5-2022

Language Barriers in the Field of Audiology: Spanish-Speaking Patient & English-Speaking Audiologist

Jamiles Trejo
trej0821@bears.unco.edu

UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

LANGUAGE BARRIERS IN THE FIELD OF AUDIOLOGY: SPANISH-SPEAKING PATIENT AND ENGLISH-SPEAKING AUDIOLOGIST

A Scholarly Project Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Audiology

Jamiles Trejo

College of Natural and Health Sciences
Department of Audiology and Speech Language Sciences

May 2022

This Scholarly Project by Jamiles Trejo

Entitled: *Language Barriers in the Field of Audiology: Spanish-Speaking Patient & English-Speaking Audiologist*

has been approved as meeting the requirement for the Degree of Doctor of Audiology in the College of Natural and Health Sciences in the Department of Audiology and Speech Language Sciences.

Accepted by the Scholarly Project Research Committee

_____
Jennifer E. Weber, Au.D., CCC-A, Research Advisor

_____
Diane Erdbruegger, Au.D., CCC-A, Committee Member

_____
Erinn Michelle Jimmerson, Au.D., CCC-A, Committee Member

_____
Sandra K. Bowen, Ph.D., Faculty Representative

Accepted by the Graduate School

_____
Jeri-Anne Lyons, Ph.D.
Dean of the Graduate School
Associate Vice President for Research

ABSTRACT

Trejo, Jamiles**.** *Language Barriers in the Field of Audiology: Spanish-Speaking Patient and English-Speaking Audiologist*. Unpublished Doctor of Audiology Scholarly Project, University of Northern Colorado, 2022.

Language barriers in the healthcare system have been a continuously growing dilemma in the United States, affecting communication between a provider and patient, which leads to problems in healthcare delivery. Policies and regulations currently in place have attempted to decrease language barriers but several healthcare providers are not aware of the responsibility, have not prioritized the issue, or have not been held accountable through the enforcement of the laws. The goal of this paper was to provide best practices for audiologic testing that minimize language and cultural barriers and maximize the benefit the patient receives from the hearing evaluation. The focus was on English-speaking audiologists and Spanish-speaking patients. The importance has been exacerbated as Spanish is the second most spoken language in the United States and Hispanic/Latino communities continue to grow with a limited amount of bilingual audiologists. Audiologic research in this population was extremely limited with little information on prevalence of hearing impairment, epidemiology, risk factors, genetic basis of hearing impairment, and hearing aid use. Yet, options are currently available such as resources, educational interventions focused on overcoming language barriers, cultural competency, translators, and machine translators that can help decrease the negative impacts of a language barrier in the audiology field. The goal was to create an audiologic protocol for English-speaking

audiologists to use when seeing Spanish-speaking patients to reduce the negative impacts of language barriers in health care.

Keywords: audiology, hearing evaluation, language barriers, Spanish speaking, Hispanic, Latino

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CHAPTER I

INTRODUCTION

Have you ever gone to a doctor's appointment and had to face a language barrier? This has become a daily struggle in the United States for many. The United States consists of several different languages and cultures. This can result in language barriers in the healthcare system, causing problems. I am a native Spanish-speaker and have had medical appointments where I and my family had to face and overcome language barriers the best we could. I have grown up having to interpret and translate for family members and friends in various settings. I have heard horrendous experiences and seen the effects that came with language barriers in a healthcare setting. These experiences as well as pursuing audiology led me to questions such as what are the best routes in overcoming language barriers? What evidence exists to inform and support audiologists and patients? How can English-speaking audiologists best serve the limited English proficiency population? This evidence-based paper investigated the best practices in the areas of audiologic testing for limited English proficiency patients who speak Spanish as their primary language. I investigated the best practices for audiologic testing in a hearing evaluation that minimized language and cultural barriers and maximized the benefit the patient received from the hearing evaluation.

Demographics

The United States is diverse in both language and culture. Flores (2006) described how 49.6 million Americans (18.7% of U.S. residents) speak another language than English at home and 22.3 million have limited English proficiency (LEP). Between the years of 1990 and 2000,

the number of Americans who spoke a language other than English grew by 47% and the LEP population grew by 53% (Flores, 2006).

When analyzing the languages spoken at home in the United States, the 2019 Census data showed Spanish was the largest language spoken at home besides English (78% spoke English only, 13.5% spoke primarily Spanish at home in comparison to 3.7% who spoke Indo-European languages, 3.6% spoke Asian and Pacific Islander languages, and 1.2% spoke another language) (Steinberg et al., 2016). There was a diminishing share of U.S.-born Latinos who spoke Spanish at home but there was an increase in the percentage of foreign-born Hispanics who spoke Spanish at home. U.S.-born Hispanics represented an increasing share of the Hispanic population as immigration was declining. This resulted in the highest level of English proficiency among the Hispanic population but a decrease in Spanish proficiency (Hernández-Nieto & Gutiérrez, 2017). Despite the percentage of Spanish speakers slowly declining, the number of Hispanics age five or older who spoke Spanish at home has increased from 9.8 million in 1980 to 37.9 million in 2016 (Hernández-Nieto & Gutiérrez, 2017). Furthermore, the percentage of foreign-born Hispanics who speak Spanish at home has remained high and comparatively unchanged since 1980. Thus, the number of Spanish speakers is expected to continue to grow. The changing demographic trends also need to be continuously analyzed such as the U.S.-born Hispanic population growth, which facilitated the highest level of English proficiency in the Hispanic population and declining Hispanic immigration (Hernández-Nieto & Gutiérrez, 2017).

The Hispanic or Latino population is also the largest in the United States besides Whites alone (72%). The Hispanic or Latino population is 18.4%, Black or African American is 12.8%, and Asian alone is 5.7%. States with the largest Hispanic or Latino populations include New

Mexico (49.3%), Texas (39.7%), California (39.4%), Arizona (31.7%), Nevada (29.2%), Florida (26.4%), Colorado (21.8%), Illinois (17.5%), and New York (19.3%; Steinberg et al., 2016).

It is important to acknowledge that the Hispanic and Latino community encompasses several origins. Hispanic refers to those who speak Spanish or who are descendants from Spanish-speaking countries. Latino on the other hand is focused on geography and not so much language as it includes people from Latin America (Central America, South America, and the Caribbean). Both terms do not directly relate to race and people can be both or one. The Spanish speaking population has different cultural backgrounds, cultural influences, and education levels (Haffner, 1992).

U.S. Hispanics trace their heritage to over 20 Spanish-speaking countries (Steinberg et al., 2016). The U.S. Census stated the largest Hispanic or Latino population in the United States was Mexican (37,186,361), then Puerto Rican (5,828,706), followed by Cuban (2,381,565), and Dominican Republic (2,094,222; Steinberg et al., 2016). According to Hernández-Nieto and Gutiérrez (2017), 63.2% of U.S. Hispanics trace their country of origin to Mexico, 9.5% to Puerto Rico, 3.9% to Cuba, and 3.7% to El Salvador. From Central America, the largest populations included Costa Rican, Guatemalan, Honduran, Nicaraguan, Panamanian, Salvadoran. South America included Argentinean, Bolivian, Chilean, Colombian, Ecuadorian, Paraguayan, Peruvian, Uruguayan, and Venezuelan (Steinberg et al., 2016). Others included Spaniard and Spanish American. Immigration from Mexico continues to decrease; currently the second biggest source of Hispanic population is Puerto Ricans followed by Salvadorians, Cubans, Dominicans, and Guatemalans (Hernández-Nieto & Gutiérrez, 2017).

The Latino population is the largest minority group in the United States and is also the majority of the 25 million people in the United States with LEP (Steinberg et al., 2016). This

evolving population continues to grow and change linguistically and culturally. With regard to the U.S. population forecast by race/ethnicity from 2000 to 2012, the Hispanic population grew by 50% while the rest of the U.S. population only grew by 12%; and between 1970 and 2016, the Hispanic population increased from 9.1 million to 57.5 million (over six-fold growth) (Hernández-Nieto & Gutiérrez, 2017). This means the Hispanic population is projected to reach 106 million by 2050 and 119 million by 2060. Currently the U.S. Hispanic population is about 17.8% but with expected growth, it could reach 26.5% by 2050 and 28.6% by 2060 (Hernández-Nieto & Gutiérrez, 2017). Analysts have estimated that Whites will make up less than half of the U.S. population by 2045 as there continues to be growth in Black, Asian, Hispanic, and other race/ethnicities within the United States (Hernández-Nieto & Gutiérrez, 2017).

Language Barrier

A language barrier is generally seen as a barrier in communication between people who are unable to speak a common language. It is the inability to communicate via a known language. Language barriers are the most common communication barrier leading to misunderstandings and misinterpretations. Segalowitz and Kehayia (2011) defined language barriers in health care as language-based obstacles affecting successful communication between the provider and the patient, leading to problems in healthcare delivery. In their study, they found language barriers could adversely affect the access to services by patients. Segalowitz and Kehayia also discussed how language barriers were not simply problems with translating or code switching (language alternation, alternating between two or more languages in a single conversation) but constituted problems of expression. In health care, this could be expressed by both the physician and patient. In audiology, taking case history and counseling are key factors in a successful appointment. Expression of results from the audiologist and expression of symptoms by the patient are

compromised with language barriers and make an appointment difficult for both parties. The dynamic nature of communication also includes the use of language to express status, power, and identity. Communication is important for human relationships and thus is also the foundation of the physician and patient relationship. In addition, communication has diagnostic importance and could provide therapeutic benefits.

Two important aspects of language include joint attention and reading intention (Segalowitz & Kehayia, 2011). Joint attention refers to the interlocuters monitoring each other and directing attention in an intended manner. Reading intention relates to people in conversation trying to understand the social intentions of one another. This means conversation not only conveys cognitive information but also includes perspective. It is critical to acknowledge that the patient is a free agent and can make decisions on their own. Imposing perspective could alter the cognitive information given and give mixed signals to patients.

A language barrier could arise when there is a disruption to communication. This includes the dynamics of the conversation and the semantic barriers that result in an incomplete or incorrect understanding between the patient and provider. To help in these situations, Segalowitz and Kehayia (2011) presented some suggestions. One would be communication activities in which a scenario is recreated and encourages authentic communication in language learning. Another is identifying some language skills that need to be learned including vocabulary, expressions, and idioms. The provider could also establish operational definitions of appropriate levels of fluency. The development of training modules to promote specific skills addressing the language barrier could also help healthcare professionals.

Jacobs et al. (2006) described how clinicians are more educated and scientific than ever; yet, their ability to communicate effectively with patients could prove to be difficult. The

conversation between physician and patient has diagnostic and therapeutic importance but because of language barriers, it could provide little to no benefit to the patient. Saha and Fernandez (2007) described how for most Americans it is difficult to feel vulnerable when facing a language barrier. In the current global era of "Americanization," it is hard to envision, much less experience, a scenario in which Americans have no English-language "lifeline" in the event of a health emergency. The majority of healthcare providers in the United States are mono-lingual English speakers (Metzger, 1993). With regard to physicians, 80.5% are non-Hispanic White, 3.5% are non-Hispanic Black, and 4.9% are Hispanic (Metzger, 1993). When looking at registered nurses, 83.4% are non-Hispanic White, 8.7% are non-Hispanic Black, and 2.8% are Hispanic (Metzger, 1993). Lastly, with pharmacists, 85.7% are non-Hispanic White, 4.2% are non-Hispanic Black, and 3.1% are Hispanic (Metzger, 1993). Saha and Fernandez postulated this might be a reason why as a profession, industry, and as a nation, we continue to drag our feet in addressing the problem of language barriers in health care. This occurs despite the millions of Americans whose care is compromised on a daily basis as a result of fear, uncertainty, poor quality, and potentially life-threatening medical errors caused by the inability of a doctor and patient to communicate with each other.

State Regulations and Laws

Title VI

Due to the increasing number and diversity of LEP speakers in the United States, there has been increased pressure for legal requirements in the healthcare system to ensure equal treatment of LEP patients (Chen et al., 2007). Chen et al. (2007) investigated the legal framework that exists currently and future implications it might have. When it comes to the federal government, the 1964 Civil Rights Act was one of the most important pieces of

legislation in providing LEP speakers a right to language assistance services. Title VI of the 1964 Civil Rights act stated: “No person in the United States shall on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance” (U.S. Department of Labor, 1986, para. 1).

Congress passed the act to ensure that federal money was not being used in discriminatory programs or activities (U.S. Department of Labor, 1986). The Supreme Court has used national origin to be equivalent to discrimination based on language, i.e., people who speak a language other than English are entitled to treatment equal to that of English speakers. Title VI applies to all federal agencies, and the Department of Health and Human Services (HHS) expanded on this for the healthcare branch. Title VI of the Civil Rights Act in summary states LEP patients must have meaningful language services; thus, those agencies and departments must provide accommodations to reduce language barriers.

Metzger (1993) explained two main issues with Title VI. The first pertained to whether Title VI was applicable to the program being funded by the government or if it extended to non-federally funded activities in the same institution. The Supreme Court case in 1984, Grove City College vs. Bell (cited in Metzger, 1993), led to the Restoration Act in 1987 which stated that Title VI extended beyond the program receiving government funding to the entire agency or institution if any part received federal financial assistance (Metzger, 1993). The second issue was whether Title VI should test “intent” or “effects” to identify discrimination. When Title VI was issued, its intent was to prohibit explicit discrimination of segregation. Since then, the executive branch has dealt with more subtle forms of discrimination, usually facially neutral policies or procedures that have a disparate impact or effect on a particular group.

Furthermore, with Title VI, Congress did not explicitly state that language was part of national origin (Metzger, 1993). In 1974, Lau v. Nichols (cited in Metzger, 1993) dealt with this exact dilemma. Lau addressed 2,856 mono-lingual Chinese-speaking students in a school system who were entitled under Title VI to receive English language instruction or other processes to ensure an equal education to that of the English-speaking students (Metzger, 1993). The Court found that providing the Chinese students with the same facilities, textbooks, teacher, and curriculum did not equate to a meaningful education for them. Although not related to health care, it was the only Supreme Court case that discussed language as a part of Title VI.

The HHS included language as part of the national origin provisions of Title VI, stating that federally funded entities must provide bilingual services to those with LEP to have equal access to health care services (Metzger, 1993). Despite this, the force of this requirement was weak because the HHS Office for Civil Rights (OCR) interprets Title VI regulations. Further development and implementation of regulations by HHS is needed to protect the civil rights of the Hispanic community regarding language barriers in health care.

Chen et al. (2007) explained the basics of each federal department having a civil rights office in charge of making sure their programs and departments are discrimination free, the OCR being a part of this. This means organizations receiving monies through HHS are overseen by OCR. When there are complaints about linguistic barriers, OCR has the authority to initiate reviews and to withhold federal funds for noncompliance. For several medical settings, complaints from LEP patients to OCR have led to development or enhanced language assistance services.

Culturally and Linguistically Appropriate Services Standards

The National Standards for Culturally and Linguistically Appropriate Services in Health Care (CLAS) were issued by HHS and state guidelines to comply with Title VI. The CLAS aimed to improve healthcare quality and advance health equity by establishing a framework for organizations to serve the nation's increasingly diverse communities. It consists of four parts: first is the principal standard; second is governance, leadership, and workforce; third is communication and language assistance; and lastly, engagement, continuous improvement, and accountability. Into these four parts, 15 guidelines describe how to achieve healthcare quality and advance health equity with the LEP population (see Appendix A for CLAS standards). The CLAS are also operationalized by the Joint Commission for accreditation of many hospitals, yet many do not meet them (Steinberg et al., 2016). One of the reasons for this dilemma is the cost of the requirements (including but not limited to equipment, hiring interpreters, insurance coverage, etc.), which is greatly debated. Due to all this confusion, many insurers and clinicians do not know if there is a need to address the issue of language barriers in medical care.

Executive Order 13166

In August 2000, Executive Order (EO) 13166, "Improving Access to Services for Persons with Limited English Proficiency," was issued by President Clinton to further improve access to services for LEP people (Chen et al., 2007). It requires federal agencies to examine the services they provide, identify any need for services to those with LEP, and develop and implement a system to provide those services so LEP patients can have meaningful access to them (Chen et al., 2007).

Later under the Bush Administration, the EO was upheld, and the policy guidance was revised and reissued in August 2003 (Chen et al., 2007). The guidance outlined four parts that

institutions, programs, and providers should consider in determining what types of language assistance to pursue. The first part dealt with the number or portion of LEP patients who are served or are eligible to being served. The second factor considered the frequency of contact with a particular language group. The third part was concerned with the nature and importance of the service provided. Lastly, the fourth factor dealt with resources and cost. In summary, these factors tried to ensure the appropriate language services were provided where they were needed the most, and the factors should not be used as reasons to limit language assistance. The Department of Justice also provided several different documents that helped follow the executive order. What this meant for healthcare providers was once federal funds (e.g., Medicaid) were accepted, the provider had the responsibility to provide appropriate language access to all patients (Chen et al., 2007).

Reimbursement for Language Services

Title VI stated that the denial or delay of medical care because of language barriers was discrimination and required that Medicaid or Medicare funds provide appropriate language assistance (Flores, 2006). In 2000, a presidential executive order was issued to improve such services. Currently, only 13 states provide third-party reimbursement for interpreter services. Additionally, most states with large populations of LEP patients have not implemented these orders, usually due to cost. The 2003 guidelines by the OCR allowed facilities to opt out of providing such services but Title VI did not (Flores, 2006).

