi.org/10.1377/hlthaff.2017.1158>
- Barnett, M., Balkissoon, C., & Sandhu, J. (2022). The level of quality care nurse practitioners provide compared with their physician colleagues in the primary care setting: A systematic review. *J Am Assoc Nurse Pract*, 34(3), 457-464. <https://doi.org/10.1097/jxx.0000000000000660>
- Batalova, J. (2025). Frequently requested statistics on immigrants and immigration in the United States. *Migration Policy Institute*. <https://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states>
- Bazemore, A. W., Petterson, S. M., & McCulloch, K. K. (2024). US Primary Care Workforce Growth: A Decade of Limited Progress, and Projected Needs Through 2040. *Journal of General Internal Medicine*. <https://doi.org/10.1007/s11606-024-09121-x>
- Betancur, S., Walton, A. L., Smith-Miller, C., Wiesen, C., & Leak Bryant, A. (2020). Cultural Awareness: Ensuring High-Quality Care for Limited English Proficient Patients. *Clin J Oncol Nurs*, 24(5), 530-537. <https://doi.org/10.1188/20.Cjon.530-537>
- Bhattacharya, M., Cronin, K. A., Farrigan, T. L., Kennedy, A. E., Yu, M., & Srinivasan, S. (2024). Description of census-tract-level social determinants of health in cancer surveillance data. *J Natl Cancer Inst Monogr*, 2024(65), 152-161. <https://doi.org/10.1093/jncimonographs/lgae027>
- Cafiero, M. (2013). Nurse practitioners' knowledge, experience, and intention to use health literacy strategies in clinical practice. *J Health Commun*, 18 Suppl 1(Suppl 1), 70-81. <https://doi.org/10.1080/10810730.2013.825665>

- Camarota, S. A., & Zeigler, K. (2021). *Immigrants coming to America at older ages*.
https://cis.org/sites/default/files/2021-03/camarota-aging-21_0.pdf
- Carthon, J. M. B., Brom, H., Poghosyan, L., Daus, M., Todd, B., & Aiken, L. (2020). Supportive Clinical Practice Environments Associated With Patient-Centered Care. *J Nurse Pract*, *16*(4), 294-298. <https://doi.org/10.1016/j.nurpra.2020.01.019>
- Carthon, M. B., Brom, H., Nikpour, J., Todd, B., Aiken, L., & Poghosyan, L. (2022). Supportive Practice Environments Are Associated With Higher Quality Ratings Among Nurse Practitioners Working in Underserved Areas. *J Nurs Regul*, *13*(1), 5-12.
[https://doi.org/10.1016/s2155-8256\(22\)00028-x](https://doi.org/10.1016/s2155-8256(22)00028-x)
- Centers for Medicare & Medicaid Services. (2017). *Understanding communication and language needs of Medicare beneficiaries* [Issue brief]. U.S. Department of Health and Human Services. <https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/Issue-Briefs-Understanding-Communication-and-Language-Needs-of-Medicare-Beneficiaries.pdf>
- Centers for Medicare & Medicaid Services. (2024a). *MCBS socio-demographic and health characteristics of Medicare beneficiaries living in the community by dual eligibility status: PUF 2021*. <https://www.cms.gov/data-research/research/medicare-current-beneficiary-survey/data-tables/mcbs-socio-demographic-and-health-characteristics-medicare-beneficiaries-living-community-dual>
- Centers for Medicare & Medicaid Services. (2024b). *Medicare monthly enrollment*. <https://data.cms.gov/summary-statistics-on-beneficiary-enrollment/medicare-and-medicaid-reports/medicare-monthly-enrollment>

- Centers for Medicare & Medicaid Services. (2025). *Value-based care*. <https://www.cms.gov/priorities/innovation/key-concepts/value-based-care>
- Chandrashekar, P., Zhang, R., Leung, M., & Jain, S. H. (2022). Impact of Patient-Physician Language Concordance on Healthcare Utilization. *Journal of General Internal Medicine*, 37(8), 2120-2122. <https://doi.org/10.1007/s11606-021-06998-w>
- Chang, E., Davis, T. L., & Berkman, N. D. (2024). Delayed and Forgone Health Care Among Adults With Limited English Proficiency During the Early COVID-19 Pandemic. *Medical Care*, 62(6). https://journals.lww.com/lww-medicalcare/fulltext/2024/06000/delayed_and_forgone_health_care_among_adults_with.4.aspx
- Civil Rights Act of 1964, Title VII, 42 U.S.C. § 2000e et seq. (1964).
- Covidence. (2024). *Better systematic review management*. <https://www.covidence.org/>
- Daggett, A., Abdollahi, S., & Hashemzadeh, M. (2023). The Effect of Language Concordance on Health Care Relationship Trust Score. *Cureus*, 15(5), e39530. <https://doi.org/10.7759/cureus.39530>
- Dhaliwal, J. K., Hall, T. D., LaRue, J. L., Maynard, S. E., Pierre, P. E., & Bransby, K. A. (2021). Expansion of telehealth in primary care during the COVID-19 pandemic: benefits and barriers. *J Am Assoc Nurse Pract*, 34(2), 224-229. <https://doi.org/10.1097/jxx.0000000000000626>
- Diamond, L., Izquierdo, K., Canfield, D., Matsoukas, K., & Gany, F. (2019). A Systematic Review of the Impact of Patient-Physician Non-English Language Concordance on Quality of Care and Outcomes. *J Gen Intern Med*, 34(8), 1591-1606. <https://doi.org/10.1007/s11606-019-04847-5>

