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Neurodiagnostic Program Director Perceptions on Low Enrollments

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NEURODIAGNOSTIC PROGRAM DIRECTOR PERCEPTIONS ON LOW ENROLLMENTS

by

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NEURODIAGNOSTIC PROGRAM DIRECTOR PERCEPTIONS ON LOW ENROLLMENTS

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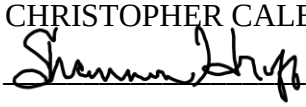

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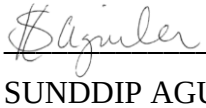

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Abstract

Higher education enrollments have trended downward over the last several years and fallen further due to the impact of the COVID-19 pandemic. The problem addressed in this study was low student enrollment in neurodiagnostic programs in the United States, resulting in an increasing shortage of neurodiagnostic professionals working in the field. The purpose of this descriptive qualitative study was to explore the perceptions of neurodiagnostic program directors and their views on the low enrollments in neurodiagnostic programs in the United States. A descriptive qualitative design was used to understand the perspectives of these program directors. human capital theory, the theory of planned behavior, and self-determination theory were used as the framework for this study. The research question was designed to help provide an understanding of the perceptions of neurodiagnostic program leadership on low student enrollments in neurodiagnostic programs in the United States. Program directors from nine neurodiagnostic programs were interviewed using semistructured interviews. Open-ended questions addressed enrollment trends, visibility of the neurodiagnostic career path, and neurodiagnostic licensure. Inductive and reflexive thematic analysis were used when coding and analyzing the interview data to identify emerging themes and determine the causes of low enrollments. The results of this study demonstrated a lack of visibility of the field of neurodiagnostics, the lack of clinical sites, and a lack of standardization, impacting low enrollments. Future research could incorporate a larger group of program directors as well as broaden the study to include additional modalities within the field of neurodiagnostics. Implications of these findings may be that hospital administrators review entry-level requirements for new hires, advocate for more clinical sites, and engage in better marketing campaigns to encourage increased visibility of neurodiagnostic programs and higher enrollments.

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Chapter 1: Introduction

The shortage of health care professionals in the United States has been detailed and discussed since the 1970s (Patlak & Levit, 2009). The demand for qualified professionals has grown and become more pronounced as the country's population is aging and retiring from the workforce (American Hospital Association [AHA], 2021b). Although there are entry-level positions, many health care roles require some form of schooling, licensure, or certification (Frogner & Skillman, 2016). Within the field of health care education, the two programs or career paths most well-known are those of physicians and nurses. Another field that encompasses the roles of health care professionals who support nurses and physicians is allied health, comprising 60% of the health care workforce (Ressler, 2022). The broad classification of allied health education includes those pursuing educational advancement in a field other than physician, nurse, or dentist (Jaffe, n.d.). Allied health professionals are a part of the interdisciplinary team caring for a patient in various specialties, such as physical therapy, cardio diagnostics, radiology, and neurodiagnostics (ND).

According to Ressler (2022), the baby boomer generation (those born between 1946 and 1964) will have reached the age of 65 by 2030. For perspective, the projected need for physicians by 2034 is 407,300, in contrast to the need for 280,700 in 2019 (Boyle, 2021). There is a projected need for an approximately 19% increase in medical and clinical laboratory specialists, a small portion of the overall allied health field (Health Resources and Services Administration, 2022). Levine (2021) described the health care shortage as an issue with the allied health field as a whole; this sector is broad and consists of multiple modalities, limiting the influence of any specialty or profession. Due to the underrepresented nature of allied health care professions, education, and personnel, there is a strain on health care facilities nationwide, exacerbated by the

COVID-19 pandemic (Levine, 2021). According to Schwartz (2022), the pandemic caused a decrease in health care workers by approximately 20%. Health care workers are employed in careers designed to aid and assist patients with their medical needs and goals (Jaffe, n.d.). The personnel needed to care and provide for these needs and goals will increase as the baby boomer generation ages in the coming years.

The shortage of allied health professionals has been a concern for over 20 years (American Association for Clinical Chemistry, n.d., 2020). One reason for this ongoing and projected shortage is an aging population and subsequently decreased workforce (Patlak & Levit, 2009; Schwartz, 2022). The baby boomer generation is retiring and requiring more medical care. The shortage was further highlighted by the COVID-19 pandemic (AHA, 2021a). An aging population and consequent aging workforce require a new generation of professionals to fill the gap. These vacancies in health care professions need to be filled by qualified professionals who have obtained and demonstrated the skills necessary to fulfill these positions. The primary method of skill acquisition is the completion of an approved program, which prepares a student to enter their chosen field in an entry-level position. The shortage of allied health professionals is reflected in low enrollments in these programs.