Flores (2006) stated that these are all concerns for the 2003 guidelines that state ad hoc interpreters might be appropriate. In a 2002 report from the Office of Management and Budget, it was estimated that it would cost about $4.04 more per physician visit to provide appropriate language services for LEP patients in the emergency department (Flores, 2006). Flores

mentioned this was a small price to pay for safe and high-quality health care for 49.6 million Americans.

Chen et al. (2007) further explained the reality is many healthcare providers are not aware of the responsibility to overcome language barriers, have not prioritized the issue, or are not held accountable through the enforcement of the laws. Chen et al. also delved into the complexity and variability in the issues due to the heterogeneous legal terms from the legislative process and the variations from each state. Despite the laws already mentioned, few states have laws mandating provision of language assistance services.

Each state has its own laws, i.e., Colorado, Rhode Island, and New Jersey have linked facility licensure to the provision of language services (Chen et al., 2007). Most legislative and regulatory activity addressing language barriers in healthcare occur at the state level and usually are concerned with three areas: continuing education for health professionals, certification of healthcare interpreters, and reimbursement for language services for Medicaid/State Children's Health Insurance Program enrollees. When it came to continuing education, legislative and regulatory activity addressed language access and/or cultural competency. The goal was to educate providers on the impact language barriers had on access and quality of health care received. Chen et al. (2007) found multiple exposures, and a model that integrated both linguistic competency and cultural aspects in clinical topics had the best results. Regarding reimbursement, Medicaid and the State Children's Health Insurance Program had made language services eligible for federal matching funds but each state determined how or if they provided reimbursement for interpreters. The researchers pointed out the states paying for interpreting services were states with small LEP populations except for Hawaii.

Although there is a legal right to language access, there are specific rights for certain settings, languages, and states. There is also a low level of awareness and enforcement of such legal rights. Chen et al. (2007) explained four changes that needed to occur in order for language services to be more consistent and comprehensive. The first was the need for financing language assistance services across payors. The second was developing a medical interpreter workforce by increasing numbers and the quality of training. The third was providing healthcare providers with the understanding of the effects of language barriers and the benefits of advocating for language assistance services for LEP patients. Lastly, there was a need for LEP patients to be aware of their legal rights and advocacy. Chen et al. stated that with the United States continuing to become culturally and linguistically diverse, we owed it to LEP patients to ensure communication was not an impediment to health.

Purpose of the Study

The purpose of this project was to research language barriers in the healthcare system with a focus on best practices for English speaking Audiologists working with Spanish speaking patients. I wanted to delve into the complexity of the issue and disseminate available information. Although policies and regulations are currently in place attempting to decrease language barriers, several healthcare providers are not aware of the responsibility, have not prioritized the issue, or have not been held accountable through the enforcement of the laws. On top of this, audiologic research in the Hispanic and Latino population is also extremely limited with little information on prevalence of hearing impairment, epidemiology, risk factors, genetic basis of hearing impairment, and hearing aid use. Yet, there are options currently available such as resources, educational interventions focused on overcoming language barriers, cultural

competency, translators, and machine translators that could help decrease the negative impacts of language barriers in the field of audiology.

This project covered several areas within language barriers in the healthcare system needing growth and advocacy. The purpose of this information was to spread education and awareness on the issue to progress toward a solution leading to better healthcare outcomes in audiology. The culmination of the capstone project was the development of a protocol for English-speaking audiologists to use as a guide to limit language barriers and better serve Spanish-speaking patients. The goal was for the information and resources to reduce negative impacts of language barriers for audiologists and-Spanish speaking patients.

CHAPTER II

IMPACTS ON HEALTH CARE

Now that we know what language barriers in healthcare are and that the Spanish speaking population in the United States is large, how does this affect Spanish speakers with limited English proficiency in health care?

DuBard and Gizlice (2008) at the University of North Carolina at Chapel Hill delved into self-reported health status, health behaviors, access to care, and the use of preventive services in the United States for the Hispanic adult population to determine language-associated disparities. DuBard and Gizlice analyzed the Behavioral Risk Factor Surveillance System data from 2003-2005 that included 45,076 Hispanic adults from 23 states (representing 90% of the U.S. Hispanic population). In their study, 25 health indicators between Spanish-speaking Hispanics and English-speaking Hispanics were compared. Both groups were further analyzed through factors such as socioeconomic status and educational, environmental, legal, and cultural differences. The data collected demonstrated that physical activity, rates of chronic disease, obesity, and smoking were higher in the Spanish-speaking Hispanic population. The Spanish-speaking population also reported worse health status, access to care, and received less preventive care in comparison to English-speaking Hispanics. When accessing demographic and socioeconomic factors, the researchers found no influence on language (DuBard & Gizlice, 2008).

The Spanish-speaking population as a vulnerable subpopulation in the United States has less access to care and use of preventive services. Priorities for this group include maintenance of healthy behaviors (related to tobacco and alcohol use), promotion of physical activity,

improvement of immunizations and cancer screening rates, preventive health care (affordable and timely), increased access to care, and linguistically appropriate care (DuBard & Gizlice, 2008).

Jacobs et al. (2006) also described how most healthcare organizations did not provide linguistic assistance or it was inadequate. This then resulted in healthcare providers relying on other patients, family members, friends, and untrained nonclinical employees for communication. Jacobs et al. explored several articles and found the LEP population was less likely to receive the care they needed, to understand the process to become insured, to receive preventive care, to have a regular source of primary care, and to receive timely eye, dental, and physical examinations. When it came to comprehension and adherence, the LEP population had a poorer understanding of the care received and therefore was less likely to follow recommendations and go to follow-up visits. Regarding quality of care, the LEP population was more likely to be admitted to a hospital, to have longer hospital stays, to receive insufficient anesthesia, and to have asthmatic children who needed to be intubated. The LEP population also had a greater risk of receiving unnecessary diagnostic testing and was at a greater risk of suffering medical errors. Focusing on satisfaction, LEP patients were less satisfied with the health care. Latinos were less satisfied with the communication as well as the care received. Healthcare providers were also less satisfied with their interactions with patients when faced with a language barrier.

Steinberg et al. (2016) investigated some of the problems parents with LEP faced with health care. Through their research, the researchers tried to understand and describe the viewpoints of LEP Latina mothers on their experiences with health care in a pediatric setting. Interview data of 48 participants with most of the mothers being of Mexican descent were

included within the study. They described their primary care experiences as being better than those in specialty care, emergency care, and other healthcare services, this being due to the better accommodation of language needs by primary care providers. The study found six emergent themes: the “battle” of managing language barriers, preference for bilingual providers, negative bias toward interpreted encounters, “getting by” with limited language skills, fear of being a burden, and stigma and discrimination due to language barriers.

Through their results, Steinberg et al. (2016) summarized the complexity of the healthcare system, providers, and patient-level barriers with LEP patients. Steinberg et al. found that addressing the provider language gap required incentives for improving language skills, having training programs, and improving cultural competency. One of the major themes was discrimination and stigma toward LEP Latino patients. This perceived discrimination was associated with lower health care and poor patient-provider communication. Although this study included a small sample of mothers in an urban community, the findings are still relevant in showing the patient perspective of language barriers in health care. Healthcare practitioners must partner with patients and families to manage language barriers from the first interaction to improve health care to the LEP populations by changing policies and practices.

Flores (2006) described language barriers based on LEP population experiences in health care. In one experience, an interpreter mistranslated for a nurse and told a mother with a daughter who had otitis media to put oral amoxicillin in her daughters’ ears. In another incident, a Spanish-speaking woman told a resident her daughter had hit herself when she fell off her tricycle. Two words were misunderstood and it was understood the fracture was due to abuse and hence the Department of Social Services was contacted. True life stories like this are happening right now as you read this paper, continuously affecting lives.

Despite all the data and increase in the LEP population in the United States, many healthcare providers do not provide access to medical interpreters (Flores, 2006). Forty-six percent of LEP patients in the emergency department did not receive any interpreting services. Furthermore, few clinicians received training on working with interpreters or the LEP population. Only about 23% of hospitals provided such training and most of them were optional (Flores, 2006). This language barrier could create several problems for the LEP population. They are less likely to have the usual source of medical care, receive preventive services at reduced rates, and have an increased risk of nonadherence to medication (Flores, 2006). The LEP population is also more likely to be diagnosed with severe psychopathology, to leave a hospital against medical advice, and more likely to be intubated for asthma. They are also less likely to return for follow-up appointments and have higher rates of hospitalization and drug complications. Overall, there are lower levels of patient satisfaction with health care. This inadequate communication between patient and practitioner has led hospitals to pay millions in malpractice settlements. This not only adversely affects the patient's health but in turn the health care system as a whole.

Metzger (1993) focused on data from the Hispanic population that showed poorer health status when compared to the non-Hispanic population. This was the lack of access to healthcare services largely due to language and cultural barriers. Regarding health insurance, Metzger found Hispanics were the least likely to be insured. In 1987, 31.5% of Hispanics were uninsured in comparison to 12.4% of Whites (Metzger, 1993). Metzger also stated that with a regular source of care, Hispanics were the most likely to not have a regular source of health care with 30.1% of Hispanics compared to 20.1% of Blacks and 16.3% of Whites. When it came to prenatal service use, Hispanic mothers were more likely to have late or no prenatal care with 12.1% for Hispanics

in comparison to 4.1% for non-Hispanic Whites. In 1990, only 61% of pregnant Hispanic women received prenatal care during the first trimester (Metzger, 1993). This continues to be a concern as Latinas continue to underutilize these services and enter prenatal care late. When it came to Hispanics using physician services, the rates between the ages of 45 and 64 were 4.8% for Puerto Ricans, Cuban Americans, and Mexican Americans when compared to 6.5% for non-Hispanic whites. Lastly, poverty programs, specifically Medicaid, did not cover two of every three Hispanics under the age of 65. Metzger found that although Hispanics had the least access to health care, lower incomes, and lower educational attainment levels, Hispanics were statistically doing as well as non-Hispanic Whites when looking at low birth weight, infant deaths, and death rate. This paradox was dissolved when Metzger examined morbidity data that showed quality of life being severely impaired. When it came to explaining the causes for the low rates of access to care by Hispanics, one reason was cultural barriers. The other major factor was language barriers. With this reasoning, adequate linguistic accommodations such as interpreters and translated materials should improve Hispanic access to health and quality of life.

So how do language barriers in health care affect the Spanish-speaking population in the United States? According to Jacobs et al. (2006), when it came to comprehension and adherence, the LEP population had a poorer understanding of the care received and therefore was less likely to follow recommendations and to go to follow-up visits, which led to the increased risk of nonadherence to medication. Regarding quality of care, the LEP population was more likely to be admitted to a hospital, to have longer hospital stays, to receive insufficient anesthesia, and asthmatic children were also more likely to be intubated. This resulted in higher hospitalization rates and drug complications. They had worse health status, less access to care, and received less preventive care. They were less likely to receive the care they needed, to understand the process

of being insured (less likely to be insured), to receive preventive care, to have regular source of primary care, to receive prenatal care, and to receive timely eye, dental, and physical examinations (Jacobs et al., 2006). The LEP population also had a greater risk of receiving unnecessary diagnostic testing and was at a greater risk of suffering medical errors. They were more likely to be diagnosed with severe psychopathology and to leave a hospital against medical advice. Focusing on satisfaction, the LEP patients were less satisfied with the health care. Also, many described primary care experiences being better than those in specialty care, emergency care, and other health care services, this being due to the better accommodation of language needs by the primary care providers (Jacobs et al., 2006).

This lower health care and poor patient-provider communication resulted in Spanish-speaking patients feeling discrimination and stigma toward them, which led to a reduced quality of life due to the health care provided. It did not help that few clinicians received any training in working with interpreters or the LEP population.

Ad Hoc Interpreter and Professional Interpreter

Ad hoc interpreters are people who are not trained but are called on to interpret and, thus, usually do not have training with medical terminology or confidentiality (Haffner, 1992). Ad hoc interpreters include family members, friends, untrained staff, children, and strangers. Inexperienced Spanish speakers who interpret could lead to confusing, insulting, and comic results since they are more likely than professional interpreters to make errors that lead to adverse clinical consequences (Haffner, 1992). Several studies have shown ad hoc interpreters are likely to commit errors that could have adverse clinical consequences (Abreu et al., 2011). It should be noted that they did not have training pertinent to medical/health sciences terminology and confidentiality issues.

Using a child to interpret could be a heavy burden for them and their English is frequently marginal or not sophisticated. Furthermore, its harmful for the child and family because it threatens the effectiveness of their communication. Haffner (1992) also described the hierarchy in the Hispanic culture with authority going from older to younger and from male to female. When a physician puts a child in control, this hierarchy is broken and disrupts the family's social order.

Haffner (1992) addressed times where having a professional interpreter might not always be possible and healthcare professionals rely on their marginal Spanish and the patient's marginal English or ad hoc interpreters. This should be avoided because it is an inadequate level of communication required for good medical care (Haffner, 1992). Using family members or other untrained people could lead to a decline in English proficiency when confronted with the stresses of the context. Professional interpreters are the conduit for effective, efficient, and reliable communication between the healthcare professional and the patient or family (Haffner, 1992). It is critical to understand that it is not just a language problem but also a cultural one, requiring more than mechanical translation. Using a professional interpreter could help in achieving health care objectives

True bilingualism of a professional interpreter takes a lot of time, training, certification, and practice. Proper medical interpretation requires a firm grasp on two different and complex languages to achieve immediate, highly functional, and accurate translation in many different educational levels (Haffner, 1992).

Interpreter's View

Linda Haffner (1992) is a professional Spanish-language interpreter and translator at Stanford (California) University Medical Center and is from Nicaragua. Haffner described the

communication and cultural difficulties that arose with Spanish-speaking patients. In her article, she reminisced on several events that happened throughout a day of work, highlighting some of the complexities of bilingual and bicultural communication, with Hispanic patients.

Her day began in the Delivery Room where an 18-year-old Mexican patient was offered an epidural block due to experiencing regular contractions and only being 4 cm dilated. The patient denied the epidural because she understood the nurse as offering a *raquea*, which is a spinal block in Spanish. After Haffner (1992) translated and bridged the language, cultural, and knowledge gaps, the patient changed her decision.

Later in the Obstetrical Diabetic Clinic, a 34-year-old Central American woman was asked case history questions and when it came to pregnancies, she said she had had two. As Haffner (1992) talked to her, she discovered the woman had also had a miscarriage, which in her culture did not equate to a pregnancy. Her different cultural attitudes and beliefs were discovered and better understood through conversation and provided a more accurate and complete case history.

Then in the Internal Medicine Clinic, Haffner (1992) was called to interpret for a 50-year-old woman from Mexico because her 35-year-old son, who usually interpreted for her, had to leave. She had been to the doctors three times before with different vague and diffuse complaints that made no medical sense. Haffner discovered the patient had a fistula in her rectum and had been inventing symptoms because she was embarrassed since her son was interpreting. Haffner described this as illustrating the result of a higher cultural standard of modesty in Latino women and how they were often reluctant to reveal personal and private problems when their children were used to interpret.

Later, Haffner (1992) was called to interpret for a pregnant woman who might have a stillbirth. The doctors had been using the patient's seven-year-old daughter to interpret. When Haffner walked in, the little girl said, "*No podía explicarle a mi mama todo lo que los doctores me decían*" ("I couldn't explain to my mom everything the doctors were telling me"). The little girl was distraught as she had been told to tell her mother the baby was dead. In another case, Haffner described doctors using a patient's seven-year-old son. Although Haffner was available to go in, the physician told her she was not needed and that the boy was doing a good job. The boy, who was frightened, told her, "Please, señora, can you help me? I don't know if I am doing this right?" Haffner confirmed using an interpreter could be frustrating because it made communication slower, more awkward, and less precise. Haffner also addressed the frustration healthcare professionals experienced because they had less control when there was an interpreter. Haffner described more scenarios within the article, each with different language and cultural barriers that had been overcome.

Audiologists' View

What are the views or impacts of language barriers for audiologists? Abreu et al. (2011) expressed the importance in understanding language barriers for audiologists as the number of foreign-born residents is projected to rise from 31 million in 2000 to 48 million in 2025, and the Hispanic population itself is projected to triple in the United States by the mid-century. Audiology is a unique profession since discipline with communication is at its heart; thus, providing high quality, culturally sensitive services, and communication with patients regardless of language barrier is critically important. Twenty audiologists (two bilingual in Spanish and English) worked together to discuss some of the challenges they faced when assessing bilingual children. The audiologists agreed that one of the major challenges with language barriers was

communicating with the parents/guardians of the children. This made obtaining a detailed case history and relaying recommendations for follow-up quite difficult. Case history is one of the key factors when assessing a child for potential hearing impairment as birth history, complications, neonatal intensive care admissions, family history of hearing impairment, developmental milestones, use of hearing aids, and trauma all help form a better picture of what is happening. This communication is made difficult by the parents not understanding the question or not being able to properly answer them in English. The same goes for the audiologists; it is difficult to ask the questions in a manner that can be understood and then attempt to understand the response. A lot of important information can be easily lost as incomplete background information could comprise clinical outcomes regardless of clinical protocol. Not only is the start of the appointment affected but so is explaining and understanding test results, recommendations, and counseling provided by the audiologist.

Most audiologists who participated indicated they used ad hoc interpreters and telephone "language lines" as primary methods to overcome such language barriers during history, intake, and recommendations. Two private-practice audiologists also indicated not using or not being aware of the availability of language lines. Audiologists expressed ad hoc interpreters still being problematic as they felt ad hoc interpreters did not convey accurate information to parents about hearing impairment and counseling. One respondent expressed, "I have no reassurance that the information was presented the way I intended to convey it" (Abreu et al., 2011, p. 12).