- Diaz, A. A., Thakur, N., & Celedón, J. C. (2023). Lessons Learned from Health Disparities in Coronavirus Disease-2019 in the United States. *Clin Chest Med*, 44(2), 425-434.
<https://doi.org/10.1016/j.ccm.2022.11.021>
- Dietrich, S., & Hernandez, E. (2022). Nearly 68 million people spoke a language other than English at home in 2019. *United States Census Bureau*.
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. John Wiley & Sons.
- Din, A., & Wilson, R. (2020). Crosswalking ZIP codes to census geographies. *Cityscape*, 22(1), 293-314.
- Donabedian, A. (1966). Evaluating the quality of medical care. *Milbank Mem Fund Q*, 44(3), Suppl:166-206.
- Eberly, L. A., Kallan, M. J., Julien, H. M., Haynes, N., Khatana, S. A. M., Nathan, A. S., Snider, C., Chokshi, N. P., Eneanya, N. D., Takvorian, S. U., Anastos-Wallen, R., Chaiyachati, K., Ambrose, M., O'Quinn, R., Seigerman, M., Goldberg, L. R., Leri, D., Choi, K., Gitelman, Y., . . . Adusumalli, S. (2020). Patient Characteristics Associated With Telemedicine Access for Primary and Specialty Ambulatory Care During the COVID-19 Pandemic. *JAMA Netw Open*, 3(12), e2031640.
<https://doi.org/10.1001/jamanetworkopen.2020.31640>
- Espinoza Suarez, N. R., Urtecho, M., Nyquist, C. A., Jaramillo, C., Yeow, M. E., Thorsteinsdottir, B., Wilson, M. E., & Barwise, A. K. (2021). Consequences of suboptimal communication for patients with limited English proficiency in the intensive care unit and suggestions for a way forward: A qualitative study of healthcare team perceptions. *J Crit Care*, 61, 247-251. <https://doi.org/10.1016/j.jcrc.2020.10.012>

- Etz, R. S., Cohen, D. J., Woolf, S. H., Holtrop, J. S., Donahue, K. E., Isaacson, N. F., Stange, K. C., Ferrer, R. L., & Olson, A. L. (2008). Bridging primary care practices and communities to promote healthy behaviors. *Am J Prev Med*, 35(5 Suppl), S390-397.
<https://doi.org/10.1016/j.amepre.2008.08.008>
- Executive Order No. 13166, 3 C.F.R. 289 (2000).
- Executive Order No. 14224. (2025).
- Facchinetti, G., D'Angelo, D., Piredda, M., Petitti, T., Matarese, M., Oliveti, A., & De Marinis, M. G. (2020). Continuity of care interventions for preventing hospital readmission of older people with chronic diseases: A meta-analysis. *Int J Nurs Stud*, 101, 103396.
<https://doi.org/10.1016/j.ijnurstu.2019.103396>
- Federici, F. M. (2022). Translating health risks: language as a social determinant of health. In *Language as a social determinant of health: Translating and interpreting the COVID-19 pandemic* (pp. 1-35). Springer.
- Feuerherm, E., Showstack, R. E., Santos, M. G., Martínez, G. A., & Jacobson, H. E. (2021). Language as a social determinant of health: Partnerships for health equity. *Extending applied linguistics for social impact: Cross-disciplinary Collaborations in Diverse Spaces of Public Inquiry*, 125.
- Friedberg, M. W., Hussey, P. S., & Schneider, E. C. (2010). Primary care: a critical review of the evidence on quality and costs of health care. *Health Aff (Millwood)*, 29(5), 766-772.
<https://doi.org/10.1377/hlthaff.2010.0025>
- Gerchow, L., Burka, L. R., Miner, S., & Squires, A. (2021). Language barriers between nurses and patients: A scoping review. *Patient Educ Couns*, 104(3), 534-553.
<https://doi.org/10.1016/j.pec.2020.09.017>

- Gonzalez-Barrera, A., Hamel, L., Artiga, S., & Presiado, M. (2024). *Language Barriers in Health Care: Findings from the KFF Survey on Racism, Discrimination, and Health*. Kaiser Family Foundation. <https://www.kff.org/racial-equity-and-health-policy/poll-finding/language-barriers-in-health-care-findings-from-the-kff-survey-on-racism-discrimination-and-health/>
- Guilamo-Ramos, V., Amankwah, F. K., Tucker-Seeley, R., Jernigan, V. B. B., & Benjamin, G. C. (2024). Toward Community-Engaged Health Care to Bridge Public Health With Clinical Care. *American Journal of Public Health, 114*(12), 1300-1304. <https://doi.org/10.2105/AJPH.2024.307816>
- Gulati, R. K., & Hur, K. (2022). Association Between Limited English Proficiency and Healthcare Access and Utilization in California. *J Immigr Minor Health, 24*(1), 95-101. <https://doi.org/10.1007/s10903-021-01224-5>
- Hacker, K., Choi, Y. S., Trebino, L., Hicks, L., Friedman, E., Blanchfield, B., & Gazelle, G. S. (2012). Exploring the impact of language services on utilization and clinical outcomes for diabetics. *PLoS One, 7*(6), e38507. <https://doi.org/10.1371/journal.pone.0038507>
- Haldar, S., Pillai, D., & Artiga, S. (2023). *Overview of Health Coverage and Care for Individuals with Limited English Proficiency (LEP)*. <https://www.kff.org/racial-equity-and-health-policy/issue-brief/overview-of-health-coverage-and-care-for-individuals-with-limited-english-proficiency/#>
- Harrison, J. M., Germack, H. D., Poghosyan, L., D'Aunno, T., & Martsolf, G. R. (2021). Methodology for a six-state survey of primary care nurse practitioners. *Nurs Outlook, 69*(4), 609-616. <https://doi.org/10.1016/j.outlook.2021.01.010>