Higher education enrollments as a whole, and subsequent graduates that feed into the allied health fields, have decreased over the past several years, causing increasing pressure on the already strained workforce (Patlak & Levit, 2009). Declining enrollments, specifically in allied health, have affected the shortage of health care professionals and have decreased over the past decade (National Student Clearinghouse Research Center [NSCRC], n.d.). According to Dundar et al. (2011), some of the decline is due to high education costs. Athena Career Academy (2022) in Ohio projected a deficiency of approximately 1 million allied health professionals through the

year 2030, citing the need for nearly 100,000 medical assistants by 2028. This does not include the other specialties within the broader context of allied health, including neurodiagnostic technologist (NDT), a lesser-known profession (Athena Career Academy, 2022; Japsen, 2021). NDT professionals work as a part of the interdisciplinary team by running various tests to monitor and diagnose outcomes within the field of neurology. As a subspecialty of allied health, the enrollments of NDT programs can be included in the projections of low enrollments and shortages in health care professions.

Students entering educational programs that teach allied health professionals can demonstrate program completion by earning a certificate or graduating with an advanced degree, depending on the specialty (College Factual, 2022; Wrightson & Cross, 2004). For instance, a student enrolled in an ND program could receive a certificate or an associate's or bachelor's degree, while a physical therapy graduate has the potential to earn a doctorate in this discipline. Due to the broad options for degrees, students' thought processes should be considered when choosing a program while also evaluating the entry requirements for these programs (La Morte, 2022). A student will set their life goals, which may include plans and objectives for education and careers. An individual will determine the benefit of various roles or career choices and whether pursuing a particular program will further advance their ambitions and goals (Galiakberova, 2019). With respect to health care programs and their particular requirements, individuals may have to determine their self-efficacy and ability to accomplish these goals (Klassen & Klassen, 2018), which may play a role in the decline of current health care program enrollments. Ooley et al. (2021) noted standardized testing as another reason for low enrollments in some of these programs. Health care educational programs are no different than others concerning the requirements needed for entry. They require specific scoring on entry exams for

admittance; this may cause prospective students to evaluate their ability to enter and complete these programs, which can then be a factor in enrollment statistics (Center for Allied Health Education, 2023).

Neurology is a specialty within medicine involving the body's processes that send and receive signals via the nervous system (American Academy of Neurology, 2023). Within this specialty is the diagnostic part of the neurology field that involves procedures and testing that can play a role in determining various diagnoses. This is known as ND, and an NDT performs the testing. Neurology is a specialty in which there is not only a shortage of physicians (Majersik et al., 2021) but also of NDTs entering the workforce (Boldery, 2019; Neurology Insights, n.d.). Although the field of ND encompasses all testing done in these departments, the focus of many programs is electroencephalography and the credential that corresponds with this, which designates the technologist as a registered technologist or R. EEG. T. The ND programs offer those who are interested in health care fields an option to work in a career with various modalities; however, the current career outlook due to a lack of licensure requirements, program design, and offerings may provide a reason for low enrollments (Neurology Insights, n.d.). While there is no federal regulation surrounding ND and no requirements for licensure to work in the field, there are governing bodies that monitor and regulate the credentials professionals may obtain to demonstrate their knowledge and skills within their subspecialties.

There are two main governing bodies for ND: the American Society of Electroencephalographic Technicians (ASET) and the American Board of Registration of Electroencephalographic and Evoked Potential Technologists (ABRET), which were established in 1959 and 1964, respectively, to assist in providing support as well as standardization and excellence in the field (Walbert & Ahn-Ewing, 2009). Training in this profession can encompass

anything from on-the-job training to a formal accredited program at an educational institution. Although there are accredited programs for ND, there are not as many as other allied health professions. The Commission on Accreditation of Allied Health Education Programs (CAAHEP; n.d.), which is an accreditation board for many allied health programs, lists approximately 25 accredited cardiovascular programs for every ND program. Both ASET and ABRET assist in providing educational resources for professionals in these individual fields while also serving as a means to gain important licensure and recognition for career security (Weissman, 2021).

Boosting enrollments in ND programs can help provide the staff necessary to fill shortages. Graduates from these programs can gain valuable experience from the aging workforce while also providing quality care and service to patients in the field of neurology. With a well-developed, fully staffed, qualified workforce, health care facilities may provide better patient care and reap the benefits of a more well-rounded care team (AHA, 2021a). The field of ND is smaller and lesser known than other allied health fields, such as radiology or respiratory therapy, and this lack of visibility as a career path could contribute to the lack of enrollments from graduating high school students and those looking to change careers. Low enrollments can have far-reaching effects on the field of ND that can span decades and leave a gap in a labor force that is constantly evolving and expanding.