Other challenges faced included the lack of availability of testing materials specifically with word discrimination, aided bilingual language outcomes tools, and auditory processing test materials. Counseling regarding communication options for speech-language development in bilingual children with hearing impairment was also a big issue with lack of materials and

support (Abreu et al., 2011). The bilingual audiologists expressed not having significant challenges with the assessment of bilingual pediatric patients but they did have some difficulty understanding the various Spanish dialects. They also mentioned having difficulties with the lack of materials explaining auditory neuropathy/dys-synchrony at a basic level in Spanish.

The discussion by these audiologists indicated lack of standardized interpretation options or protocols. Many audiologists also did not have access to all appropriate standardized speech audiometry testing materials (Abreu et al., 2011). Although language-specific tests have been developed, the validity and lack of clinical research to support such testing materials remained salient concerns (Abreu et al., 2011). Audiologists faced language challenges similar to those faced in other health professional including emergency medicine providers and mental health care providers. Several of these health care practices used ad hoc interpreters and language lines to overcome language barriers. Language-line interpreter services, although not perfect, are a better choice than ad hoc interpreters when possible and feasible.

Hearing Impairment in the Latino and Hispanic Population

Hearing impairment is one of the most common chronic conditions affecting adults; yet, data specific to the Hispanic/Latino population are limited. Growing evidence showed age-related hearing impairment was associated with lower socioeconomic status, occupational noise exposure, diabetes mellitus, smoking, and obesity; these factors might all be more common in the Hispanic/Latino population (Cruickshanks et al., 2015). Hearing impairments could go undiagnosed and untreated for many, and this could be exacerbated for groups that are underserved in health care like the Hispanic/Latino population. Cruickshanks et al. (2015) delved into hearing impairment and addressed the few studies looking at the U.S. Hispanic/Latino

population. They determined the prevalence of hearing impairment of U.S. Hispanic/Latino adults of diverse backgrounds and associations with potential risk factors.

The Hispanic Community Health Study/Study of Latinos (HCHS/SOL), which is a population-based sample of Hispanics/Latinos in U.S. communities (Bronx, New York; Chicago, Illinois; Miami, Florida; and San Diego California), was used in the study from 2008-2011 (Cruickshanks et al., 2015). The population used included 16,415 self-identified Hispanic/Latino people ranging from 18 to 74 years of age recruited randomly (stratified 2-stage area probability design) based on census block groups and household within block groups. For this study, hearing thresholds were obtained through pure-tone audiometry, and hearing impairment was determined using a pure-tone average (PTA; at 500, 1,000, 2,000, and 4,000 Hz) greater than 25 dB HL (bilateral hearing impairment was established if PTAs were greater than 25 dB in both ears). In addition to the pure tone testing, a multivariable analysis included adjustments for sociodemographic, lifestyle variables, body mass index, and medical conditions.

A prevalence of 15.06% for hearing impairment overall and an 8.24% for bilateral hearing impairment were gathered by the researchers with 0.85% reporting history of ear surgery or disease (Cruickshanks et al., 2015). A small portion of those with hearing impairment had evidence of conductive hearing losses: 3.12% for the left ear and 2.9% for the right ear (Cruickshanks et al., 2015). The prevalence of hearing impairment for the ages of 18-44 years ranged from 2.68% (in either ear) from men reporting South American background to 7.14% for those reporting Puerto Rican background. For men aged 45 years or older, the prevalence of hearing impairment was the highest among those reporting Puerto Rican background (41.20% in either ear) and for other grounds, it varied with a low of 29.35% for men reporting Dominican background (Cruickshanks et al., 2015). Hearing impairment prevalence also varied among the

Hispanic/Latino women. Women ranging from 18-44 years of age had a hearing impairment prevalence as high as 8.14% for those reporting Puerto Rican background and as low as 2.72% for those reporting South American background (Cruickshanks et al., 2015). Women 45 years and older who reported mixed or other background had the highest prevalence of hearing impairment at 32.11% and ranged as low as 17.89% for women reporting Mexican background (Cruickshanks et al., 2015). The study demonstrated how hearing impairment is common in Hispanic/Latino adults and the prevalence increases sharply after the age of 45 years. Hispanic/Latino men were also more likely than the women to have a hearing impairment. A Puerto Rican background was also associated with higher prevalence of hearing impairment than a Mexican background. The researchers hypothesized that this could be due to Puerto Rican background also being more likely than other groups to have multiple cardiovascular disease risk factors (Cruickshanks et al., 2015). Thus, for this population, cardiovascular diseases and aging might be affecting the stria vascularis, resulting in a hearing impairment (Cruickshanks et al., 2015). The study found smoking, obesity, history of cardiovascular disease, and diabetes were associated with hearing impairments in a simple modified adjusted demographic factor. In a multivariable model, diabetes and prediabetes remained significantly associated with hearing impairment. It was also noted that some of the participants had a conductive component that could be amenable through medical treatment (Cruickshanks et al., 2015). Education and higher income were also associated with lower rates of hearing impairment. Lower socioeconomic status for many participants also meant more noise exposure occupationally and sometimes recreationally as well and thus related to hearing impairment. It is critical for healthcare professionals and the public to be aware of hearing impairment and its importance especially with the Hispanic/Latino communities in the United States.

Cruickshanks et al. (2015) grouped Central and South American backgrounds, which are heterogeneous because of the large number of countries and geographic regions encompassed. The testing of auditory function was also limited due to time constraints, resulting in speech understanding and central auditory processing not being assessed. Overall, the multicenter study demonstrated that hearing impairment was common in the Hispanic/Latino population (15% of the adults had hearing impairment). Diabetes, less education, lower income, and noise exposure were associated with higher prevalence of hearing impairment. Healthcare professionals and audiologists need to be aware that Hispanic/Latino patients might be at an increased risk for hearing impairment due to abnormal glucose metabolism. Further longitudinal studies need to be done to strengthen the determination of risk factors associated with hearing impairment for the Hispanic/Latino population. The conclusion was hearing impairment is a common problem in the community especially for those of older age with socioeconomic factors, noise exposure, and abnormal glucose metabolism. Researchers still need to determine if such factors are correlated to etiology of hearing impairment in order to identify ways to prevent or aid with such changes in hearing.

Lee et al. (1996) conducted a comparative analysis of the epidemiology of childhood hearing impairment among African American, Hispanic American, and non-Hispanic White children between the ages of 2 and 19 years of age using data from the National Health and Nutrition Examination Survey II (NHANES II; 1976-1980) and the Hispanic Health and Nutrition Examination Survey (HHANES; 1982-1984). The participants included 688 African Americans, 330 Cuban Americans, 2,602 Mexican Americans, 1,025 Puerto Ricans, and 3,243 non-Hispanic Whites. The HHANES used a multistage sampling design to have a representative sample of Mexican Americans from Southwestern states (Texas, New Mexico, Colorado,

Arizona, and California), Cuban Americans from Miami, and Puerto Ricans from New York City. The sampling was representative of 84% of the Mexican origin population in the United States. Data collection from both the HHANES and the NHANES II included an administered household interview and a comprehensive physical examination at centrally located trailers. For both, there were similar methodologies, same calibration specifications, and identical equipment (Lee et al., 1996). Air conduction thresholds were obtained in a sound-treated room at 500, 1,000, 2,000, and 4,000 Hz. Pure tone averages were calculated by averaging thresholds at 500, 1,000, and 2,000 Hz. Hearing impairment in this study was defined by a PTA greater than 15 dB HL in the better ear, slight to mild was a PTA between 16-30 dB HL, and moderate or greater was a PTA greater than 30 dB HL (Lee et al., 1996).

The major finding in this study was a higher prevalence of hearing impairment in the Hispanic population in comparison to African Americans and non-Hispanic Whites (Lee et al., 1996). More specifically, this was due to the high rates in Cuban Americans and Puerto Ricans prevalence of slight/mild hearing impairment. Mexican Americans had significantly lower rates of slight/mild and overall hearing impairment in comparison to other Hispanic subgroups. There was limited evidence on males having higher rates of hearing impairment than females (Lee et al., 1996). Gender and age comparisons were inconsistent and nonsignificant in the groups. In this study, there were small sample sizes for African Americans, Cuban Americans, and Puerto Ricans. Also due to time and financial constraints, there was no bone conduction testing conducted, which could have helped in determining the type of hearing impairment (Lee et al., 1996). Further research is needed to identify factors for hearing impairment in Hispanic populations.

Diabetes and Hearing Impairment

Hearing impairment affects two-thirds of U.S. adults with diabetes. The association among Hispanic/Latino adults with hearing impairment and diabetes (one-fifth) can also be seen. This means Hispanic/Latino populations might be at a risk for hearing impairment and its possible long-term sequelae (reduced health-related quality of life). Bainbridge et al. (2016) examined risk factors for hearing impairment in the Hispanic/Latino adult population with diabetes. Bainbridge et al. investigated 3,384 participants aged 18-76 years with diagnosed or previously undetected diabetes. Participants also had identified cigarette smoking, high levels of alcohol consumption, and high triglyceride levels. Participants underwent audiometric testing as part of the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). The HCHC/SOL participants were from the Bronx, Chicago, Miami, and San Diego communities. A stratified two-stage probability sampling was done to ensure diverse sampling with Hispanic ethnicity and socioeconomic status. Hearing impairment was defined as the pure-tone average (PTA) >25 dB HL taken at high frequencies (3,000, 4,000, 6,000, and 8,000 Hz) in the worse ear and defined a second hearing impairment outcome with the additional requirement of a PTA >25 dB HL taken at low/mid-frequencies (500, 1,000, and 2,000 Hz) in the worse ear.

Bainbridge et al. (2016) found participants with lower family income and lower educational attainment were more likely to have hearing impairment. More research is needed to determine what factors predispose people of lower socioeconomic status to greater risk of hearing impairment. Diabetes severity (indicated by diabetes duration, suboptimal glycemic control, and use of glycemic medication) was not associated with hearing impairment. In past longitudinal studies, hyperglycemia had been associated with incident hearing impairment in the general population but cross-sectional studies had not shown glycemia as a correlate of hearing

impairment among people with diabetes. If the study had looked at glycemia of longer duration or to episodic hyper- or hypoglycemia or to glycemic variability over time, they might have been able to see a greater association. When looking at the estimated glomerular filtration rate (to indicate renal function), hearing impairment was apparent in the earlier stages of chronic kidney disease (Bainbridge et al., 2016). The research showed no associations with hearing impairment and coronary heart disease or cerebrovascular disease. Smoking and high triglycerides showed positive associations with low/mid-frequency hearing impairment. This association lent credence to vascular etiology for hearing impairment. Thickened capillaries in the stria vascularis and sclerosis of the internal auditory artery happened among diabetic patients and provided pathophysiologic evidence of injury to the cochlea (Bainbridge et al., 2016). Smoking and dyslipidemia might be markers of a progressive, atherosclerotic mechanism, possibly related to lipid oxidation, that damages the cochlea and reduces hearing sensitivity. When it came to alcohol, moderate alcohol use was associated with lower prevalence of hearing impairment and higher levels of consumption were associated with hearing impairment. This cardioprotective effect of moderate alcohol use might be due to the related decrease in lipid oxidation (Bainbridge et al., 2016).

In conclusion, 59.3% of the participants had a hearing impairment (Bainbridge et al., 2016). Lower family income and lower education population was at an increased risk of hearing impairment. Hearing impairment was seen more in the Hispanic/Latino population that was in earlier stages of diabetic nephropathy. The findings suggested smoking cessation, reduction of high levels of alcohol consumption, and lipid management might help lower the public health burden of hearing impairment among Hispanics/Latinos with diabetes (Bainbridge et al., 2016).

Genetic Predisposition

We have discussed some of the factors and the prevalence of hearing impairment in the Hispanic/Latino population. Genetic predisposition is also critical since it is one of the most common factors that leads to hearing impairment (Mittal et al., 2018). A large portion of hearing impairment studies included few Spanish, Hispanic, and Latino participants, which then left a critical gap in the understanding of prevalence, impact, unmet health care needs, and genetic factors associated with hearing impairment for this population. Gene variants linked to hearing impairment vary among different populations, which has led to a growing interest in creating population-specific "gene panels" to improve genetic screening efficiency.

Mittal et al. (2018) reviewed research and discussed the recent advance in genetic basis of HL in Spanish and Hispanic populations. Mitochondrially encoded 12S ribosomal RNA (MTRNR1) is evolutionarily related to the bacterial ribosome making it a target for aminoglycoside antibiotic-induced ototoxicity. Currently, there are three variants. Variant m.1555A>G was seen in a study with 10 multiplex Spanish and Italian families; 35 of the participants with sensorineural deafness had this variant. Thus, hearing impairment was associated with the 12S rRNA m.1555A>G gene variant. A second variant was m.1291 T>C. It was seen in a three-generation Cuban family with hearing impairment who had no history of aminoglycoside exposure. The third variant, m.827A>G, was seen in two Argentinean sisters with hearing impairment. It was linked with aminoglycoside exposure; this exacerbated the effects of the variant, leading to hearing impairment. Again, data and understanding of hearing impairment in Spanish/Hispanic populations were severely lacking. The GJB2 and GJB6 variants were the most common cause of autosomal recessive hearing impairment in several ethnic populations. Both gene variants coded for connexins, which are vital gap junction proteins in the

cochlea (Mittal et al., 2018). In a study of 67 Caribbean Hispanic participants with autosomal recessive hearing impairment, GJB2 and GJB6 variants were scarce. This was also seen in a study of 127 Caribbean Hispanic and Black participants with bilateral hearing impairment with only 4% having the gene variant (Mittal et al., 2018). A study identified homozygous c.35delG mutation in the GJB2 gene was associated with non-syndromic hearing impairment in a Mexican family. Otoferlin is encoded by the OTOF gene and has been associated with non-syndromic hearing impairment. Several mutations were identified in OTOF in non-Hispanic populations but the only gene variant seen in Hispanics was a nonsense mutation c.2485G>T. It was reported in a Cuban family and a Mexican descent family. It has also been seen on a larger scale with Spanish participants.

Based on reports from single families and small studies, GJB2/OTOF/m.1555A> G variants were most commonly associated with this population (Mittal et al., 2018). The importance of conducting research with this population was highly stressed. Studies around the world consisted of mostly a White population. Genome-wide association hearing impairment studies were of up to 500,000 individuals and the national genome study (10 k Genomes Project) again were great studies looking at large populations, hearing impairment, and genes—yet, none included the Hispanic/Latino population. In the United States, this population continues to grow and be underserved, not just in receiving linguistically and culturally appropriate health care but also in critical research.

Occupational Hearing Impairment

Farming and Construction

Occupational noise exposure is recognized as a risk factor for hearing impairment. Farmers have been found to be at an increased risk of high frequency, sensorineural hearing

impairment, most likely due to noise exposure and pesticides. Crop spraying has specifically been associated with increased risk of hearing impairment. Most of the research focused on self-employed farmers and little to none was on the 2.5 million migrant agricultural workers in the United States (Rabinowitz et al., 2005). Migrant workers are exposed to excessive noise levels and pesticides. The majority of migrant farm workers are Hispanic and have significant rates of hearing impairment (Rabinowitz et al., 2005). You might be thinking what about the use of hearing protection?

In a study of noise-exposed workers (mainly Hispanic), lower acculturation scores were associated with less effective use of hearing protection. Rabinowitz et al. (2005) conducted a cross-sectional survey of Hispanic agricultural workers. The survey focused on determining whether rates of hearing impairment appeared to increase compared to other populations, whether measured hearing impairment was associated with reported hearing difficulties, and whether significant associations could be found between hearing impairment and occupational exposures to noise and pesticides (Rabinowitz et al., 2005).

Participants were recruited from 2001-2002 at health fairs held at migrant camps and farms in the Connecticut River valley. The survey along with tympanometry and audiometric data were obtained and 150 individuals were included in the study. Hearing impairment was defined as a threshold >25 dB HL in either ear at any frequency between 500-6000 Hz. Twelve percent of individuals had hearing impairment by American Medical Association/American Academy of Otolaryngology–Head and Neck Surgery criteria and over 35% reported subjective difficulty hearing and understanding speech due to hearing problems, yet none reported the use of hearing aids (Rabinowitz et al., 2005). Over 50% of the individuals had hearing impairment as defined by the researchers and 19% had middle ear dysfunction of those who were tested. The

prevalence of hearing impairment at 4,000 Hz in Mexican and Puerto Rican male agricultural workers was compared to that of males in the HHANES survey and it revealed higher rates of high-frequency hearing impairment for farm workers of all age groups (≤ 25 years, 26-40 years, and > 40 years) in comparison to the HHANES data (Rabinowitz et al., 2005). The data showed disproportionately high rates of hearing loss for farm workers with hearing impairment present in the younger age categories as well. Overall, 12% of the subjects in the study met the American Medical Association criteria for hearing impairment but 50% had a ≥ 25 dB hearing impairment at one or more audiometric frequencies (Rabinowitz et al., 2005). In general, 35% of the farm workers reported difficulty hearing or understanding speech.

Noise exposure and pesticide exposure were commonly reported but the use of hearing protection (14%) was rare. Perceived self-efficacy and barriers to hearing protection were the biggest issues with Hispanic use of hearing protection. There is a lot of room to further improvements in training and enforcement of hearing protection.