- Health Resources and Services Administration. (2023). *State of the primary care workforce, 2023*. U.S. Department of Health and Human Services. <https://bhwh.hrsa.gov/sites/default/files/bureau-health-workforce/data-research/state-of-primary-care-workforce-2023.pdf>
- Heath, M., Hvass, A. M. F., & Wejse, C. M. (2023). Interpreter services and effect on healthcare - a systematic review of the impact of different types of interpreters on patient outcome. *J Migr Health*, 7, 100162. <https://doi.org/10.1016/j.jmh.2023.100162>
- Himmelstein, J., Cai, C., Himmelstein, D. U., Woolhandler, S., Bor, D. H., Dickman, S. L., & McCormick, D. (2022). Specialty Care Utilization Among Adults with Limited English Proficiency. *Journal of General Internal Medicine*, 37(16), 4130-4136. <https://doi.org/10.1007/s11606-022-07477-6>
- Hostetter, J., Schwarz, N., Klug, M., Wynne, J., & Basson, M. D. (2020). Primary care visits increase utilization of evidence-based preventative health measures. *BMC Fam Pract*, 21(1), 151. <https://doi.org/10.1186/s12875-020-01216-8>
- Houser, S. H., Flite, C. A., & Foster, S. L. (2023). Privacy and Security Risk Factors Related to Telehealth Services - A Systematic Review. *Perspect Health Inf Manag*, 20(1), 1f.
- Hsueh, L., Huang, J., Millman, A. K., Gopalan, A., Parikh, R. K., Teran, S., & Reed, M. E. (2023). Cross-Sectional Association of Patient Language and Patient-Provider Language Concordance with Video Telemedicine Use Among Patients with Limited English Proficiency. *J Gen Intern Med*, 38(3), 633-640. <https://doi.org/10.1007/s11606-022-07887-6>
- Htay, M., & Whitehead, D. (2021). The effectiveness of the role of advanced nurse practitioners compared to physician-led or usual care: A systematic review. *International Journal of*

Nursing Studies Advances, 3, 100034.

<https://doi.org/https://doi.org/10.1016/j.ijnsa.2021.100034>

Institute of Medicine (US) Committee on the Future of Primary Care, Donaldson, M. S., Yordy, K. D., Lohr, K. N., & Vanselow, N. A. (Eds.). (1996). *Primary Care: America's Health in a New Era*. National Academies Press (US). <https://doi.org/10.17226/5152>

IQVIA. (2020). *OneKey Reference Assets*. <https://www.iqvia.com/locations/united-states/solutions/life-sciences/information-solutions/onekey-reference-data>

Jacobs, Z. G., Prasad, P. A., Fang, M. C., Abe-Jones, Y., & Kangelaris, K. N. (2020). The Association between Limited English Proficiency and Sepsis Mortality. *J Hosp Med*, 15(3), 140-146. <https://doi.org/10.12788/jhm.3334>

Jaeger, F. N., Pellaud, N., Laville, B., & Klauser, P. (2019). Barriers to and solutions for addressing insufficient professional interpreter use in primary healthcare. *BMC Health Services Research*, 19(1), 753. <https://doi.org/10.1186/s12913-019-4628-6>

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning* (Vol. 112). Springer.

Jindal, M., Chaiyachati, K. H., Fung, V., Manson, S. M., & Mortensen, K. (2023). Eliminating health care inequities through strengthening access to care. *Health Serv Res*, 58 Suppl 3(Suppl 3), 300-310. <https://doi.org/10.1111/1475-6773.14202>

John, R., Hill, M., Kanamori, L., Lao, R., Sayrs, L., Stottlemire, R. L., & Morphey, T. (2024). Preventing Inpatient NP Burnout: The Power of Adequate Staffing and Leadership. *Journal of Pediatric Health Care*, 38(4), 497-504.

<https://doi.org/10.1016/j.pedhc.2024.02.005>

- Johnson, D. R., & Creech, J. C. (1983). Ordinal measures in multiple indicator models: A simulation study of categorization error. *American sociological review*, 398-407.
- Kasten, M. J., Berman, A. C., Ebright, A. B., Mitchell, J. D., & Quirindongo-Cedeno, O. (2020). Interpreters in Health Care: A Concise Review for Clinicians. *The American Journal of Medicine*, 133(4), 424-428.e422.
<https://doi.org/https://doi.org/10.1016/j.amjmed.2019.12.008>
- Khatri, R., Endalamaw, A., Erku, D., Wolka, E., Nigatu, F., Zewdie, A., & Assefa, Y. (2023). Continuity and care coordination of primary health care: a scoping review. *BMC Health Services Research*, 23(1), 750. <https://doi.org/10.1186/s12913-023-09718-8>
- Khoong, E. C., Butler, B. A., Mesina, O., Su, G., DeFries, T. B., Nijagal, M., & Lyles, C. R. (2021). Patient interest in and barriers to telemedicine video visits in a multilingual urban safety-net system. *J Am Med Inform Assoc*, 28(2), 349-353.
<https://doi.org/10.1093/jamia/ocaa234>
- Kilpatrick, K., Tchouaket, E., Savard, I., Chouinard, M. C., Bouabdillah, N., Provost-Bazinet, B., Costanzo, G., Houle, J., St-Louis, G., Jabbour, M., & Atallah, R. (2023). Identifying indicators sensitive to primary healthcare nurse practitioner practice: A review of systematic reviews. *PLoS One*, 18(9), e0290977.
<https://doi.org/10.1371/journal.pone.0290977>
- Krampe, F., Fabry, G., & Langer, T. (2022). Overcoming language barriers, enhancing collaboration with interpreters - an interprofessional learning intervention (Interpret2Improve). *BMC Med Educ*, 22(1), 170. <https://doi.org/10.1186/s12909-022-03213-0>

- Krishnaswami, A., Beavers, C., Dorsch, M. P., Dodson, J. A., Masterson Creber, R., Kitsiou, S., Goyal, P., Maurer, M. S., Wenger, N. K., Croy, D. S., Alexander, K. P., Batsis, J. A., Turakhia, M. P., Forman, D. E., Bernacki, G. M., Kirkpatrick, J. N., Orr, N. M., Peterson, E. D., Rich, M. W., . . . Bhavnani, S. P. (2020). Gerotechnology for Older Adults With Cardiovascular Diseases: JACC State-of-the-Art Review. *J Am Coll Cardiol*, *76*(22), 2650-2670. <https://doi.org/10.1016/j.jacc.2020.09.606>
- Kueakomoldej, S., Turi, E., McMenamin, A., Xue, Y., & Poghosyan, L. (2022). Recruitment and retention of primary care nurse practitioners in underserved areas: A scoping review. *Nurs Outlook*, *70*(3), 401-416. <https://doi.org/10.1016/j.outlook.2021.12.008>
- Lake, E. T. (2007). The nursing practice environment: measurement and evidence. *Med Care Res Rev*, *64*(2 Suppl), 104s-122s. <https://doi.org/10.1177/1077558707299253>
- Lam, N. C.-Y., Yeung, H.-Y., Li, W.-K., Lo, H.-Y., Yuen, C.-F., Chang, R. C.-C., & Ho, Y.-S. (2019). Cognitive impairment in irritable bowel syndrome (IBS): A systematic review. *Brain research*, *1719*, 274-284.
- Lamb, A., Martin-Misener, R., Bryant-Lukosius, D., & Latimer, M. (2018). Describing the leadership capabilities of advanced practice nurses using a qualitative descriptive study. *Nurs Open*, *5*(3), 400-413. <https://doi.org/10.1002/nop2.150>
- Lasater, K. B., Jarrín, O. F., Aiken, L. H., McHugh, M. D., Sloane, D. M., & Smith, H. L. (2019). A Methodology For Studying Organizational Performance: A Multistate Survey of Front-line Providers. *Med Care*, *57*(9), 742-749. <https://doi.org/10.1097/mlr.0000000000001167>