The World Health Organization described noise-induced hearing impairment as “the most prevalent irreversible industrial disease” (Robertson et al., 2007, p. 153). Effective interventions to prevent this occupational noise-induced hearing impairment must be adapted to the experiences of the diverse worker populations globally. Robertson et al. (2007) conducted a study on Latino construction workers’ experiences with occupational noise and hearing protection to create a multimedia hearing conservation intervention and evaluate its effectiveness. The Latino population in the U.S. construction industry has grown tremendously from 1980 to 2005 with 2.5 million Latino construction workers in 2005 (Robertson et al., 2007). The Latino population accounted for over 30% of the U.S. construction work force, the majority being Mexican or Mexican American (others included Puerto Rican, Cuban, and Central or

South American). Worldwide audiometric testing demonstrated that 74% of construction workers had hearing impairment (Robertson et al., 2007). Several construction tasks and tools generate hazardous noise exposures as high as 97 dBA for an eight-hour-time-weighted average (TWA). For example, a construction worker cleaning road cuts with a handheld shovel was exposed to 87.4 dBA and while chipping concrete with a pneumatic hammer, he was exposed to 109 dBA (Robertson et al., 2007). The Occupational Safety and Health Administration (OSHA; Standard 29 CFR 1929.52) mandates employers in the construction industry provide "feasible administrative or engineering controls," hearing protection, and hearing conservation program for all employees exposed to noise at or above an eight-hour TWA of 90Dba (Robertson et al., 2007, p. 154). It did not have a specific requirement for noise exposure monitoring, audiometric testing, or worker training and education regarding the use of hearing protection, making it difficult to enforce hearing conservation training and other aspects of hearing conservation training.

For the study, Robertson et al. (2007) did purposive sampling resulting in two groups: one group (n = 9) included established bilingual construction union members (from Minneapolis/St. Paul, Minnesota) and the other group (n = 6) included newer Spanish-speaking immigrant construction workers (from Denver, Colorado). The participants ranged from 3.5 to 30 years of experience and 25to 50 years of age (only one participant was born in the United States). Focus groups investigated the perceptions of exposure to noise on the job as well as barriers and supports for wearing hearing protection. Several themes and categories arose.

The first category was the assessment of "how it feels," where participants described a range of physical responses to noise exposure. All the participants agreed the noise exposure eventually led to headaches and constant noise exposure made them feel tired. One participant

explained that by the end of a workday full of noise, he became very bothered by headaches, ringing in his ears, and fatigue. Several described bothersome tinnitus while working and even afterward.

The next category was “Why use hearing protection”? Men who had hearing impairment felt strongly about protecting their remaining hearing and took it as their responsibility to take care of it. Some saw it as a personal responsibility and explained the necessity to wear hearing protection even if the foreman was not supervising. Others initially described not giving hearing protection importance due to being young and not well informed but after training, they wore and valued hearing protection. Workers in companies with strict safety policies described wearing hearing protection because it was mandatory. A worker mentioned having to wear hearing protection constantly while working and could only take them out during lunchtime. He said he wore his hearing protection because “We want to work. We need the money. We have to follow the rules.” Several workers complied with hearing protection because they had no choice and it was a company regulation. Some even mentioned only wearing them when OSHA visited the site. The construction workers then elaborated and mentioned how Latino workers were in need of jobs and thus more willing to work in unsafe situations. One worker further explained how the companies they worked for usually did not care about the construction workers’ health as long as they got the job done. Everyone agreed that new immigrants were most at risk for not wearing protection; it was usually due to the circumstances they were coming from and the lack of knowledge on health effects and protection. One participant explained how new immigrants had to prove themselves as hardworking employees and thus took on a macho role at work that could lead to workers not wanting to wear hearing protection due to the fear of being seen as weak. Others explained how they also feared for their job. They dreaded going to their employer and

asking for hearing protection as they would be seen a as troublemaker and thus fired. They were terrified to be the first to wear hearing protection or inquire about it due to the fear of consequences that could include losing their job. One worker shared how he was fired from a company after asking for hearing and eye protection. Participants mentioned new immigrants not wanting to bring attention to themselves. One participant added, "They want to blend. They find themselves in a different environment, different place, and different people. They just want to be accepted." Another major reason for not wearing hearing protection was it was uncomfortable, and the workers felt they could handle the noise. One participant mentioned fearing the sweat and dirt from working all day with hearing protection would cause an ear infection. Others mentioned discomfort as an issue but also not being able to hear others or be aware of surroundings via sounds. Participants also mentioned how they got used to the noise and thus felt they did not need hearing protection.

Robertson et al. (2007) showed a small sample of the complexity of the interrelated factors portrayed in an ecological framework. In general, the workers were more concerned about major accidents, wore helmets and protective glasses, but were not as concerned about their hearing so most did not regularly wear hearing protection. Those who did have some hearing impairment felt responsible for wearing hearing protection irrespective of OSHA rules of racial norms. Workers might not wear hearing protection due to fear of being fired, not fitting in, and fear of not being manly or strong enough. Some workers believed their hearing would not be affected and they could handle the noise. All agreed a primary barrier to wearing hearing protection was it was uncomfortable. Some believed protection impeded hearing and compromised worksite safety. Others were concerned dirty plugs could cause infections. Further research is needed to elicit environmental and personal factors affecting Latino workers' hearing

health behavior. This would help occupational health nurses assess potential barriers and be able to deliver educational interventions to help workers overcome them (Robertson et al., 2007). This might mean finding non-traditional partnerships such as community groups and primary care providers serving Latino workers.

Occupational Noise Exposure and Ototoxicity in the Elderly Latino Population

So far, we have seen some of the effects of occupational noise exposures and how younger workers felt about hearing protection. Hong et al. (2015) examined the relationship between occupational exposures and hearing among the elderly Latino population in United States. Latino immigrants tended to work in occupations with more hazards such as agriculture, construction, and cleaning. According to the National Agricultural Workers Survey, the U.S. agricultural workforce was 75% Mexican and 2% from Central American countries (Hong et al., 2015). Thirty percent of blue-collar workers in construction were Latino. In cleaning and maintenance occupations, 35.9% were Hispanic or Latino. Latinos who worked in these high-risk industries were at a higher risk of occupational hazards, including noise and toxic chemicals, and occupational hearing impairment. Approximately 10% of adults between 20 and 69 years of age had irreversible noise-induced hearing impairment (Hong et al., 2015). Ototoxicity was seen in solvents (styrene, toluene), heavy metals (lead, mercury), polychlorinated biphenyls, and pesticides (Hong et al., 2015).

What does this mean for our aging Hispanic and Latino workforce that is being exposed to excessive noise levels? Hong et al. (2015) examined the relationship between lifelong occupational exposures and hearing impairment among the elderly Latino population. Researchers used secondary cross-sectional data from the Sacramento Area Latino Study of Aging that included 1,789 Latino Americans over the age of 60 residing in Sacramento County

between 1998-1999. Baseline data were collected and then follow-up home visits were conducted every 12-15 months through late 2007. Hong et al. included 547 of the participants between the age of 65-75 who also indicated having a hazardous occupation (noise and possible ototoxins). Other covariates of hearing impairment were also measured: smoking, hypertension, type 2 diabetes, ototoxic medications. Of the participants, 41.2% were born in Mexico, 52.7% spoke Spanish as their primary language, 66.5 % had hypertension, 43% had diabetes, 62% had ototoxic medication (loop diuretic, non-steroidal anti-inflammatory drugs, others) use, and 57.6% had occupational exposures (loud noise and /or ototoxic chemicals). Hearing impairment was defined as low (500, 1,000, 2,000, and 3,000 Hz) and high frequency (4,000, 6,000, and 8,000 Hz). Sixty-five percent of the participants had a low frequency hearing impairment (47.2% slight, 14.4% moderate, 3.1% severe, and 0.4% profound hearing impairment).

However, most of the participants had a high frequency hearing impairment of 90% (31.6% slight, 32.4% moderate, 21.8% severe, and 5.1% profound loss). A comparison between the occupational exposure group and the non-occupational exposure group demonstrated the occupational exposure group had a significantly lower education level, were more likely to be male, were more likely to be born in Mexico, were more likely to speak Spanish, were less likely to have household incomes greater than $2,000 per month, and were less likely to never be smokers (Hong et al., 2015). When both groups were compared to low and high frequency hearing impairment, the occupational exposure group was significantly more likely to have hearing impairment (72% compared to 54.6%) at low frequencies and 94.5% (compared to 85.4%) at the high frequencies. A logistic regression model with independent variables associated with hearing impairment detected no high intercorrelations among independent variables.

Hong et al. (2015) reported that occupational exposure to loud noise and/or ototoxic chemicals were significantly, twice more likely to have hearing impairment at high frequencies than the comparison group. This association was not seen with the low frequency hearing impairment. The study also found age, sex, household income, current smoking, and diabetes were significantly related to low and high frequency hearing impairment (Hong et al., 2015). The results demonstrated that lifelong occupational exposure to ototoxic hazards was significantly associated with hearing impairment among the elderly Latino Americans. Hearing protection and education from these harmful auditory effects of occupational exposures would have a positive impact on healthier hearing as this population ages.

These findings have several implications for occupational health, primary care, and public health. There are areas for improvement and ways to do so. From an occupational health approach, effective hearing conservation programs need to be disseminated throughout the lifespan of workers. A primary care approach could establish standardized hearing assessment for adults and develop intervention protocols for those exposed to noise and/or ototoxic chemicals. A more public health approach would mean involving work and community environmental surveillance on noise or chemical pollutants. San Francisco Department of Public Health (n.d.) has a Noise Enforcement Program that conducts environmental noise exposure assessments, maintains the city's background noise map for residents, and continuously educates them to reduce and prevent a plethora of health problems associated with noise exposure. The use of personal and environmental health sensors and geographic information systems could also help identify populations at risk.

Hearing Aid Use

Hearing impairment can reduce the quality of life, and hearing aid use and aural rehabilitation are methods of improving quality of life with a hearing impairment. Lee et al. (1991) analyzed data from the HHANES from 1982-1984 by the National Center for Health Statistics looking at hearing aid use in the Hispanic population. A representative sample included Mexican Americans from five southwestern states, Cuban Americans from Miami, and Puerto Ricans from New York City. Audiometric data were collected from 431 Cuban Americans, 1,648 Mexican Americans, and 615 Puerto Ricans. Hearing impairment was defined as a PTA of >25 dB HL in either ear. Lee et al. also examined sociodemographic correlates of hearing aid use for those with a PTA >40 dB HL in either ear. This reduced the number of participants even more since the number of Cuban Americans and Puerto Ricans with a hearing impairment >40 was low. Researchers decided to combine analyses with the Mexican American group that included 56 participants. Sociodemographic factors analyzed were marital status, education, employment status, poverty status, and insurance status.

Lee et al. (1991) showed that hearing impaired Mexican Americans with lower sociodemographic levels were more likely to report hearing aid use than those with hearing impairment and higher sociodemographic levels. Mexican Americans living below the poverty line were approximately nine times as likely to report ever using a hearing aid than those living above the poverty line. Lee et al. postulated the explanation for the results could be due to the introduction of Medicaid in 1965, which increased availability of hearing aids among disadvantaged sociodemographic groups. Medicaid does not cover cost of hearing aids for adults and currently most private insurance companies do not either. Only one out of three Hispanics is insured by Medicaid. Most Hispanics struggle to understand the process of becoming insured

(Lee et al., 1991). I think the researchers had the right initial thinking, but I think these results are due to the decrease in quality of life. The Hispanic population is underserved and not getting the appropriate healthcare. When you add sociodemographic factors like poverty and education level, the quality of life for several LEP patients is extremely low. They will do what they can to try and improve this with or without the help of a health care professional. If this means getting any form of hearing assistive device available for their perceived hearing impairment, they will.

Lee et al. (1991) also examined data from the 1982-1984 HHNES and looked at hearing aid use. They defined a PTA greater than 25 dB in either ear as a hearing impairment. The researchers also found a low prevalence (12%) of hearing aid use, which they attributed to cost and low consumer awareness of the benefits of amplification. Research should focus on identification of hearing-impaired Hispanics and develop culture- and language-specific interventions designed to increase hearing aid use.

In a more recent study, Arnold et al. (2019) examined hearing aid prevalence and factors associated with hearing aid use among U.S. adults with Hispanic/Latino backgrounds. Cross-sectional data were collected from 2008-2011 from four field centers including the Bronx, New York; Chicago, Illinois; Miami, Florida; and San Diego, California. This was part of a multisite Hispanic Community Health Study/Study of Latinos that looked at 1,898 participants who were between 45-76 years old with hearing impairment (PTA>25 dB HL). Other measures included age, sex, specific Hispanic/Latino background, education level, annual household income, city of residence, the Short Acculturation Scare for Hispanics (assesses language use, media, and ethnic and social relations), and the Hearing Handicap Inventory Screening-Spanish.

Only 4.6% of individuals with at least a mild hearing impairment reported hearing aid use within the past 12 months (Arnold et al., 2019). Prevalence of hearing aid use varied across

Hispanic/Latino groups. The smallest proportion of hearing aid use was 0.8% from Central American backgrounds and the highest was 7.7% from mixed or other backgrounds (Arnold et al., 2019). Of the 1,898 adults who posed to benefit from hearing aid use, only 87 (4.6%) reported doing so and of those, only 53 (61%) reported use within the past 12 months. This was lower than recent published estimates of use among the general U.S. population. Popelka et al. (1998) measured the prevalence of hearing aid use among older adults with hearing impairment. A total of 1,629 adults between 48 and 92 years old with hearing impairment participated. The prevalence for those with a PTA> 25 dB was 14.6% and for a subset of severely affected participants, the prevalence was 55% (Popelka et al., 1998), further providing evidence of hearing healthcare disparities that exist between adults of Hispanic/Latino backgrounds and those of non-Hispanic and non-Latino White backgrounds.

Arnold et al. (2019) carried out a logistic regression model and found increased odds of hearing aid use were associated with a poorer pure-tone average of the better ear, higher Hearing Handicap Inventory scores, and health insurance status for the population of the study. Arnold et al. measured hearing impairment and the Hearing Handicap Inventory Screening-Spanish score was significantly associated with reported hearing aid use, meaning Hispanic/Latino individuals had a higher likely hood of hearing aid use with poorer measured hearing and greater perceived need. Acculturation measured with the Short Acculturation Score for Hispanics showed it was not related to hearing aid uptake (Arnold et al., 2019). Health insurance status on the other hand was associated with hearing aid use. Those who reported having health insurance had higher odds of reporting use, meaning insurance access was a barrier to hearing health care use among older adults from Hispanic/Latino backgrounds. Language also had a similar effect with overall healthcare access including access to insurance. Arnold et al. found access and not culture

affected hearing aid use the most. From a public health standpoint, there needs to be a reduction of barriers to Medicare and Medicaid access to lessen this disparity. Increasing access to hearing health care through insurance is another step that could decrease this disparity. Another important step to improve access to care would be cross-cultural adaptation of hearing impairment-specific outcomes for Hispanic/Latino adults in order to understand their perception of hearing-related disability, communication difficulties, and treatment outcomes. This includes developing validated measures and counseling materials addressing needs, values, and goals of this targeted population.

Research in Audiology Materials

Patient Reported Outcome Measures

In the United States, healthcare literacy has become a major public healthcare challenge, especially with health care literacy declining. Patient reported outcome measures (PROMs) are used in clinical research to guide aural rehabilitation, evaluate degree of disability, and determine the level of effectiveness of the intervention. Past research has shown that many of these PROMs were not sensitive to the nation's health literacy levels and were affected even more through translation. Coco et al. (2017), professors in speech-language pathology and audiology departments at the university level, examined the readability level of Spanish versions of audiology and otolaryngology related PROMs as well as a readability analysis of two translation approaches (the published and functionalist version) through a nonexperimental, descriptive design. The readability levels were analyzed using the Fry Graph for Spanish, Fernandez-Huerta, and the Spaulding formulae for the PROMs. The data collected supported previous studies conducted with audiology-related PROMs in English and showed that many of the Spanish-language PROMs were beyond the fifth-grade reading level (suggested for written health-related

materials; Coco et al., 2017). The functionalist version yielded lower grade-level readability levels than the published version, which was better at meeting the suggested grade level. The researchers concluded the Spanish PROMs were more advanced than the recommended readability levels and might be due to different translation approaches. Coco et al. found the functionalist approach to be the best translation approach in this respect.

Hearing in Noise Test

Weiss and Dempsey (2008) compared the performance of bilingual participants on the English and Spanish versions of the Hearing in Noise Test (HINT). Participants were divided into early bilinguals (EB) who began learning English before the age of seven and late bilinguals (LB) who began learning English after the age of 11 years. All participants acquired Spanish as their first language and English as a second language. All participants also demonstrated good competence for self-rated speaking, understanding, reading, and writing skills in both languages. Participants also had normal hearing sensitivity through pure tones and immittance testing. The EB group had 18 participants and the LB group had 7. The researchers used the HINT for Windows Audiometric System, Version 6.2. The American English speech module and the Latin American Spanish HINT speech module version 1.0 were used, both with the adult male native speakers. Four conditions were tested: sentences with no competing noise, sentences with competing noise presented directly in front of the patient, noise at 90 degrees to the right of the patient, and at 90 degrees to the left.

The results in this study indicated bilingual participants scored significantly better in the Spanish HINT than the English HINT—both in quiet and in noise (Weiss & Dempsey, 2008). The LB group scored significantly higher than the EB group. These results were similar to those in other studies such as with the Spanish version of the synthetic sentence identification, where

bilingual participants scored higher on the Spanish version (Weiss & Dempsey, 2008). Most participants were born in the United States, reported speaking more English than Spanish, and felt they had higher linguistic competence in English.

The researchers posed some possible explanations for the results including structural differences between English and Spanish, lack of test equivalency, and processing differences among bilinguals compared to monolinguals (Weiss & Dempsey, 2008). Previous research suggested bilinguals needed more time than monolinguals to process verbal materials in both languages and bilingual individuals performed more poorly than monolinguals on measures of speech perception under noisy or degraded conditions. This study and others demonstrated that bilinguals performed best on speech perception tasks in their primary language in comparison to their secondary language.

Pediatric Picture Identification Test

In the field of audiology, the assessment of speech understanding ability is critical in making conclusions regarding a patient's auditory status. Of several different types of speech tests in audiology, the most common tests are speech recognition threshold (SRT) that looks at the lowest level one repeats spondaic words and word recognition testing, which is suprathreshold word recognition—testing speech understanding. Word recognition has several purposes such as describing the extent of a hearing impairment and its effect on speech understanding, assisting in differential diagnosis of various disorders, determining the need for amplification, and verifying benefit from hearing instruments and/or audiologic rehabilitation. The 2017 U.S. Census Bureau stated 37 million people over the age of five years spoke Spanish at home, making audiologic test materials appropriate for age, education, and linguistic backgrounds imperative (Mendel et al., 2020). This consisted of procedures and test materials

developmentally and culturally appropriate and free of any cultural bias. Test materials could be affected by familiarity and complexity of the test items, dialectical characteristics of test items, and ease of administration of the test by a clinician with limited language proficiency.

Mendel et al. (2020) constructed and validated a recorded word recognition test for monolingual Spanish-speaking children using a picture board and a picture-pointing task. In 1984, Cornstock and Martin (as cited in Mendel et al., 2020) developed, recorded, and validated four lists of 25 Spanish words for the assessment of word recognition. Unfortunately, the recordings cannot be located for use by the general audiology community. Mendel et al. recorded the lists by Cornstock and Martin to validate the items in a new test called the Spanish Pediatric Picture Identification Test (SPPIT). The recordings were done by a 50-year-old bilingual Spanish-English female from Mexico fluent in both languages. "*Di la palabra* (Say the word)" carrier phrase was recorded as well and inserted prior to each stimulus item. An English translation recording was also done by a 25-year-old native English-speaking female so a two-channel recording could be used where the Spanish target word was presented to the listener via one channel and the English translation was presented examiner in the other channel (Mendel et al., 2020). Mendel et al. validated the recorded word recognition test for monolingual Spanish-speaking children that could be administered by clinicians who did not speak Spanish.

After the lists were produced into digital recordings, they were administered to bilingual Spanish-English adults with normal hearing to determine list equivalency (Mendel et al., 2020). Participants were 15 adults bilingual in Spanish-English aged 22 to 45 years. All the participants were of Hispanic heritage from various countries (Puerto Rico, Mexico, Peru, Guatemala, Ecuador, El Salvador, and Honduras) whose first language was Spanish. The second phase included digitally illustrating the pictures and validating them with monolingual Spanish and

bilingual Spanish-English (native Spanish speakers) children. Each picture board page had four pictures—three were a stimulus item and one of the three was a distractor image; 25 picture boards were created representing the 25 words per list. Lastly, the list equivalency was re-established, picture identification functions were obtained, and the final word lists were validated using a picture pointing task with the children (Mendel et al., 2020). The carrier phrase was changed at this phase to "*Enséñame* (show me)" by the same female Spanish speaker. Testing was done through St. Jude Children's Research Hospital.

The goal was to develop and validate the SPPIT as a picture-pointing Spanish word recognition test to be used with Spanish-speaking children administered by an English-speaking practitioner. This type of testing is not always readily available when testing Spanish-speakers and is a key piece of a hearing evaluation. A limitation was the grouping of individuals with different dialects, which could have an effect on speech perception ability. In general, the SPPIT picture board provided ease and accuracy of scoring speech perception ability for the monolingual English-speaking clinician (Mendel et al., 2020). The audiologist did not judge an oral response accuracy but the appropriateness of the word/picture identification.

CHAPTER III

CONTINUING RESEARCH

Language barriers in health care are a topic that continues to grow in the field of research, but how is it affected by laws and regulations? Where is the research currently concentrated and where should it go moving forward? Schwei et al. (2016) described the state of language barriers inside and outside the United States since 2003. Schwei et al. also compared before and after a national policy change that occurred when U.S. President Clinton issued Executive Order 13166 in August 2000. The Executive Order was for improving access to services for persons with LEP. In 2003, the Bush Administration revised and reissued the Policy Guidance soon after taking office. The reversal in provision of explicit guidance by the Bush Administration brought publicity to the issue of language barriers in health care and the impact that it has on care (Schwei et al., 2016). In the 2010 U.S. census, 25.2 million (2%) people in the United States over the age of five were LEP. Schwei et al. conducted a cross-sectional analysis by tabulating frequencies for geographic location, language group, methodology, research focus and specialty, and compared the literature before and after 2003. Their sample included 136 studies before 2003 and 426 studies from 2003-2010. Schwei et al. found that most of the research from 2003-2010 focused on access barriers, comparison studies, interpreting practices, outcomes, and patient satisfaction in a descriptive nature and mostly for Spanish speakers.

The increase in research was much greater in the United States than outside of the United States. Schwei et al. (2016) hypothesized one reason might be the national policy change. Another was the increase of immigration in the United States, Canada, Europe, and Australia. A

difference inside and outside of the United States was that studies conducted in the United States tended to focus on physicians' perspectives on working with LEP patients while studies outside the United States focused on nurses' perspectives. Although there was an increase in studies, there was a drop in articles published on outcomes research, and the majority of studies continued to be descriptive. Schwei et al. explained the need to demonstrate effectiveness of interventions to overcome language barriers and how it could drive the implementation of language access services. Most of the research was also for the Spanish-speaking population, which made sense since 65% of the LEP population was Spanish-speaking, while the second most common language spoken was Chinese with 6% of the LEP population.

The policy change in 2003 led to advocacy, governmental, and healthcare organizations funding research and high levels of awareness of the necessity for language barrier research. Although it was a great start, Schwei et al. (2016) stated it was not enough to promote policy change at a national level in the United States and there needed to be more research and discussions on how to provide better linguistic access rather than continuing to document the negative impact in care. This means more research in concordant with care influences, patient outcomes, interventions mitigating language barriers, evaluations on cost effectiveness, and more. Funding agencies need to request proposals addressing such areas to further research (Schwei et al., 2016).

Audiologic Testing

Demand in the Field

There is a demand for research related to culturally and linguistically diverse populations in the field of clinical audiology. Shi (2014) focused on the assessment of hearing and speech perception in bilinguals whose first language was Spanish. Clinicians need to be prepared to

service the large, growing community with LEP. According to the American Speech-Language-Hearing Association (ASHA; Shi, 2014), the audiological field has been slow in responding to the changing cultural and linguistic composition of the population. Roughly 37% of audiologists have reported working with non-English speaking patients only 8% indicated being fluent in Spanish. In 2012, the ASHA membership profile indicated 186 certified audiologists nationwide reported themselves as bilingual in English and Spanish (Shi, 2014). The ASHA 2019 Member and Affiliate Profile stated that about 3.2% of Audiology ASHA members identified as Hispanic or Latino (Shi, 2014). Also, of the 201,961 ASHA members (including speech-language pathologists and audiologists), 6.5% met the ASHA definition of bilingual service provider and 765 were audiologists (Shi, 2014). Previous demographics were explained and we can see how the numbers are extremely disproportional, leaving the diverse Spanish speaking community underserved.

Testing Guidelines for Speech Audiometry

Shi (2014) addressed the lack of guidelines properly assessing Spanish-English bilinguals in speech perception. Speech audiometry is used to assess hearing and processing disorders that might interfere with everyday communication, which is why researchers suggested conducting testing in both languages. Despite the growing demands of audiology, test materials in Spanish currently available are substandard (Gaeta & John, 2015). Although Spanish tests have been developed, further measures of validity and reliability are needed for them to be of clinical application. Furthermore, the clinician must be aware of differences when administering tests, the phonetic and semantic nuances of Spanish and English, language dominance, age of second-language acquisition, and language used at home (Gaeta & John, 2015). This poses significant practical challenges for testing. In addition, many audiologists reported little knowledge and

confidence in selecting Spanish speech-recognition tests (Gaeta & John, 2015). Census data from 2010 showed most Spanish-English bilinguals used both languages in their everyday life, leading to the suggestion of testing bilinguals in both languages or the preferred language. Shi pointed out that Spanish has different phonetic and phonological characteristics that affect listening and comprehension. One major difference when looking at word recognition testing is the English word lists consist of consonant-nucleus-consonant words and the Spanish lists have bisyllabic grave (trochaic) words; this is because few concrete words (nouns, simple verbs and adjectives) are monosyllabic in Spanish and the consonant-nucleus construction in English is uncommon in Spanish (Gaeta & John, 2015). Speech reception threshold lists in English consist of spondaic words and in Spanish of either bisyllabic grace (trochaic) words or trisyllabic grave words since spondaic (equal stress on both syllables) is uncommon in Spanish and more than half of all Spanish words are grave (having stress on the penultimate syllable; Gaeta & John, 2015). Bilinguals are a diverse group differentiating in onset, duration, consistency, quality, and intensity of language exposure, learning, and usage. Gaeta and John (2015) provided a table of Spanish audiometric materials developed for clinical use including those for children.

Few studies examined the effects of dialect on testing. There is still a need for research in determining what language to test bilinguals in, effects and efficacy of testing in both languages, how hearing impairment affects bilinguals' speech perception in both languages, and in bilingual children's development of speech perception skills.

Rationale/Impact

Timmins (2002) conducted a systematic review of studies from 1990-2000 examining language barriers in health care for Latino populations. They looked at access to health care, quality of care, and health status/health outcomes. Although the federal government has used the

term Hispanic, Latino is more inclusive of the indigenous and African cultures in Latin America. Both terms are problematic in that they group people together from several geographically and culturally diverse regions, yet important ties also transcend through the differences. Latinos are projected to represent 24.5% of the U.S. population by 2050. In comparison to Caucasian Americans, Latinos use less screening, preventive, and primary health care services (Timmins, 2002). Latinos are also less likely to have health insurance, a regular source of health care, and at least one ambulatory health care visit in the last year in contrast to Caucasian Americans. Increased use of expensive diagnostic tests increased use of emergency services and decrease use of primary care services, poor patient satisfaction, and poor or no patient follow-up are poor patient outcomes attributed to language barriers (Timmins, 2002).

The National Health Law Program asserts federal and state laws require healthcare providers to provide linguistically appropriate health care, yet these laws are not well known and rarely enforced (Timmins, 2002). Also, few immigrants have knowledge or access to language resources. Although laws requiring healthcare providers provide linguistically appropriate healthcare exist, many are unaware of them due to their complex interpretation and implementations. Thus, specific and uniform policies guiding federal and state laws' implementation are needed. Many healthcare providers and institutions remain unaware of these laws and policies that dictate the provision of language access or they are unaware of how to comply to the laws and policies (Timmins, 2002). Cultural competency is the awareness and acceptance of cultural differences and the ability to learn about and interface with patients' diverse cultures. Whether a patient is seen with cultural competency might have implications to their future health care. Although interpreting services come at a cost, Timmins (2002) suggested weighing such costs to the potential costs of adverse effects of language barriers.

Timmins (2002) examined 19 studies: nine studies analyzing access to health care, seven regarding quality of care, and three looking at health status/health outcomes. The nine studies analyzing access to health care showed non-English speaking status, health insurance status, and not having a routine source of care were barriers to healthcare access for Latinos. As for quality of care, seven studies demonstrated evidence of language barriers resulting in decreased explanation of medication side effects, decreased patient satisfaction, decreased patient recall, and decreased question-asking behavior. Regarding health status/health outcomes, more research with consistent measures is needed to clarify casual versus associative relationships between language barriers and poor health status. Overall language concordance between patient and provider would lead to patients having better health functioning (Timmins, 2002).

Timmins (2002) provided some strategies to providing language access—one being a bilingual health professional. However, they are scarce since only 5.4% of physicians were Latino in 1989. The advantages to bilingual health professionals are increased patient satisfaction, increased patient understanding, avoidance of diagnosis and treatment errors, improved therapeutic relationship, avoidance of extra time, and avoidance of costs for interpreters. Another strategy is interpreting services such as professional interpreters or the use of technology (telephone interpreters). Timmins emphasized avoiding ad hoc interpreters since it is illegal under the Civil Rights Act of 1964. To bridge language barriers, Timmins suggested education on laws and regulations. The National Health Law Program has a manual that summarizes pertinent federal and state language access legislation by state. Providers serving Latinos should also carefully construct a method for providing economically feasible language services for the setting. Latinos with LEP experience decreased access to care and decreased quality of care, which is why it is important to address the problem in healthcare delivery.

CHAPTER IV

AUDIOLOGY MOVING FORWARD

Abreu et al. (2011) with the help of 20 audiologists worked to identify possible and innovative solutions to overcome language barriers in the field of audiology. One aid was using and having translation tools and simple terminology as a minimum so staff have access to said tools or communication boards. This included developing multilingual, closed-set history forms and using straight forward visuals without anatomical terminology to explain results. Another solution was real-time translation applications and researching the development of said applications. Abreu et al. also suggested development of a regional website managed by audiologists to address cultural diversity and language barriers at the local level. This website could provide updated information about demographics of local communities, pertinent cultural concerns, and case discussions. This could even include addressing the advancement of third-party reimbursement for interpreter services. Self-assessment is also important and many organizations such as ASHA and the National Center for Cultural Competence have developed cultural competency self-assessment modules for clinicians (Abreu et al., 2011). These aimed at identifying and developing cultural awareness, knowledge, and skill sets as well as providing opportunities for clinicians to self-assess their practice demographics and language needs. Expanded education and collaboration were also suggested. This means encouraging local speech and hearing associations or audiology doctoral programs to include introductory courses such as “Spanish for the Audiologist.” These courses could be in various languages and part of continuing education credits. Forming partnerships with other healthcare disciplines and

interdisciplinary efforts to address cultural diversity and language barriers. Abreu et al. also suggested a bilingual audiologist compile a list of websites and resources in other languages to share with patients. For example, the Centers for Disease Control and Prevention have plenty of information about hearing impairment in Spanish. Audiologists should also promote and advocate for standardized, recorded testing materials including picture identification boards in several languages.

Resources Available

We live in an era where the Internet and several other forms can make getting access to resources easier and simpler but finding the appropriate tools and resources can be difficult. Reel et al. (2015) analyzed cultural and language differences of the Hispanic population in the United States that could negatively affect services provided by audiologists. The purpose was to aid monolingual English-speaking audiologists when working with Spanish-speaking Hispanic patients by providing resources and materials. The Texas Tech University Health Sciences Center developed descriptions and instructions for hearing and balance testing in both English and Spanish for otoscopy, tympanometry, acoustic reflexes and decay, pure-tone testing, play audiometry, visual reinforcement audiometry, behavioral observation audiometry, speech recognition threshold (verbal response, picture pointing, body part identification), speech awareness threshold, word recognition (verbal and picture pointing), and auditory brainstem response testing (Reel et al., 2015). They also created and included a cultural training module and videos of the instructions in Spanish.

These resources were then reviewed by both bilingual and Spanish monolingual non-audiologists and bilingual and English monolingual audiologists (Reel et al., 2015). Through the data, the researchers demonstrated the translations were easy to understand and the

wording/dialect were appropriate. Some wording variability was noticed by the audiologists but in general, they reported the content to be consistent with what was used clinically. The cultural training module was also reviewed and rated to be easy to understand, relevant to Spanish-speaking patients, and relevant to audiologists (Reel et al., 2015). They then revised the materials based on the feedback. Reel et al. (2015) created materials for monolingual English-speaking audiologists to use when working with Spanish-speaking Hispanic patients and provided open access to this resource online.

Another resource available is Alejandra Ullauri's (2021) book, *Audiology Services in Diverse Communities: A Tool to Help Clinicians Working with Spanish-Speaking Patients and Families*. The goal was to build knowledge, help recognize barriers, develop ideas to address those barriers, as well as provide language tools. The book covers topics such as cultural competency, addressing barriers in healthcare, anatomy, clinical case history, test descriptions and instructions for hearing tests, hearing technology, and cochlear implants.

Educational Competency

Having the materials and resources necessary to conduct an audiologic examination with LEP patients is not enough to provide proper service. Educational and cultural competency is necessary. Diamond and Jacobs (2010) discussed risks and benefits to teaching specific cultural competitive skills and made recommendations for teaching content and methods for educational interventions focused on overcoming language barriers. Having LEP is a risk factor for health disparities such as decreased access to preventive care, decreased satisfaction with care, poor understanding of instructions or medications, longer hospital stays, and increased risk for medical errors and misdiagnoses. These could be reduced and/or eliminated through professional interpreters or providers who speak the preferred language (Diamond & Jacobs, 2010). To

reduce the health disparities in the LEP population, clinicians need to be educated as to how language barriers contribute to such disparities. Studies focusing on teaching clinicians about language barriers in health care and how and when to use interpreting services have shown to be beneficial with an increase in likelihood of the physician choosing the appropriate interpreting services with LEP patients.