- Levesque, J. F., Harris, M. F., & Russell, G. (2013). Patient-centred access to health care: conceptualising access at the interface of health systems and populations. *Int J Equity Health*, 12, 18. <https://doi.org/10.1186/1475-9276-12-18>
- Lim, S., Yi, S. S., Lundy De La Cruz, N., & Trinh-Shevrin, C. (2017). Defining Ethnic Enclave and Its Associations with Self-Reported Health Outcomes Among Asian American Adults in New York City. *Journal of immigrant and minority health*, 19(1), 138–146. <https://doi.org/10.1007/s10903-015-0334-6>
- Liu, C. F., Hebert, P. L., Douglas, J. H., Neely, E. L., Sulc, C. A., Reddy, A., Sales, A. E., & Wong, E. S. (2020). Outcomes of primary care delivery by nurse practitioners: Utilization, cost, and quality of care. *Health Serv Res*, 55(2), 178-189. <https://doi.org/10.1111/1475-6773.13246>
- Liu, T. T., Chen, M. Y., Chang, Y. M., & Lin, M. H. (2022). A Preliminary Study on the Cultural Competence of Nurse Practitioners and Its Affecting Factors. *Healthcare (Basel)*, 10(4). <https://doi.org/10.3390/healthcare10040678>
- Lu, T., & Myerson, R. (2020). Disparities in Health Insurance Coverage and Access to Care by English Language Proficiency in the USA, 2006-2016. *Journal of general internal medicine*, 35(5), 1490–1497. <https://doi.org/10.1007/s11606-019-05609-z>
- MacFarlane, A., Huschke, S., Pottie, K., Hauck, F. R., Griswold, K., & Harris, M. F. (2020). Barriers to the use of trained interpreters in consultations with refugees in four resettlement countries: a qualitative analysis using normalisation process theory. *BMC Family Practice*, 21(1), 259. <https://doi.org/10.1186/s12875-020-01314-7>
- Martinez, E. M., Carr, D. T., Mullan, P. C., Rogers, L. E., Howlett-Holley, W. L., McGehee, C. A., Mangum, C. D., & Godambe, S. A. (2021). Improving Equity of Care for Patients

- with Limited English Proficiency Using Quality Improvement Methodology. *Pediatr Qual Saf*, 6(6), e486. <https://doi.org/10.1097/pq9.0000000000000486>
- McMenamin, A., Turi, E., Schlak, A., & Poghosyan, L. (2023). A Systematic Review of Outcomes Related to Nurse Practitioner-Delivered Primary Care for Multiple Chronic Conditions. *Med Care Res Rev*, 80(6), 563-581. <https://doi.org/10.1177/10775587231186720>
- Medicare Payment Advisory Commission. (2019). *Report to the Congress: Medicare and the healthcare delivery system*. https://www.medpac.gov/wp-content/uploads/import_data/scrape_files/docs/default-source/reports/jun19_medpac_reporttocongress_sec.pdf
- Medrano, F. J., Fernandez, A. J., Sudore, R. L., Kirkpatrick, J. N., Benda, N. C., Creber, R. M., Goyal, P., Beavers, C., Maurer, M. S., Rich, M. W., Alexander, K. P., & Krishnaswami, A. (2023). Limited English Proficiency in Older Adults Referred to the Cardiovascular Team. *Am J Med*, 136(5), 432-437. <https://doi.org/10.1016/j.amjmed.2023.01.028>
- Melgoza, E., Ismail, A., Félix-Beltrán, L., Majano, R., & Vargas Bustamante, A. (2025). A Qualitative Mystery Shopper Study that De(Codes) the Experiences of English and Spanish-Speaking Patients Who Call to Schedule a First-Time Primary Care Appointment in the Los Angeles, Houston, and New York Metropolitan Statistical Areas. *SSM - Qualitative Research in Health*, 100525. <https://doi.org/https://doi.org/10.1016/j.ssmqr.2025.100525>
- Melo, G., Dutra, K. L., Rodrigues Filho, R., Ortega, A. d. O. L., Porporatti, A. L., Dick, B., Flores-Mir, C., & De Luca Canto, G. (2018). Association between psychotropic

- medications and presence of sleep bruxism: A systematic review. *Journal of Oral Rehabilitation*, 45(7), 545-554.
- Michael, R., Ricardo, B., Ewa, S., Michael, P., Rhiannon, R., Emily, R., Emily, S., Claire, K., Lise, B., Louise, B., Sharon, J., Manish, S., Denis, P. h., Douglas, M., & Peter, T. (2024). Impact of patientâfamily physician language concordance on healthcare utilisation and mortality: a retrospective cohort study of home care recipients in Ontario, Canada. *BMJ Public Health*, 2(1), e000762. <https://doi.org/10.1136/bmjph-2023-000762>
- Migration Policy Institute. (n.d.). *U.S. immigrant population and share over time, 1850–present*. Migration Data Hub. <https://www.migrationpolicy.org/programs/data-hub/charts/immigrant-population-over-time>
- Mileski, M., Pannu, U., Payne, B., Sterling, E., & McClay, R. (2020). The Impact of Nurse Practitioners on Hospitalizations and Discharges from Long-term Nursing Facilities: A Systematic Review. *Healthcare (Basel)*, 8(2). <https://doi.org/10.3390/healthcare8020114>
- Mizoguchi, N., Walker, L., Trevelyan, E., & Ahmed, B. (2019). The older foreign-born population in the United States: 2012–2016. *Washington: United States Census Bureau*.
- Molina, R. L., & Kasper, J. (2019). The power of language-concordant care: a call to action for medical schools. *BMC Med Educ*, 19(1), 378. <https://doi.org/10.1186/s12909-019-1807-4>
- Morgan, P., Everett, C., & Hing, E. (2015). Nurse practitioners, physician assistants, and physicians in community health centers, 2006-2010. *Healthc (Amst)*, 3(2), 102-107. <https://doi.org/10.1016/j.hjdsi.2014.06.002>
- Muir, K. J., Sliwinski, K., & Lasater, K. B. (2025). Reducing disparities in emergency department outcomes for individuals with limited English proficiency: The nurse work

environment. *Nursing Outlook*, 73(1), 102318.