A systematic review of cultural competence interventions by Diamond and Jacobs (2010) demonstrated that those focused on language barriers improved knowledge, attitudes, and skills of healthcare professionals. Cultural competence interventions have been shown to also improve participants' understanding of racial/ethnic differences in disease burdens, traditional cultural practices, influences of patient culture on providers' own behaviors, best interpreter practices, immigration demographics, and legal issues surrounding language barriers, which results in more culturally sensitive care of LEP patients. On the other hand, interventions geared toward improving non-English language skills have had some negative outcomes. Brief and intense language training programs in Spanish have led to diminished interpreter use despite the providers' limited proficiency. Studies have identified significant communication errors when providers used their improved but not fluent language skills instead of interpreters.

Diamond and Jacobs (2010) identified five topics that should be included in a high-quality educational intervention to overcome language barriers in health care: the role language barriers play in contributing to health disparities, what the best interventions are for reducing the risk of disparities when caring for LEP populations, how to work with an interpreter, how to recognize when an interpretation is not going well and what to do about it, and when it is appropriate and safe to use limited non-English language skills. The use of ad-hoc interpreters could lead to misunderstandings, misdiagnoses, and medical errors. The best methods for

overcoming language barriers are professional interpreters and bilingual providers. When there are no other options but to use an ad-hoc interpreter, clinicians must make the conversation as simple as possible and give the ad-hoc interpreter permission to stop at any point to clarify vocabulary or to discuss any discomfort in the interpreting role. Diamond and Jacobs emphasized avoiding the use of children as interpreters as it is unethical and should not be done. Care providers should be encouraged to use non-fluent language skills to establish rapport and conduct simple physical exams but not for complex interactions. Educational interventions should be introduced early in the career of health professionals and be reinforced throughout their career. Educational interventions do not need to be extensive or complex but strategically target enhancing knowledge to facilitate accurate communication.

Interpreters

People with LEP are less likely to have a regular source of primary care, less likely to receive preventive care, less satisfied with the care received, less likely to report overall problems with care, and might be at an increased risk of experiencing medical errors (Jacobs et al., 2004). It is important to know the difference between interpreters and translators. Interpreters convert oral messages from one language to another including meetings, medical appointments, legal proceedings, live TV coverage, and more. Translators convert written text from one language to another including websites, print, video subtitles, software, and multimedia. Most healthcare organizations provide inadequate interpreter services or none at all. Thus, LEP patients do not receive needed health care or quality health care. This usually results in the use of ad hoc services due to the financial burden interpreting services impose, which have been shown to have negative clinical consequences.

Jacobs et al. (2004) assessed the impact of a new interpreter program and the cost and utilization of healthcare services among LEP patients. This study was conducted over two years from 1995-1997 at four health centers who serve about 122,000 patients. The health centers were staffed by salaried physicians and a part of the Massachusetts Health Maintenance Organization (HMO). The HMO implemented comprehensive interpreter services for Spanish- and Portuguese-speaking patients. Five trained interpreters were available 24 hours a day either by phone or during walk-in visits. Cost data included both direct costs of the interpreter services and the costs of net changes in healthcare utilization that occurred after the services were implemented. A total of 380 patients were in the interpreter group (300 were Spanish speaking) and 4,119 in the comparison group (Jacobs et al., 2004).

The interpreter service group showed significant increases per person per year in percentage of recommended preventive services, number of office visits made, and number of prescriptions written and filled (Jacobs et al., 2004). The cost for providing the interpreting services for Spanish and Portuguese for a year was $245,363 with 3,089 documented interpretations performed the second year. The average cost was $79 per documented interpretation. The researchers found providing professional interpreter services in a large staff-model HMO increased delivery of health care to patients with LEP (Jacobs et al., 2004). Also, most of the increase in cost of care was due to the interpreter services. Patients who used the services had significant increases in receipt of preventive services, physician visits, and prescription drugs, enhancing their access to primary and preventive care at a moderate cost. This statistically significant increase also suggested that improving language access to LEP patients would lower the cost of care in the long run (Jacobs et al., 2004). Jacobs et al. mentioned most interpreter services were more reasonable—about $35 per interpretation in contrast to their

$79. These are benefits interpretation services could provide for patients, policymakers, and healthcare providers.

Machine Translation

Dew et al. (2018) characterized machine translation (MT) and its development to overcome language barriers in healthcare settings and determined which MT approaches showed efficacy through evidence. Through two levels of screening, 27 articles met the criteria from 2006-2016. The analyses looked at application setting, target users, underlying technology, whether MT was used in isolation or in combination with human editing, languages tested, evaluation methods, findings, and gaps in literature. Dew et al. showed that over the decade, MT technology had advances in statistical modeling and an increase in the amount of data available for both speech and text translation. Machine translation has gained development in health communication fields to improve patient-provider and patient-staff communication in multilingual clinical settings and to increase access to health education resources in minority languages (Dew et al., 2018).

An approach that showed evidence and promise for adoption was still unclear due to the lack of shared evaluation criteria and low numbers of participants. Translation in healthcare settings must be highly accurate and based on the research, the translations might not be good enough to encourage adoption of MT (Dew et al., 2018). At this time, MT should be used as an initial step, time- or money-saving step, with subsequent correction or verification of accuracy by a human translator with domain expertise (Dew et al., 2018). When using speech translation tools, pitch, accent, quality of microphone, and noise levels must be considered on top of accuracy. Sehda’s 2-way speech translation system, S-MINDS, is a speech system aimed at eliciting chief complaints from patients and assisting medical staff in accurate triage and

diagnosis (Dew et al., 2018). It uses a combination of rule-based and statistical machine translation methodology. Research has shown S-MINDS to be a promising speech technology and the closest to actual clinical deployment. It was rated high for accuracy and patient satisfaction but there was still a lack of research in its evaluation.

Most of the studies were unidirectional translations with English-Spanish being the most common (Dew et al., 2018). Machine translation incorporation in a clinical setting has limited evidence. Machine translation alone does not provide adequate quality translations for a healthcare setting. Many studies reported also using human analysis and correction to improve the translations. Statistical machine translation seems to be more accurate than rule-based translation systems (Dew et al., 2018). Through further development and research, MT could successfully improve health communications in multilingual settings.

Jacobs and Vela (2015) conducted a randomized clinical trial of video versus telephonic modes of delivering Spanish interpretation in a pediatric emergency department. They found when video interpretation was used, the parents were more likely to name the child's diagnosis correctly in comparison to those who received telephonic interpretation and reported a lower percentage of frequent lapses in interpreter use (Jacobs & Vela, 2015). Video interpretation was also more costly with a mean of $30. When it came down to the self-reported quality of interpretation and emergency department length of stay, there were no significant differences between the groups. Research like this contributed to the decision-making of many healthcare systems. The interpreter ratings were 47.2% for telephone and 50% for video, and two-thirds of patients experienced lapses in the interpreter services (Jacobs & Vela, 2015). The researchers showed the need to continue the development of interventions to provide consistent, equitable, high-quality communication to patients with LEP. Jacobs and Vela did not include in-person

interpretation and provision of language-concordant care because evidence showed they were superior to any other method of provision of care to LEP patients.

Jacobs and Vela's study (2015) was conducted at the Seattle Children's Hospital where they had a policy that prohibited clinicians from using non-native language skills for medical communication unless certified as proficient by the hospital through the Clinical Cultural and Linguistic Assessment. Jacobs and Vela suggested having policies like this in place was an additional important step to ensure patients had access to high-quality-interpreter services. Jacobs and Vela described the lapses in interpretation as having little to do with the interpreter services or the accessibility but had to do with clinicians' lack of insight into key concepts like the importance of using interpretation if patients could not understand them; equitable care of patients at risk for language barriers was an issue in the quality of care.

Jacobs and Vela (2015) said the big question was what would it take for clinicians to commit to using interpreter services? This should begin with appropriate education of clinicians on equity as a quality issue, use of policy to implement important safeguards, and followed by a systematic evaluation of clinicians' practices targeting the care of LEP patients. Research in the area of effective and efficient communication with LEP populations needs to inform policy and practice (Jacobs & Vela, 2015). Technology could be an important part in improving communication in the healthcare system but teaching healthcare professionals about the LEP populations' experience and access to interpreter services must be acknowledged.

CHAPTER V

SPANISH-ENGLISH HEARING EVALUATION PROTOCOL

Throughout the body of this paper, one can see many factors contribute to language barriers in the medical field, several areas with lack of knowledge, areas needing growth, and possible and attainable solutions. Fragments of information are everywhere, making it difficult to fully address the issue of language barriers in the field of audiology. The protocol in Appendix B is a culmination of the research and information presented in this paper with more online resources, test description, and instruction translations. It was created with the objective to help minimize language and cultural barriers and maximize the benefit a Spanish-speaking patient receives from a hearing evaluation carried out by an English-speaking audiologist. It includes topics such as state regulations and laws, Medicaid and Children's Health Insurance Program (CHIP), interpreters, educational competency, test description and instruction translations, speech testing word lists, patient counseling and education, and ear anatomy in English and Spanish. This protocol is meant to be used during an adult hearing evaluation and translations could be given to the patient prior to the appointment so they are informed and prepared for testing.

A limitation to this protocol was it has not been tested in a variety of clinical settings. The protocol is a guide meant to facilitate access to several resources and to provide instructions for a hearing evaluation. There are areas for growth such as including test instructions for other

audiologic testing, case history, and more counseling tools. The protocol is a great tool for English-speaking audiologists to use when seeing a Spanish-speaking patient.

The protocol is also a tool for clinics and hospitals to use when thinking about language appropriate services as it has resources on the laws and legislation, interpreting and translation services, and different training options for clinicians and physicians to better treat non-English speaking patients. Several areas of growth are needed in battling language barriers in the U.S healthcare system. This paper and the protocol are a culmination of the information and resources currently available in order to facilitate the process and growth needed.

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APPENDIX A

NATIONAL CULTURALLY AND LINGUISTICALLY APPROPRIATE SERVICES STANDARDS

Principal Standard

1) Provide effective, equitable, understandable and respectful quality care and services that are responsive to diverse cultural health beliefs and practices, preferred languages, health literacy and other communication needs.

Governance, Leadership and Workforce

2) Advance and sustain organizational governance and leadership that promotes CLAS and health equity through policy, practices and allocated resources.

3) Recruit, promote and support a culturally and linguistically diverse governance, leadership and workforce that are responsive to the population in the service area.

4) Educate and train governance, leadership and workforce in culturally and linguistically appropriate policies and practices on an ongoing basis.

Communication and Language Assistance

5) Offer language assistance to individuals who have limited English proficiency and/or other communication needs, at no cost to them, to facilitate timely access to all health care and services.

6) Inform all individuals of the availability of language assistance services clearly and in their preferred language, verbally and in writing.

7) Ensure the competence of individuals providing language assistance, recognizing that the use of untrained individuals and/or minors as interpreters should be avoided.

8) Provide easy-to-understand print and multimedia materials and signage in the languages commonly used by the populations in the service area.

Engagement, Continuous Improvement and Accountability

9) Establish culturally and linguistically appropriate goals, policies and management accountability, and infuse them throughout the organizations' planning and operations.

10) Conduct ongoing assessments of the organization's CLAS-related activities and integrate CLAS-related measures into assessment measurement and continuous quality improvement activities.

11) Collect and maintain accurate and reliable demographic data to monitor and evaluate the impact of CLAS on health equity and outcomes and to inform service delivery.

12) Conduct regular assessments of community health assets and needs and use the results to plan and implement services that respond to the cultural and linguistic diversity of populations in the service area.

13) Partner with the community to design, implement and evaluate policies, practices and services to ensure cultural and linguistic appropriateness.

14) Create conflict- and grievance-resolution processes that are culturally and linguistically appropriate to identify, prevent and resolve conflicts or complaints.

15) Communicate the organization's progress in implementing and sustaining CLAS to all stakeholders, constituents, and the general public.

APPENDIX B

DECREASING LANGUAGE BARRIERS BETWEEN ENGLISH-SPEAKING AUDIOLOGISTS AND SPANISH-SPEAKING PATIENTS: HEARING EVALUATION PROTOCOL

Background Information and Rationale

Language barriers in the healthcare system have been a continuously growing dilemma in the United States, affecting communication between a provider and patient which leads to problems in health care delivery. This includes the field of audiology in which communication is a major component. There are policies and regulations currently in place which attempt to decrease negative effects of language barriers in healthcare, but several healthcare providers are not aware of the responsibility, have not prioritized the issue, or are not being held accountable through the enforcement of the laws. Language barriers in the United States is a real issue and one affected group is the Spanish-speaking population. Spanish is the second most spoken language in the United States and there is a continual growth in Hispanic/Latino communities. Audiologic research in this population is extremely limited with little information on prevalence of hearing loss, hearing loss prevention epidemiology, risk factors, genetic basis of hearing loss, and hearing aid use. Yet there are options currently available such as resources, educational interventions focused on overcoming language barriers, cultural competency, translators, and machine translators that can help decrease the negative impacts of a language barrier in the audiology field.

Purpose

The primary objective of this protocol is to minimize language and cultural barriers and maximize the benefit a Spanish-speaking patient receives from a hearing evaluation carried out by an English-speaking audiologist.

Goals

One of the goals is to create an audiologic protocol for English speaking audiologists to use when seeing Spanish speaking patients in order to reduce the negative impacts of language

barriers in healthcare. Secondly, additional information was included to increase awareness in healthcare disparity, regarding language. Thirdly, to provide appropriate tools to aid an Audiologist best serve their non-English speaking patients. Fourthly, to improve communication and understanding of audiologic test instructions and counseling in Spanish.

Product Description

This protocol was created based on research and is further explained in *Language Barriers in the Field of Audiology: Spanish-Speaking Patient and English-Speaking Audiologist*. Please refer and read said document for a better understanding of the population demographics, language barriers, state regulations and laws, impacts on healthcare, interpreters, hearing impairment in the Latino and Hispanic Population, occupational hearing loss, hearing aid use, research, resources available, educational competency, and continuing research in the field of audiology. As there is limited research available on language barriers in the field of audiology, this is an attempt to reduce language barriers based on information available. It should be noted that the best way to minimize language barriers is through the use of professional medical interpreters and having cultural competency. This is not something that is readily available to many English-speaking practicing audiologists who see Spanish speaking patients; thus, this protocol is meant to be used as a tool in those situations to minimize the negative effects of language barriers during a hearing evaluation.

State Regulations and Laws

Title VI

The U.S. Department of Health and Human Services (n.d.) has several resources available that aid in learning, understanding, and applying Title VI of the Civil Rights Act. This

includes LEP (limited English proficiency) resources, guidance, a language plan, success stories, and other federal, state, and non-governmental resources.

- Resource is geared toward providers in health care and human services: https://www.hhs.gov/civil-rights/for-providers/laws-regulations-guidance/guidance-federal-financial-assistance-title-vi/index.html
- Resource is geared towards the general public and advocates. https://www.hhs.gov/civil-rights/for-individuals/special-topics/limited-english-proficiency/index.html#:~:text=Title%20VI%20of%20the%20Civil,persons%20with%20limited%20English%20proficiency.

Culturally and Linguistically Appropriate Services Standards

The National Standards for Culturally and Linguistically Appropriate Services in Health Care (CLAS standards) were issued by the U.S Department of Health and Human Services (HHS) and state guidelines to comply to Title VI. The CLAS standards aim to improve health care quality and advance health equity by establishing a framework for organizations to serve the nation's increasingly diverse communities. The CLAS standards are also operationalized by the Joint Commission, for accreditation of many hospitals.

- Link to the U.S. Department of Health and Human Services regarding the CLAS standard: https://thinkculturalhealth.hhs.gov/clas
- Link to the Office of Minority Health and the National CLAS Standards: https://www.minorityhealth.hhs.gov/omh/browse.aspx?lvl=2&lvlid=53
- Guide to help implement the CLAS standards. https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/CLAS-Toolkit-12-7-16.pdf

Executive Order 13166

In August 2000, Executive Order (EO) 13166, "Improving Access to Services for Persons with Limited English Proficiency", was issued by President Clinton to further improve access to services for LEP people. It requires Federal agencies to examine the services they provide, identify any need for services to those with limited English proficiency (LEP), and develop and implement a system to provide those services so LEP patients can have meaningful access to them. Later under the Bush Administration, the EO was upheld, and the Policy Guidance was revised and reissued in August 2003. The Guidance outlines four parts that institutions, programs, and providers should consider to determine what types of language assistance to pursue.

The United States Department of Justice has great tools explaining what the executive order means and tools for how to be able to accomplish what it states.

- Link to the U.S. Department of Justice website regarding Executive Order 13166: https://www.justice.gov/crt/executive-order-13166
- Document has information on advancing meaningful access for limited English proficiency persons through Executive Order 13166: https://www.lep.gov/sites/lep/files/resources/20151218_EO_13166_accomplishment_report.pdf

Medicaid and Children's Health Insurance Program

All Medicaid and CHIP service providers must ensure that LEP persons receive the language assistance necessary to meaningfully access needed health care services. Currently, only 15 states directly reimburse providers for language services: Connecticut, District of Columbia, Iowa, Idaho, Kansas, Maine, Minnesota, Montana, New Hampshire, New York,

Texas (only sign language interpreters), Utah, Vermont, Washington, and Wyoming. The following links are by the Department of Health and Human Services (HHS) outlining responsibilities of health and social services providers who receive federal financial assistance from HHS.

- Link to the Medicaid website regarding translation and interpretation services: https://www.medicaid.gov/medicaid/financial-management/medicaid-administrative-claiming/translation-and-interpretation-services/index.html
- Document goes through the process of getting federal funds to pay for language services for Medicaid and CHIP enrollees: https://healthlaw.org/wp-content/uploads/2016/11/How-Can-States-Get-Medicaid-and-CHIP-for-Language-Services.pdf
- Document by the National Health Law Program goes through reimbursement models for language services: https://healthlaw.org/wp-content/uploads/2017/02/Medicaid-CHIP-LEP-models-FINAL.pdf

Interpreters

Research continues to show in person medical interpreters as being the best and most effective resource in decreasing language barriers in a medical setting. Most health care organizations provide inadequate interpreter services or none. Limited English proficiency patients thus do not receive needed health care or good quality health care. This usually results in the use of ad hoc services, due to the financial burden interpreting services impose, which has been shown to have negative clinical consequences. Patients who have access to medical interpreters have significant increases in receipt of preventive services, physician visits, and prescription drugs enhancing their access to primary and preventive care at a moderate cost. This

suggests that improving language access to LEP patients may lower the cost of care in the long run. There are benefits interpretation services can provide for patients, policymakers, and health care providers. Implementing interpreters into a medical center is the best solution to overcoming language barriers in the United States, this being said one must be mindful and make sure interpreters are certified. This can be through The Certification Commission for Healthcare Interpreters (GCHI) or The National Board for Certified Medical Interpreters which includes medical interpreting hours of training, demonstration of education and competency in languages, and an exam.

- Link to The National Board of Certification for Medical Interpreters: https://www.certifiedmedicalinterpreters.org/
- Link to The Certification Commission for Healthcare Interpreters: https://cchicertification.org/
- Article on appropriate use of medical interpreters: https://www.aafp.org/afp/2014/1001/afp20141001p476.pdf

Educational Competency

Having the materials and resources necessary to conduct an audiologic examination with LEP patients is not enough to provide proper service. It is necessary to have educational and cultural competency. To reduce the health disparities in the LEP population clinicians need to be educated as to how language barriers contribute to health care disparities. Studies focusing on teaching clinicians about language barriers in health care, and how and when to use interpreting services have shown to be beneficial, with an increase in likelihood of the physician choosing the appropriate interpreting services with LEP patients.

Educational interventions should be introduced early in the career of health professionals and be reinforced throughout their career. Educational interventions do not need to be extensive or complex but strategically target enhancing knowledge to facilitate accurate communication.

- Link to the Crossroads Hospice cultural competence in health care course which is accredited by several associations and boards from various areas of healthcare: https://crhcf.org/continuing-education-courses/cultural-competence-in-health-care/#:~:text=The%20goal%20of%20this%20course,systems%3B%20describe%20cultural%20competence%3B%20and
- Link to resources on cultural competency by the U.S. Department of Health and Human Services, the Office of Minority Health, and the Association of American Medical Colleges: https://www.countyhealthrankings.org/take-action-to-improve-health/what-works-for-health/strategies/cultural-competence-training-for-health-care-professionals

Hearing Impairment and Prevalence in the Latino and Hispanic Population

Hearing impairment is one of the most common chronic conditions affecting adults; yet data specific to the Hispanic/Latino population are limited. Growing evidence showed age-related hearing impairment was associated with lower socioeconomic status, occupational noise exposure, diabetes mellitus, smoking, and obesity; these factors might all be more common in the Hispanic/Latino population (Cruickshanks et al., 2015). Hearing impairments could go undiagnosed and untreated for many, and this could be exacerbated for groups that are underserved in health care like the Hispanic/Latino population.

The Hispanic Community Health Study/Study of Latinos (HCHS/SOL), which is a population-based sample of Hispanics/Latinos in U.S. communities (Bronx, New York; Chicago,

Illinois; Miami, Florida; and San Diego California), was used in the study from 2008-2011 (Cruickshanks et al., 2015). The population used included 16,415 self-identified Hispanic/Latino people ranging from 18 to 74 years of age recruited randomly (stratified 2-stage area probability design) based on census block groups and household within block groups.

A prevalence of 15.06% for hearing impairment overall and an 8.24% for bilateral hearing impairment were gathered by the researchers with 0.85% reporting history of ear surgery or disease (Cruickshanks et al., 2015). A small portion of those with hearing impairment had evidence of conductive hearing losses, 3.12% for the left ear and 2.9% for the right ear (Cruickshanks et al., 2015). The study demonstrated how hearing impairment is common in Hispanic/Latino adults and the prevalence increases sharply after the age of 45 years. Hispanic/Latino men were also more likely than the women to have a hearing impairment. A Puerto Rican background was also associated with higher prevalence of hearing impairment than Mexican background. The researchers hypothesized that this could be due to Puerto Rican background also being more likely than other groups to have multiple cardiovascular disease risk factors (Cruickshanks et al., 2015). The study found smoking, obesity, history of cardiovascular disease, and diabetes were associated with hearing impairments in a simple modified adjusted demographic factor. In a multivariable model, diabetes and prediabetes remained significantly associated with hearing impairment. It was also noted that some of the participants had a conductive component that could be amenable through medical treatment (Cruickshanks et al., 2015).

Overall, the multicenter study demonstrated that hearing impairment was common in the Hispanic/Latino population (15% of the adults had hearing impairment). Diabetes, less education, lower income, and noise exposure were associated with higher prevalence of hearing

impairment. Healthcare professionals and audiologists need to be aware that Hispanic/Latino patients might be at an increased risk for hearing impairment due to abnormal glucose metabolism. The conclusion was hearing impairment is a common problem in the community especially for those of older age with socioeconomic factors, noise exposure, and abnormal glucose metabolism. Researchers still need to determine if such factors are correlated to etiology of hearing impairment in order to identify ways to prevent or aid with such changes in hearing.

Lee et al. (1996) conducted a comparative analysis of the epidemiology of childhood hearing impairment among African American, Hispanic American, and non-Hispanic White children between the ages of 2 and 19 years of age using data from the National Health and Nutrition Examination Survey II (NHANES II; 1976-1980) and the Hispanic Health and Nutrition Examination Survey (HHANES; 1982-1984). The participants included 688 African Americans, 330 Cuban Americans, 2,602 Mexican Americans, 1,025 Puerto Ricans, and 3,243 non-Hispanic Whites.

The major finding in this study was a higher prevalence of hearing impairment in the Hispanic population in comparison to African Americans and non-Hispanic Whites (Lee et al., 1996). More specifically, this was due to the high rates in Cuban Americans and Puerto Ricans prevalence of slight/mild hearing impairment. Mexican Americans had significantly lower rates of slight/mild and overall hearing impairment in comparison to other Hispanic subgroups. There was limited evidence on males having higher rates of hearing impairment than females (Lee et al., 1996). Gender and age comparisons were inconsistent and nonsignificant in the groups. In this study, there were small sample sizes for African Americans, Cuban Americans, and Puerto Ricans. Also due to time and financial constraints, there was no bone conduction testing conducted, which could have helped in determining the type of hearing impairment (Lee et al.,

1996). Further research is needed to identify factors for hearing impairment in Hispanic populations.

Diabetes and Hearing Impairment

Hearing impairment affects two-thirds of U.S. adults with diabetes. The association among Hispanic/Latino adults with hearing impairment and diabetes (one-fifth) can also be seen. This means Hispanic/Latino populations might be at a risk for hearing impairment and its possible long-term sequelae (reduced health-related quality of life). Bainbridge et al. (2016) examined risk factors for hearing impairment in the Hispanic/Latino adult population with diabetes. Bainbridge et al. investigated 3,384 participants aged 18-76 years with diagnosed or previously undetected diabetes. Participants also had identified cigarette smoking, high levels of alcohol consumption, and high triglyceride levels. Participants underwent audiometric testing as part of the Hispanic Community Health Study/Study of Latinos (HCHS/SOL).

In conclusion, 59.3% of the participants had a hearing impairment (Bainbridge et al., 2016). Lower family income and lower education population was at an increased risk of hearing impairment. Hearing impairment was seen more in the Hispanic/Latino population that was in earlier stages of diabetic nephropathy. The findings suggested smoking cessation, reduction of high levels of alcohol consumption, and lipid management might help lower the public health burden of hearing impairment among Hispanics/Latinos with diabetes (Bainbridge et al., 2016).

Genetic Predisposition

Genetic predisposition is one of the most common factors that leads to hearing impairment (Mittal et al., 2018). A large portion of hearing impairment studies include few Spanish, Hispanic, and Latino participants, which then leaves a critical gap in the understanding of prevalence, impact, unmet health care needs, and genetic factors associated with hearing

impairment for this population. Gene variants linked to hearing impairment vary among different populations, which has led to a growing interest in creating population-specific “gene panels” to improve genetic screening efficiency.

Mittal et al. (2018) reviewed research and discussed the recent advance in genetic basis of HL in Spanish and Hispanic populations. Mitochondrially encoded 12S ribosomal RNA (MTRNR1) is evolutionarily related to the bacterial ribosome making it a target for aminoglycoside antibiotic-induced ototoxicity. Currently, there are three variants. Variant m.1555A>G was seen in a study with 10 multiplex Spanish and Italian families; 35 of the participants with sensorineural deafness had this variant. Thus, hearing impairment was associated with the 12S rRNA m.1555A>G gene variant. A second variant was m.1291 T>C. It was seen in a three-generation Cuban family with hearing impairment who had no history of aminoglycoside exposure. The third variant, m.827A>G, was seen in two Argentinean sisters with hearing impairment. It was linked with aminoglycoside exposure; this exacerbated the effects of the variant, leading to hearing impairment. Again, data and understanding of hearing impairment in Spanish/Hispanic populations were severely lacking. The GJB2 and GJB6 variants were the most common cause of autosomal recessive hearing impairment in several ethnic populations. Both gene variants coded for connexins, which are vital gap junction proteins in the cochlea (Mittal et al., 2018). In a study of 67 Caribbean Hispanic participants with autosomal recessive hearing impairment, GJB2 and GJB6 variants were scarce. Otoferlin is encoded by the OTOF gene and has been associated with non-syndromic hearing impairment. Several mutations were identified in OTOF in non-Hispanic populations, but the only gene variant seen in Hispanics was a nonsense mutation c.2485G>T. It was reported in a Cuban family and a Mexican descent family. It has also been seen on a larger scale with Spanish participants.

Based on reports from single families and small studies, GJB2/OTOF/m.1555A> G variants were most commonly associated with this population (Mittal et al., 2018). The importance of conducting research with this population was highly stressed. Studies around the world consisted of mostly a White population. Genome-wide association hearing impairment studies were of up to 500,000 individuals and the national genome study (10 k Genomes Project) again were great studies looking at large populations, hearing impairment, and genes—yet none included the Hispanic/Latino population.

Occupational Hearing Impairment

Farming and Construction

Occupational noise exposure is recognized as a risk factor for hearing impairment. Farmers have been found to be at an increased risk of high frequency, sensorineural hearing impairment, most likely due to noise exposure and pesticides. Crop spraying has specifically been associated with increased risk of hearing impairment. Most of the research focused on self-employed farmers and little to none was on the 2.5 million migrant agricultural workers in the United States (Rabinowitz et al., 2005). Migrant workers are exposed to excessive noise levels and pesticides. The majority of migrant farm workers are Hispanic and have significant rates of hearing impairment (Rabinowitz et al., 2005).

Rabinowitz et al. (2005) conducted a cross-sectional survey of Hispanic agricultural workers. The survey focused on determining whether rates of hearing impairment appeared to increase compared to other populations, whether measured hearing impairment was associated with reported hearing difficulties, and whether significant associations could be found between hearing impairment and occupational exposures to noise and pesticides (Rabinowitz et al., 2005).

Participants were recruited from 2001-2002 at health fairs held at migrant camps and farms in the Connecticut River valley. The survey along with tympanometry and audiometric data were obtained and 150 individuals were included in the study. Hearing impairment was defined as a threshold >25 dB HL in either ear at any frequency between 500-6000 Hz. Twelve percent of individuals had hearing impairment by American Medical Association/American Academy of Otolaryngology–Head and Neck Surgery criteria and over 35% reported subjective difficulty hearing and understanding speech due to hearing problems, yet none reported the use of hearing aids (Rabinowitz et al., 2005). Over 50% of the individuals had hearing impairment as defined by the researchers and 19% had middle ear dysfunction of those who were tested. The prevalence of hearing impairment at 4,000 Hz in Mexican and Puerto Rican male agricultural workers was compared to that of the males in the HHANES survey and it revealed higher rates of high-frequency hearing impairment for farm workers of all age groups (≤ 25 years, 26-40 years, and > 40 years) in comparison to the HHANES data (Rabinowitz et al., 2005). The data showed disproportionately high rates of hearing loss for farm workers, with hearing impairment present in the younger age categories as well. Overall, 12% of the subjects in the study met the AMA criteria for hearing impairment, but 50% had a ≥ 25 dB hearing impairment at one or more audiometric frequencies (Rabinowitz et al., 2005).

Noise exposure and pesticide exposure were commonly reported but the use of hearing protection (14%) was rare. Perceived self-efficacy and barriers to hearing protection were the biggest issues with Hispanic use of hearing protection. There is a lot of room to further improvements in training and enforcement of hearing protection.

The World Health Organization has described noise induced hearing impairment as “the most prevalent irreversible industrial disease” (Robertson et al., 2007, p. 153). Effective interventions to prevent this occupational noise-induced hearing impairment must be adapted to the experiences of the diverse worker populations globally. Robertson et al. (2007) conducted a study on Latino construction workers’ experiences with occupational noise and hearing protection to create a multimedia hearing conservation intervention and evaluate its effectiveness. The Latino population in the U.S. construction industry has grown tremendously from 1980 to 2005 with 2.5 million Latino construction workers in 2005 (Robertson et al., 2007). The Latino population accounted for over 30% of the U.S. construction work force, the majority being Mexican or Mexican American (others included Puerto Rican, Cuban, and Central or South American). Worldwide audiometric testing demonstrated that 74% of construction workers had hearing impairment (Robertson et al., 2007). Several construction tasks and tools generate hazardous noise exposures as high as 97 dBA for an eight-hour-time-weighted average (TWA). For example, a construction worker cleaning road cuts with a handheld shovel was exposed to 87.4 dBA and while chipping concrete with a pneumatic hammer, he was exposed to 109 dBA (Robertson et al., 2007). The Occupational Safety and Health Administration (OSHA; Standard 29 CFR 1929.52) mandates employers in the construction industry provide “feasible administrative or engineering controls,” hearing protection, and hearing conservation program for all employees exposed to noise at or above an eight-hour TWA of 90dBa (Robertson et al., 2007, p. 154). It did not have a specific requirement for noise exposure monitoring, audiometric testing, or worker training and education regarding the use of hearing protection, making it difficult to enforce hearing conservation training and other aspects of hearing conservation training.

For the study, Robertson et al. (2007) did purposive sampling resulting in two groups: one group (n = 9) included established bilingual construction union members (from Minneapolis/St. Paul, Minnesota) and the other group (n = 6) included newer Spanish-speaking immigrant construction workers (from Denver, Colorado). The participants ranged from 3.5 to 30 years of experience and 25 to 50 years of age (only one participant was born in the United States). Focus groups investigated the perceptions of exposure to noise on the job as well as barriers and supports for wearing hearing protection. Several themes and categories arose.

The first category was the assessment of "how it feels," where participants described a range of physical responses to noise exposure. All the participants agreed the noise exposure eventually led to headaches and constant noise exposure made them feel tired. One participant explained that by the end of a workday full of noise, he became very bothered by headaches, ringing in his ears, and fatigue. Several described bothersome tinnitus while working and even afterward.

The next category was "Why use hearing protection"? Men who had hearing impairment felt strongly about protecting their remaining hearing and took it as their responsibility to take care of it. Some saw it as a personal responsibility and explained the necessity to wear hearing protection even if the foreman was not supervising. Others initially described not giving hearing protection importance due to being young and not well informed but after training, they wore and valued hearing protection. Workers in companies with strict safety policies described wearing hearing protection because it was mandatory. A worker mentioned having to wear hearing protection constantly while working and could only take them out during lunchtime. He said he wore his hearing protection because "We want to work. We need the money. We have to follow the rules." Several workers complied with hearing protection because they had no choice and it

was a company regulation. Some even mentioned only wearing them when OSHA visited the site. The construction workers then elaborated and mentioned how Latino workers were in need of jobs and thus more willing to work in unsafe situations. One worker further explained how the companies they worked for usually did not care about the construction workers' health as long as they got the job done. Everyone agreed that new immigrants were most at risk for not wearing protection; it was usually due to the circumstances they were coming from and the lack of knowledge on health effects and protection. One participant explained how new immigrants had to prove themselves as hardworking employees and thus took on a macho role at work that could lead to workers not wanting to wear hearing protection due to the fear of being seen as weak. Others explained how they also feared for their job. They dreaded going to their employer and asking for hearing protection as they would be seen a as troublemaker and thus fired. They were terrified to be the first to wear hearing protection or inquire about it due to the fear of consequences that could include losing their job. One worker shared how he was fired from a company after asking for hearing and eye protection. Participants mentioned new immigrants not wanting to bring attention to themselves. One participant added, "They want to blend. They find themselves in a different environment, different place, and different people. They just want to be accepted." Another major reason for not wearing hearing protection was it was uncomfortable, and the workers felt they could handle the noise. One participant mentioned fearing the sweat and dirt from working all day with hearing protection would cause an ear infection. Others mentioned discomfort as an issue but also not being able to hear others or be aware of surroundings via sounds. Participants also mentioned how they got used to the noise and thus felt they did not need hearing protection.