<https://doi.org/https://doi.org/10.1016/j.outlook.2024.102318>

National Academies of Sciences, E., & Medicine. (2024). Ending unequal treatment: strategies to achieve equitable health care and optimal health for all.

National Academies of Sciences, E., Medicine, Health, Medicine, D., Board on Health Care, S., & Committee on Implementing High-Quality Primary, C. (2021). In S. K. Robinson, M. Meisner, R. L. Phillips, Jr., & L. McCauley (Eds.), *Implementing High-Quality Primary Care: Rebuilding the Foundation of Health Care*. National Academies Press (US)

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<https://doi.org/10.17226/25983>

Naylor, K. B., Tootoo, J., Yakusheva, O., Shipman, S. A., Bynum, J. P. W., & Davis, M. A.

(2019). Geographic variation in spatial accessibility of U.S. healthcare providers. *PLoS One*, 14(4), e0215016. <https://doi.org/10.1371/journal.pone.0215016>

Newton, W. P., Baxley, E., & Magill, M. (2021). Learning from COVID-19: system blindness to primary care. *The Annals of Family Medicine*, 19(3), 282-284.

Nock, A. M., Metzger, S., Jürgensen, I. N., & Petersen-Ewert, C. (2023). Health Literacy in

Adults with Chronic Diseases in the Context of Community Health Nursing: A Scoping Review. *Nurs Rep*, 13(2), 823-834. <https://doi.org/10.3390/nursrep13020072>

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Adv Health*

Sci Educ Theory Pract, 15(5), 625-632. <https://doi.org/10.1007/s10459-010-9222-y>

Nouri, S., Lyles, C. R., Sherwin, E. B., Kuznia, M., Rubinsky, A. D., Kemper, K. E., Nguyen, O.

K., Sarkar, U., Schillinger, D., & Khoong, E. C. (2023). Visit and Between-Visit

- Interaction Frequency Before and After COVID-19 Telehealth Implementation. *JAMA Netw Open*, 6(9), e2333944. <https://doi.org/10.1001/jamanetworkopen.2023.33944>
- O'Donoghue, A. L., Dechen, T., & O'Donoghue, S. C. (2024). Health Equities with Limited English Proficiency: A Review of the Literature. *Crit Care Nurs Clin North Am*, 36(3), 407-413. <https://doi.org/10.1016/j.cnc.2024.01.004>
- Office of Civil Rights (2013). *Guidance to Federal Financial Assistance Recipients Regarding Title VI Prohibition Against National Origin Discrimination Affecting Limited English Proficient Persons*. Department of Health and Human Services Retrieved from <https://www.hhs.gov/civil-rights/for-individuals/special-topics/limited-english-proficiency/guidance-federal-financial-assistance-recipients-title-vi/index.html>
- O'Reilly-Jacob, M., Featherston, K. G., Barnes, H., Xue, Y., & Poghosyan, L. (2025). Socioeconomic Characteristics of Communities With Primary Care Practices With Nurse Practitioners. *JAMA Network Open*, 8(2), e2462360-e2462360. <https://doi.org/10.1001/jamanetworkopen.2024.62360>
- O'Reilly-Jacob, M., Perloff, J., Berkowitz, S., & Bock, L. (2021). Nurse practitioner-owned practices and value-based payment. *J Am Assoc Nurse Pract*, 34(2), 322-327. <https://doi.org/10.1097/jxx.0000000000000635>
- Osakwe, Z. T., Aliyu, S., Sosina, O. A., & Poghosyan, L. (2020). The outcomes of nurse practitioner (NP)-Provided home visits: A systematic review. *Geriatr Nurs*, 41(6), 962-969. <https://doi.org/10.1016/j.gerinurse.2020.07.001>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E.,

- McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Bmj*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Parameswaran, V., Koos, H., Kalwani, N., Qureshi, L., Rosengaus, L., Dash, R., Scheinker, D., Rodriguez, F., Johnson, C. B., Stange, K., Aron, D., Lyytinen, K., & Sharp, C. (2023). Drivers of telemedicine in primary care clinics at a large academic medical centre. *J Telemed Telecare*, 1357633x231219311. <https://doi.org/10.1177/1357633x231219311>
- Patel, S. Y., Huskamp, H. A., Frakt, A. B., Auerbach, D. I., Neprash, H. T., Barnett, M. L., James, H. O., & Mehrotra, A. (2022). Frequency Of Indirect Billing To Medicare For Nurse Practitioner And Physician Assistant Office Visits. *Health Aff (Millwood)*, 41(6), 805-813. <https://doi.org/10.1377/hlthaff.2021.01968>
- Poghosyan, L., & Carthon, J. M. B. (2017). The Untapped Potential of the Nurse Practitioner Workforce in Reducing Health Disparities. *Policy, Politics, & Nursing Practice*, 18(2), 84-94. <https://doi.org/10.1177/1527154417721189>
- Poghosyan, L., Chaplin, W. F., & Shaffer, J. A. (2017). Validation of Nurse Practitioner Primary Care Organizational Climate Questionnaire: A New Tool to Study Nurse Practitioner Practice Settings. *J Nurs Meas*, 25(1), 142-155. <https://doi.org/10.1891/1061-3749.25.1.142>
- Poghosyan, L., Ghaffari, A., Liu, J., & McHugh, M. D. (2020). Organizational Support for Nurse Practitioners in Primary Care and Workforce Outcomes. *Nurs Res*, 69(4), 280-288. <https://doi.org/10.1097/nnr.0000000000000425>
- Poghosyan, L., Ghaffari, A., & Shaffer, J. (2019). Nurse practitioner primary care organizational climate questionnaire: Item response theory and differential item functioning. *J Clin Nurs*, 28(15-16), 2934-2945. <https://doi.org/10.1111/jocn.14895>

- Poghosyan, L., Kueakomoldej, S., Liu, J., & Martsof, G. (2022). Advanced practice nurse work environments and job satisfaction and intent to leave: Six-state cross sectional and observational study. *J Adv Nurs*, 78(8), 2460-2471. <https://doi.org/10.1111/jan.15176>
- Poghosyan, L., & Liu, J. (2016). Nurse Practitioner Autonomy and Relationships with Leadership Affect Teamwork in Primary Care Practices: a Cross-Sectional Survey. *J Gen Intern Med*, 31(7), 771-777. <https://doi.org/10.1007/s11606-016-3652-z>
- Poghosyan, L., Liu, J., Chen, J. L., Flandrick, K., McMenamin, A., Porat-Dahlerbruch, J., Rowell-Cunsolo, T. L., & Martsof, G. R. (2025). Racial disparities in hospitalization and neighborhood deprivation among Medicare beneficiaries. *Health Aff Sch*, 3(2), qxaf010. <https://doi.org/10.1093/haschl/qxaf010>
- Poghosyan, L., Liu, J., Perloff, J., D'Aunno, T., Cato, K. D., Friedberg, M. W., & Martsof, G. (2022). Primary Care Nurse Practitioner Work Environments and Hospitalizations and ED Use Among Chronically Ill Medicare Beneficiaries. *Med Care*, 60(7), 496-503. <https://doi.org/10.1097/mlr.0000000000001731>
- Poghosyan, L., Liu, J., Schlak, A., Courtwright, S., Flandrick, K., Nantsupawat, A., & Martsof, G. R. (2023). Primary Care Nurse Practitioner Burnout and ED Use and Hospitalizations Among Chronically Ill Medicare Beneficiaries. *Inquiry*, 60, 469580231219108. <https://doi.org/10.1177/00469580231219108>
- Poghosyan, L., Liu, J., Spatz, E., Flandrick, K., Osakwe, Z., & Martsof, G. R. (2024). Nurse Practitioner Care Environments and Racial and Ethnic Disparities in Hospitalization Among Medicare Beneficiaries with Coronary Heart Disease. *J Gen Intern Med*, 39(1), 61-68. <https://doi.org/10.1007/s11606-023-08367-1>

- Poghosyan, L., Liu, J., Turi, E., Flandrick, K., Robinson, M., George, M., Martsof, G., Carthon, J. M. B., & O'Reilly-Jacob, M. (2024). Racial and ethnic disparities in ED use among older adults with asthma and primary care nurse practitioner work environments. *Res Sq*. <https://doi.org/10.21203/rs.3.rs-3972673/v1>
- Poghosyan, L., Nannini, A., Finkelstein, S. R., Mason, E., & Shaffer, J. A. (2013). Development and psychometric testing of the Nurse Practitioner Primary Care Organizational Climate Questionnaire. *Nurs Res*, *62*(5), 325-334. <https://doi.org/10.1097/NNR.0b013e3182a131d2>
- Rajan, D., Rouleau, K., Winkelmann, J., Jakab, M., Kringos, D., & Khalid, F. (2024). Implementing the primary health care approach: a primer.
- Ramirez, N., Shi, K., Yabroff, K. R., Han, X., Fedewa, S. A., & Nogueira, L. M. (2023). Access to Care Among Adults with Limited English Proficiency. *J Gen Intern Med*, *38*(3), 592-599. <https://doi.org/10.1007/s11606-022-07690-3>
- Rao, A., Pillai, D., Artiga, S., Hamel, L., Schumacher, S., Kearney, A., & Presiado, M. (2024). Five key facts about immigrants with limited English proficiency. *Kaiser Family Foundation*, *24*.
- Sachs, J. W., Graven, P., Gold, J. A., & Kassakian, S. Z. (2021). Disparities in telephone and video telehealth engagement during the COVID-19 pandemic. *JAMIA Open*, *4*(3), ooab056. <https://doi.org/10.1093/jamiaopen/ooab056>
- Schiaffino, M. K., Ruiz, M., Yakuta, M., Contreras, A., Akhavan, S., Prince, B., & Weech-Maldonado, R. (2020). Culturally and Linguistically Appropriate Hospital Services Reduce Medicare Length of Stay. *Ethn Dis*, *30*(4), 603-610. <https://doi.org/10.18865/ed.30.4.603>

- Schirle, L., Norful, A. A., Rudner, N., & Poghosyan, L. (2020). Organizational facilitators and barriers to optimal APRN practice: An integrative review. *Health Care Manage Rev*, 45(4), 311-320. <https://doi.org/10.1097/hmr.0000000000000229>
- Schulson, L. B., & Anderson, T. S. (2022). National Estimates of Professional Interpreter Use in the Ambulatory Setting. *Journal of General Internal Medicine*, 37(2), 472-474. <https://doi.org/10.1007/s11606-020-06336-6>
- Schumacher, S., Hamel, L., Artiga, S., Pillai, D., Kirzinger, A., Kearney, A., Presiado, M., Gonzalez-Barrera, A., & Brodie, M. (2023). Understanding the US Immigrant Experience: The 2023 KFF/LA Times Survey of Immigrants. KFF/LA TIMES. In.
- Seifert, B., Volckaert, A. E., O'Connor, S., Flaherty, E., & Pepin, R. L. (2024). Bridging the gap between primary care and community-based organizations to address complex care needs of older adults. *J Am Geriatr Soc*, 72 Suppl 2, S21-s25. <https://doi.org/10.1111/jgs.18670>
- Sharkiya, S. H. (2023). Quality communication can improve patient-centred health outcomes among older patients: a rapid review. *BMC Health Services Research*, 23(1), 886. <https://doi.org/10.1186/s12913-023-09869-8>
- Shi, L. (2012). The impact of primary care: a focused review. *Scientifica (Cairo)*, 2012, 432892. <https://doi.org/10.6064/2012/432892>
- Slade, S., & Sergent, S. R. (2024). Language Barrier. In *StatPearls*. StatPearls Publishing Copyright © 2024, StatPearls Publishing LLC.
- Sliwinski, K., Ancheta, A. J., Muir, K. J., & Lasater, K. B. (2024a). Mapping segregation patterns of hospital care among patients with limited English proficiency. *Journal of Immigrant and Minority Health*, 26(6), 1113–1116. <https://doi.org/10.1007/s10903-024-01630-5>