Robertson et al. (2007) showed a small sample of the complexity of the interrelated factors portrayed in an ecological framework. In general, the workers were more concerned about major accidents, wore helmets and protective glasses, but were not as concerned about their hearing so most did not regularly wear hearing protection. Those who did have some hearing impairment felt responsible for wearing hearing protection irrespective of OSHA rules of racial norms. Workers might not wear hearing protection due to fear of being fired, not fitting in, and fear of not being manly or strong enough. Some workers believed their hearing would not be affected and they could handle the noise. All agreed a primary barrier to wearing hearing protection was it was uncomfortable. Some believed protection impeded hearing and compromised worksite safety. Others were concerned dirty plugs could cause infections. Further research is needed to elicit environmental and personal factors affecting Latino workers' hearing health behavior. This would help occupational health nurses assess potential barriers and be able to deliver educational interventions to help workers overcome them (Robertson et al., 2007). This might mean finding non-traditional partnerships such as community groups and primary care providers serving Latino workers.

Occupational Noise Exposure and Ototoxicity in the Elderly Latino Population

Latino immigrants tend to work in occupations with more hazards such as agriculture, construction, and cleaning. According to the National Agricultural Workers Survey, the U.S. agricultural workforce was 75% Mexican and 2% from Central American countries (Hong et al., 2015). Thirty percent of blue-collar workers in construction were Latino. In cleaning and maintenance occupations, 35.9% were Hispanic or Latino. Latinos who worked in these high-risk industries were at a higher risk of occupational hazards, including noise and toxic chemicals, and occupational hearing impairment. Approximately 10% of adults between 20 and 69 years of

age had irreversible noise-induced hearing impairment (Hong et al., 2015). Ototoxicity was seen in solvents (styrene, toluene), heavy metals (lead, mercury), polychlorinated biphenyls, and pesticides (Hong et al., 2015).

Hong et al. (2015) examined the relationship between lifelong occupational exposures and hearing impairment among the elderly Latino population in the United States. Researchers used secondary cross-sectional data from the Sacramento Area Latino Study of Aging that included 1,789 Latino Americans over the age of 60 residing in Sacramento County between 1998-1999. Baseline data were collected and then follow-up home visits were conducted every 12-15 months through late 2007. Hong et al. included 547 of the participants between the age of 65-75 who also indicated having a hazardous occupation (noise and possible ototoxins). Other covariates of hearing impairment were also measured: smoking, hypertension, type 2 diabetes, ototoxic medications. Of the participants, 41.2% were born in Mexico, 52.7% spoke Spanish as their primary language, 66.5 % had hypertension, 43% had diabetes, 62% had ototoxic medication (loop diuretic, non-steroidal anti-inflammatory drugs, others) use, and 57.6% had occupational exposures (loud noise and /or ototoxic chemicals). Hearing impairment was defined as low (500, 1,000, 2,000, and 3,000 Hz) and high frequency (4,000, 6,000, and 8,000 Hz). Sixty-five percent of the participants had a low frequency hearing impairment (47.2% slight, 14.4% moderate, 3.1% severe, and 0.4% profound hearing impairment).

However, most of the participants had a high frequency hearing impairment of 90% (31.6% slight, 32.4% moderate, 21.8% severe, and 5.1% profound loss). A comparison between the occupational exposure group and the non-occupational exposure group demonstrated the occupational exposure group had a significantly lower education level, were more likely to be male, were more likely to be born in Mexico, were more likely to speak Spanish, were less likely

to have household incomes greater than $2,000 per month, and were less likely to never be smokers (Hong et al., 2015). When both groups were compared to low and high frequency hearing impairment, the occupational exposure group was significantly more likely to have hearing impairment (72% compared to 54.6%) at low frequencies and 94.5% (compared to 85.4%) at the high frequencies. A logistic regression model with independent variables associated with hearing impairment detected no high intercorrelations among independent variables.

Hong et al. (2015) reported that occupational exposure to loud noise and/or ototoxic chemicals were significantly, twice more likely to have hearing impairment at high frequencies than the comparison group. The study also found age, sex, household income, current smoking, and diabetes were significantly related to low and high frequency hearing impairment (Hong et al., 2015). The results demonstrated that lifelong occupational exposure to ototoxic hazards was significantly associated with hearing impairment among the elderly Latino Americans. Hearing protection and education from these harmful auditory effects of occupational exposures would have a positive impact on healthier hearing as this population ages.

These findings have several implications for occupational health, primary care, and public health. There are areas for improvement and ways to do so. From an occupational health approach, effective hearing conservation programs need to be disseminated throughout the lifespan of workers. A primary care approach could establish standardized hearing assessment for adults and develop intervention protocols for those exposed to noise and/or ototoxic chemicals. A more public health approach would mean involving work and community environmental surveillance on noise or chemical pollutants. San Francisco has a Noise Enforcement Program run by the Department of Public Health (n.d.) that conducts environmental

noise exposure assessments, maintains the city's background noise map for residents, and continuously educates them to reduce and prevent a plethora of health problems associated with noise exposure. The use of personal and environmental health sensors and geographic information systems could also help identify populations at risk.

Spanish Audiologic Evaluation Test Description and Instruction Translations

Reel et al. (2015 are the authors of *New Resources for Audiologists Working with Hispanic Patients: Spanish Translations and Cultural Training* (Reel et al., 2015). I reached out to Leigh Ann Reel, Au.D., Ph.D, CCC-A who is currently the Director for the Center for Speech, Language, and Hearing research at Texas Tech University, Health Sciences Center. I inquired about the materials they created and described the protocol I was working on building. Reel sent their materials, and I was able to create my Spanish translations using their materials as a guide and reference. Reel et al. have several other resources and test descriptions for further audiologic testing. Please refer to their article for more information.

I also gave these test instructions to five Spanish speakers of Mexican descent here in the United States and to two Spanish-speakers in Mexico to be accessed in comprehension and readability. The goal is to create test instructions that could be easily read by Spanish speakers of various backgrounds and education levels. As well as creating something that could be printed or sent to the patients before the appointment so that they are familiar with the testing that will occur. At the appointment the English-speaking audiologist would be able to point to instructions concerning the part of the evaluation that is about to occur. The intent is to reduce patient and physician anxiety about the appointment, give greater understanding of test procedures to reduce negative effects of language barriers, and to increase reliability of audiologic testing during a hearing evaluation.

Spanish Audiologic Evaluation Test Description and Instruction Translations

Otoscopy	**Otoscopia**
I will examine your ears using an otoscope. This instrument has a light and allows me to see if your ear canal is clear and how the eardrum appears. I will be gently inserting the otoscope in your ear canal, please remain still.	Examinare sus oídos con un otoscopio. Este instrumento tiene una luz y me permite ver si su canal auditivo está claro y la apariencia del tímpano. Yo suavemente introduciré el otoscopio a su canal auditivo, favor de permanecer tranquilo y sin movimiento.
Instructions:	*Instrucciones:*
Mr/Ms……, I'm going to look in your ears. please remain still.	Sr./Sra./Srta……, voy a examinar sus oídos. Por favor permanezca quieto, sin movimiento.
Tympanometry	**Timpanometría**
In this test we will evaluate your eardrum movement. I will put a small plastic tip in your ear. You will feel some pressure (similar to flying in the airplane or driving up/down a mountain). This test is fast and only requires you to remain still and quiet, the equipment will run itself.	En este examen evaluaremos el movimiento de su tímpano. Yo pondré una punta de plástico en su oído. Sentirá un poco de presión (como cuando viaja en un avión o subiendo/bajando de una montaña). El examen es rápido y solo requiere que usted permanezca en silencio y sin movimiento, el equipo hará el trabajo.
Instructions:	*Instrucciones:*
I will place this rubber tip in your ear. You will feel some pressure, for a couple of	Voy a poner esta punta de goma en su oído. sentirá un poco de presión por algunos

seconds. Please remain still and quiet while the test is running.	segundos. Por favor permanezca quieto y en silencio durante el examen.
Acoustic Reflexes and Acoustic Reflex Decay	**Reflejo Acústico y Deterioro del Reflejo Acústico**
These tests measure how well the muscles in your middle ear function in response to loud sounds. You may hear some loud tones, but you do not have to respond, just remain still and quiet.	Estos exámenes miden la función de los músculos del oído medio en respuesta a sonidos fuertes. Puede ser que escuche sonidos fuertes durante el examen, pero no tiene que responder, solo permanecer sin movimiento y en silencio.
Instructions:	*Instrucciones:*
I will place this rubber tip in your ear. You may hear some tones (or "beeps") during the test, but you do not have to respond. Just remain still and quiet, the equipment will measure the response.	Voy a poner esta punta de goma en su oído. Puede ser que escuche tonos (o sonidos) durante el examen, pero no tiene que responder. Solamente permanezca quieto y en silencio, el equipo medirá la respuesta del oído.
Otoacoustic Emissions (OAEs)	**Emisiones Otacústicas**
This test measures the hearing organ (cochlea), which is located in your inner ear. I will place a small plastic tip in your ear, and the equipment will play some tones. You do not have to respond. The	Este examen mide el órgano de audición (cóclea o caracol), que está localizado en la parte del oído interno. Yo introduciré una punta de plástico en su oído, el equipo presentara sonidos. No tiene que responder. El

equipment is sensitive to noise, please remain still and quiet. *Instructions:* I will place this plastic tip in your ear, and you may hear some tones ("beeps"). The equipment will record the measurements, please remain still, and quiet. **Pure Tone Testing-Air** This test finds the softest levels that you can hear at different pitches in each ear. During testing you will be in a sound booth, which is quiet. You will hear tones through headphones/insert foam earphones. I will be seated on the other side and will be able to see you. I will present tones (beeps) at different pitches, please respond (by raising your hand, saying yes, or pressing the button) every time you hear the tones, even if you can barely hear them. *Instructions-Unmasked air:* Let's go into the sound booth. Have a seat here. For this test I will place these foam inserts inside (or headphones over) your	equipo es sensible a los ruidos, por favor de permanecer sin movimiento y en silencio. *Instrucciones:* Voy a poner esta punta de goma en su oído, y puede ser que escuche algunos tonos (sonidos). El equipo registrará las medidas, por favor permanezca quieto y en silencio. **Prueba de Tonos** Este examen es para detectar los niveles más suaves de tonos que puede escuchar en cada oído. Durante el examen, usted estará en una cabina diseñada para eliminar ruido. Usted escuchara tonos por los auriculares/audífonos pequeños de esponja. Yo estaré sentad@ afuera de la cabina y podre verl@. Le presentare tonos diferentes, favor de responder (levantando la mano, diciendo si, u oprimiendo el botón) cada vez que escuche los tonos, aunque estén muy suaves (bajos). *Instrucciones-Conducción Aérea:* Vamos a la cabina sonomoamortiguada. Tome asiento aquí. Para este examen pondré estos audífonos de esponja adentro (o auriculares

ears. You will hear tones ("beeps") at different pitches in each ear. I need you to push the button (raise your hand, say "yes", or give a response) each time you hear the tones, even if you can barely hear them. *Instructions- Masked Air:* Now you are going to hear some noise in one ear, it will sound like wind or static. I want you to ignore the noise and focus on the tones. When you hear the tone, please push the button (raise your hand, say "yes", or give a response).	sobre) sus oídos. Escuchara tonos en diferentes frecuencias en cada oído. Necesito que usted oprima el botón (levante la mano, diga "si", o responda) cada vez que escuche el tono, aunque sean muy suaves. *Instrucciones- Aire Masked:* Ahora usted va a oír ruido en un oído, sonará como viento o estática. Quiero que ignore el ruido y enfóquese en los tonos. Cuando oiga el tono, oprima el botón (levante la mano, diga "sí" o responda).
Pure Tone Testing-Bone This test uses a special type of headband that with a small black box that sits on the bone behind your ear. The headband sends the sounds straight to your inner ear and bypasses the outer and middle ear. You will still hear the tones and respond to them every time you hear them, even if you can barely hear them. *Instructions-Unmasked Bone*:	**Prueba de Tonos-Conducción Ósea** Este examen utiliza una diadema/banda con una cajita negra colocada en el hueso detrás de su oído. La cajita negra manda los tonos directamente a la parte del oído interno y sobrepasa la parte del oído externo y medio. Sin embargo, aun escuchara los tonos y tendrá que responder cada vez que escuche los tonos, aunque estén muy suaves (bajos). *Instrucciones- Tonos via osea:*

I am going to put this headband on you, and this little black box behind your ear. You are going to hear tones like before. Once again, I need you to press the button (raise your hand, say “yes”, or give a response) every time you hear the tones, even if they are very soft.	Colocare esta diadema (banda) y esta pequeña caja negra detrás de tu oído. Vas a escuchar tonos como antes. Una vez más, necesito que oprima el botón (levante la mano, diga “sí” o dé una respuesta) cada vez que escuche los tonos, incluso si son muy suaves.
Instructions-Masked Bone: I am going to place the headband on you and a foam insert (or headphone) to present some noise. The noise will sound like wind or static. I want you to ignore the noise and focus on the tones. When you hear the tone, please press the button (raise your hand, say “yes”, or give a response). It may be difficult to tell from which ear or where the tones are coming from. I just want you to focus on the tones and give a response when you hear them despite of location.	*Instrucciones-Tonos vía ósea:* Te voy a colocar la diadema y también un audífono de esponja (o auriculares) para presentar algo de ruido. El ruido sonará como viento o estática. Quiero que ignores el ruido y te enfoques en los tonos. Cuando escuche el tono, presione el botón (levante la mano, diga “sí” o responda). Puede ser difícil saber de qué oído o de dónde provienen los tonos. Solo quiero que se concentre en los tonos y dé una respuesta cuando los escuche a pesar de la ubicación.

Speech Recognition Threshold SRT)	**Umbral de Reconocimiento del Habla (URH)**
This test measures the softest level that you can understand speech. You will hear words and they will gradually get softer and softer, your will repeat each word you hear.	Este examen detecta el nivel más suave en el cual uno puede entender el habla. Escuchara palabras y gradualmente se harán más y más suaves, usted tendrá que repetir cada palabra que oiga.
Instructions- Unmasked:	*Instrucciones*:
You will hear some words; I need you to repeat them back to me. The words will get softer and softer, please try your best to repeat them back and it is okay to guess.	Usted escuchara palabras, y necesito que las repita. Las palabras gradualmente serán más y más suaves, por favor intente lo mejor de repetir las palabras incluso trate de adivinarlas.
Instructions-Masked:	*Instrucciones:*
Now you will hear some noise in the other ear. Ignore the noise and repeat the words back to me. Again, the words will get softer and softer, it is okay to guess if you aren't sure of the word.	Ahora escuchara ruido en su otro oído. Ignore el ruido y repita las palabras. De nuevo las palabras gradualmente serán más y más suaves, y si no está seguro intente de adivinarlas.
Word Recognition Testing	**Reconocimiento de Palabras**
This test measures how well you can hear and recognize words. The words will stay at a constant level and again you will repeat each word you hear.	Este examen detecta que tan bien uno puede oír y reconocer las palabras. Las palabras serán presentadas a un nivel constante, y tendrá que repetir cada palabra que oiga.

Instructions Unmasked: You will hear some words and I need you to repeat them back. You will hear "say the word" and a word. You only need to repeat the last word. If you are not sure of the word, take a guess. *Instructions Masked:* Now you will hear noise in the other ear, please ignore the noise and repeat the words back to me. Remember if you're not sure of the word, it's okay to take a guess.	*Instrucciones:* Va a oír unas palabras y necesito que me las repita. Va a oír la frase, "diga usted", y luego la palabra. Usted solo necesita que repetir la última palabra. Si no está segur@ de la palabra, intente adivinarla. *Instrucciones:* Ahora va a oír ruido en el otro oído, por favor ignore el ruido y repítame las palabras. Recuerde si no está segur@ de la palabra, puede intentar adivinar la palabra.

Speech Testing Word Lists

Most clinical speech audiometric test materials are recorded in English, making it challenging to effectively and accurately assess Spanish speakers. None the less, resources are available. Shi (2014) summarized several commonly used tests in the United States and those not yet commercially available. A limitation is many have not clearly established psychometric properties. The test materials included the child and adult speech reception threshold test, child and adult word recognition tests, auditory processing, and speech in noise testing.

Auditec Incorporated also has been creating and providing a variety of auditory test materials for audiologists, psychologists, speech-language pathologists, hearing professionals, and other medical professions since 1972. They sell over 80 tests in over 200 variations; this includes Spanish auditory tests. Auditec has a Spanish auditory test CD with trysyllables for SRT, paired comparison sentences, bysyllable word recognition lists, and monosyllable word recognition lists. Auditec also has Spanish SRT and speech discrimination recordings for children (https://auditec.com/2015/09/30/spanish-auditory-test-cd/).

Patient Counseling and Education

After an appointment the counseling and education portion is critical to the patient's health. This can be difficult with language barriers. That does not mean the Spanish-speaking patient cannot be informed about their test results, implications, and future steps. Following are resources that can be helpful in counseling and educating a Spanish-speaking patient.

- The American Speech-Language-Hearing Association (ASHA, n.d.) has several handouts in PDF format. These patient education handouts are available in English and Spanish. They are available for free and printable. There are handouts for audiologic rehabilitation, balance, disorders, hearing loss, hearing loss prevention,

technology, and tinnitus. These materials can be printed out and given to the patient during counseling.

- The National Institute on Deafness and Other Communication Disorders also has several recourses on balance disorders, hearing protection, syndromes related to hearing impairment, other hearing pathologies, and information explaining the process of hearing anatomically. It also has resources explaining hearing aids, cochlear implants, and accommodations. This online resource is displayed in Spanish. This is a website that can be navigated by someone who speaks Spanish. This is a great tool to give a Spanish-speaking patient wanting more information on hearing and hearing rehabilitation: https://www.nidcd.nih.gov/es/espano

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