- Sliwinski, K., Kutney-Lee, A., McHugh, M. D., & Lasater, K. B. (2024b). *A review of disparities in outcomes of hospitalized patients with limited English proficiency: The importance of nursing resources. Journal of Health Care for the Poor and Underserved, 35*(1), 359–374.
- Sliwinski, K., McHugh, M. D., Squires, A. P., Muir, K. J., & Lasater, K. B. (2025c). *Nurse work environment and hospital readmission disparities between patients with and without limited English proficiency. Research in Nursing & Health, 48*(3), 398–405. <https://doi.org/10.1002/nur.22462>
- Smith, V. A., Morgan, P. A., Edelman, D., Woolson, S. L., Berkowitz, T. S. Z., Van Houtven, C. H., Hendrix, C. C., Everett, C. M., White, B. S., & Jackson, G. L. (2020). Utilization and Costs by Primary Care Provider Type: Are There Differences Among Diabetic Patients of Physicians, Nurse Practitioners, and Physician Assistants? *Med Care, 58*(8), 681-688. <https://doi.org/10.1097/mlr.0000000000001326>
- So, M., Jadoo, H., Stong, J., Klemenhagen, K. C., Philbrick, A. M., & Freeman, K. (2024). Effect of Virtual Versus In Person Interpreting on Diabetes Outcomes in Non-English Language Preference Patients: A Pilot Study. *J Prim Care Community Health, 15*, 21501319241240347. <https://doi.org/10.1177/21501319241240347>
- Squires, A. (2017). Evidence-based approaches to breaking down language barriers. *Nursing, 47*(9), 34-40. <https://doi.org/10.1097/01.NURSE.0000522002.60278.ca>
- Squires, A., Engel, P., Ma, C., Miner, S. M., Feldman, P. H., McDonald, M. V., & Jones, S. A. (2023). Continuity of Care Versus Language Concordance as an Intervention to Reduce Hospital Readmissions From Home Health Care. *Med Care, 61*(9), 605-610. <https://doi.org/10.1097/mlr.0000000000001884>

- Squires, A., Gerchow, L., Ma, C., Liang, E., Trachtenberg, M., & Miner, S. (2023). A multi-language qualitative study of limited English proficiency patient experiences in the United States. *PEC Innovation*, 2, 100177.
<https://doi.org/https://doi.org/10.1016/j.pecinn.2023.100177>
- Squires, A., Ma, C., Miner, S., Feldman, P., Jacobs, E. A., & Jones, S. A. (2022). Assessing the influence of patient language preference on 30 day hospital readmission risk from home health care: A retrospective analysis. *Int J Nurs Stud*, 125, 104093.
<https://doi.org/10.1016/j.ijnurstu.2021.104093>
- Stange, K. C., Miller, W. L., & Etz, R. S. (2023). The Role of Primary Care in Improving Population Health. *Milbank Q*, 101(S1), 795-840. <https://doi.org/10.1111/1468-0009.12638>
- Starfield, B., Shi, L., & Macinko, J. (2005). Contribution of primary care to health systems and health. *Milbank Q*, 83(3), 457-502. <https://doi.org/10.1111/j.1468-0009.2005.00409.x>
- Stephen, J. M., Zoucha, R., Cazzell, M., & Devido, J. (2023). Cultural care needs of Spanish speaking parents with limited English proficiency whose children are hospitalized: An ethn nursing study. *J Pediatr Nurs*, 69, 62-70.
<https://doi.org/10.1016/j.pedn.2022.12.019>
- Sullivan, G. M., & Artino, A. R., Jr. (2013). Analyzing and interpreting data from likert-type scales. *J Grad Med Educ*, 5(4), 541-542. <https://doi.org/10.4300/jgme-5-4-18>
- Tam, C. C. (2019). Beyond the immigrant enclave: Differentiating between coethnic neighborhoods for the study of health and social problems. *GeoJournal*, 84(4), 983-999.
<https://doi.org/10.1007/s10708-018-9904-1>

- Tan-McGrory, A., Schwamm, L. H., Kirwan, C., Betancourt, J. R., & Barreto, E. A. (2022). Addressing virtual care disparities for patients with limited English proficiency. *Am J Manag Care*, 28(1), 36-40. <https://doi.org/10.37765/ajmc.2022.88814>
- Tang, D., Jawad, D., Dragoje, V., Wen, L. M., & Taki, S. (2024). The use of interpreter services and its barriers faced by hospital staff when accessing interpreters for patients with low English proficiency during the COVID-19 pandemic. *Health Promot J Austr*, 35(4), 1184-1193. <https://doi.org/10.1002/hpja.850>
- Timmins, L., Peikes, D., & McCall, N. (2020). Pathways to reduced emergency department and urgent care center use: Lessons from the comprehensive primary care initiative. *Health Serv Res*, 55(6), 1003-1012. <https://doi.org/10.1111/1475-6773.13579>
- Tukur, M., Saad, G., AlShagathrh, F. M., Househ, M., & Agus, M. (2023). Telehealth interventions during COVID-19 pandemic: a scoping review of applications, challenges, privacy and security issues. *BMJ Health Care Inform*, 30(1). <https://doi.org/10.1136/bmjhci-2022-100676>
- Turi, E., McMenamin, A., Kueakomoldej, S., Kurtzman, E., & Poghosyan, L. (2023). The effectiveness of nurse practitioner care for patients with mental health conditions in primary care settings: A systematic review. *Nurs Outlook*, 71(4), 101995. <https://doi.org/10.1016/j.outlook.2023.101995>
- Twersky, S. E., Jefferson, R., Garcia-Ortiz, L., Williams, E., & Pina, C. (2024). The Impact of Limited English Proficiency on Healthcare Access and Outcomes in the U.S.: A Scoping Review. *Healthcare (Basel, Switzerland)*, 12(3), 364. <https://doi.org/10.3390/healthcare12030364>

- U.S. Bureau of Labor Statistics. (2023). *A look at nurse practitioners for National Nurse Practitioner Week*. *The Economics Daily*. <https://www.bls.gov/opub/ted/2023/a-look-at-nurse-practitioners-for-national-nurse-practitioner-week.htm>
- U.S. Bureau of Labor Statistics. (2024). *Occupational outlook handbook: Nurse anesthetists, nurse midwives, and nurse practitioners*. U.S. Department of Labor. <https://www.bls.gov/ooh/healthcare/nurse-anesthetists-nurse-midwives-and-nurse-practitioners.htm>
- U.S. Census Bureau. (2018). *ACS 5-year estimates subject tables: Limited English speaking households* [Table S1602]. U.S. Department of Commerce. [https://data.census.gov/table/ACSST5Y2018.S1602?q=S1602&g=040XX00US04\\$1400000,06\\$1400000,42\\$1400000,48\\$1400000,53\\$1400000&y=2018](https://data.census.gov/table/ACSST5Y2018.S1602?q=S1602&g=040XX00US04$1400000,06$1400000,42$1400000,48$1400000,53$1400000&y=2018)
- U.S. Census Bureau. (2023a). *ACS 1-year estimates subject tables: Language spoken at home* [Table S1601]. U.S. Department of Commerce. <https://data.census.gov/table/ACSST1Y2023.S1601?q=language>
- U.S. Census Bureau. (2023b). *ACS 1-year estimates subject tables: Characteristics of people by language spoken at home*[Table S1603]. U.S. Department of Commerce. <https://data.census.gov/table/ACSST1Y2023.S1603?q=language>
- U.S. Census Bureau. (2023c). *ACS 1-year estimates subject tables: Limited English speaking households* [Table S1602]. U.S. Department of Commerce. <https://data.census.gov/table/ACSST1Y2023.S1602?q=S1602:%20Limited%20English%20Speaking%20Households>
- U.S. Census Bureau. (2024a). *About the American Community Survey*. U.S. Department of Commerce. <https://www.census.gov/programs-surveys/acs/about.html>

- U.S. Census Bureau. (2024b). *Glossary*. U.S. Department of Commerce. <https://www.census.gov/programs-surveys/geography/about/glossary.html>
- U.S. House of Representatives, Office of the Legislative Counsel. (2010). *Compilation of Patient Protection and Affordable Care Act: As amended through November 1, 2010, including Patient Protection and Affordable Care Act health-related portions of the Health Care and Education Reconciliation Act of 2010*. U.S. Government Printing Office.
- Uscher-Pines, L., Kapinos, K., Rodriguez, C., Pérez-Dávila, S., Raja, P., Rodriguez, J. A., Rabinowitz, M., Youdelman, M., & Sousa, J. L. (2023). Access challenges for patients with limited English proficiency: a secret-shopper study of in-person and telehealth behavioral health services in California safety-net clinics. *Health Affairs Scholar*, 1(3). <https://doi.org/10.1093/haschl/qxad033>
- van Lent, L. G. G., Yilmaz, N. G., Goosen, S., Burgers, J., Giani, S., Schouten, B. C., & Langendam, M. W. (2025). Effectiveness of interpreters and other strategies for mitigating language barriers: A systematic review. *Patient Educ Couns*, 136, 108767. <https://doi.org/10.1016/j.pec.2025.108767>
- Wagner, J., Henderson, S., Hoefl, T. J., Gosdin, M., & Hinton, L. (2022). Moving beyond referrals to strengthen late-life depression care: a qualitative examination of primary care clinic and community-based organization partnerships. *BMC Health Services Research*, 22(1), Article 605. <https://doi.org/10.1186/s12913-022-07997-1>
- Weber, E., Miller, S. J., Shroff, N., Beyrouthy, M., & Calman, N. (2023). Recent Telehealth Utilization at a Large Federally Qualified Health Center System: Evidence of Disparities Even Within Telehealth Modalities. *Telemed J E Health*, 29(11), 1601-1612. <https://doi.org/10.1089/tmj.2022.0511>

- Wijayanti, E. (2024). How to Strengthen Primary Care? The Integration of Clinical Practice and Community Health Care. *Korean J Fam Med*, 45(3), 176-177.
<https://doi.org/10.4082/kjfm.23.0242>
- Wiles, I., Tariq, A., Karasneh, G., Summerville, D., Tovar, D. E., & Woltenberg, L. N. (2023). The effects of interpreter utilization on patient outcomes: A contemporary literature review. *Education in the Health Professions*, 6(2).
https://journals.lww.com/ehpf/fulltext/2023/06020/the_effects_of_interpreter_utilization_on_patient.1.aspx
- Wilkinson, E., Jetty, A., Petterson, S., Jabbarpour, Y., & Westfall, J. M. (2021). Primary Care's Historic Role in Vaccination and Potential Role in COVID-19 Immunization Programs. *Ann Fam Med*, 19(4), 351-355. <https://doi.org/10.1370/afm.2679>
- World Health Organization. (2024). *Implementing the primary health care approach: A primer*. <https://www.who.int/publications/i/item/9789240090583>
- Woods, A. P., Alonso, A., Duraiswamy, S., Ceraolo, C., Feeney, T., Gunn, C. M., Burns, W. R., Segev, D. L., & Drake, F. T. (2022). Limited English Proficiency and Clinical Outcomes After Hospital-Based Care in English-Speaking Countries: a Systematic Review. *J Gen Intern Med*, 37(8), 2050-2061. <https://doi.org/10.1007/s11606-021-07348-6>
- Zumbo, B. D., & Zimmerman, D. W. (1993). Is the selection of statistical methods governed by level of measurement? *Canadian Psychology/Psychologie Canadienne*, 34(4), 390.