There is a lack of research pertinent to the ND allied health career field, with even less research focused on the low enrollments of ND educational programs. When searching for literature to support this dissertation, the researcher explored adjacent health care fields and the information surrounding the enrollments in these programs. Concerning nursing and other allied health fields, a theme that emerged from the literature was the lack of faculty for these programs, which affects the acceptance, enrollment, and subsequent graduation rates, with many programs

limiting instructor-to-student ratios (Fawaz et al., 2018). The trickle-down effect is highlighted as insufficient staffing in the workplace (Bothra, 2019). Weissman (2021) researched and documented the shortage of health care workers. Others have mentioned the lack of staff and enrollments in more well-known allied health fields, such as respiratory and medical laboratory technicians (AHA, 2021a). For example, Commission on Accreditation for Respiratory Care prepares a yearly report on respiratory care programs and discusses the change in enrollments over multiple years (Smalling, 2021). When searching the literature pertinent to ND, however, the research was lacking regarding ND programs. Due to the gap in the literature, supporting documentation was used from other allied health fields in which leaders have experienced similar situations with a shortage in labor.

The findings of this study demonstrated that low enrollments in ND programs can put an additional strain on an already struggling labor force (see National Center for Health Workforce Analysis, 2015). This research also informs and educates program directors and administrators regarding the need for ND programs to provide a qualified workforce to serve an underrepresented and unresearched sector of allied health care. The constant struggle and need to fill health care professional vacancies requires health care administrators to observe and monitor enrollments in the educational aspect of these fields to search for a cause as well as encourage staff to continually participate in education. Administrators may encourage current staff to utilize available resources within their organization to further educational goals while also supplying the organization, and ultimately patients, with a better qualified workforce (Cherry, 2014).

Background of the Study

Personnel shortages in the health care field have been recognized as a trend, causing organizational administrators to express concern (Perez-Vergara, 2019). As advancements have

been made in health care and technology, it is imperative for those currently employed and entering the workforce to be qualified to perform their jobs competently, including the use of technology (Pew Research Center, 2017). Some technological advances have contributed to the shortage in nursing, which could be extrapolated to include allied health and ND health care workers (Fawaz et al., 2018). Health care shortages affect employees and potentially impact patient care and safety (Bean & Masson, 2021).

Although physician and nursing positions are at the forefront of health care shortages, allied health professions are also of concern regarding a lack of workers in the coming years (AHA, 2021b). The president of the AHA noted several contributing factors to the shortages, including increased labor costs amid decreasing reimbursements, an aging labor force, and the aging population of baby boomers who will require a larger workforce to care for them (Pollack, 2022). Along with these intersecting areas of concern that create a need for a larger workforce, there is also a decline in health care enrollments, exacerbating the overall problem (AHA, 2021a; Smalling, 2021).

Due to the smaller student populations entering various higher education programs, the pool for health care and allied health care continues to be smaller than in preceding generations (Perez-Vergara, 2019). These students must think introspectively, weigh the costs versus benefits of particular educational programs, and decide what career path they want to pursue along with a potential specialty. Song and Petracchi (2020) explored students' perceptions of a cost-and-benefit analysis based on a history of parental saving for college. This scenario can affect overall enrollments as well as a student's perception of self-efficacy to complete a higher education program while also finding a meaningful profession in which they are satisfied.

Should students select the professional health care path, there is a plethora of specialties from which to choose. Students can chart the course for physician or nurse or may enter into the broader generalized field of allied health care, which encompasses other professions in the health care field (Ressler, 2022). Allied health positions are considered skilled labor and have various entry requirements to begin working in these fields (Frogner & Skillman, 2016). Some of these positions include on-the-job training, which can benefit not only the employee but also the health care organization and educational institution should the individual proceed with higher education (Explore Health Careers, n.d.). Depending on the chosen health care career, educational demands may play a part in enrollment trends (Frogner & Skillman, 2016; Song & Petracchi, 2020).

Education vs. On-the-Job Training

Higher education enrollments have declined over the last several decades, and this trend also has affected enrollments in allied health programs (Institute of Medicine, National Academy of Sciences, 1989). In 1989, the Institute of Medicine identified the lack of allied health programs as well as the interval required to recognize the need for programs, the consequent period needed to develop these programs, followed by the mandatory time involved for prospective graduates to complete the programs and enter the workforce. Enrollments, retention numbers in various programs, and graduation statistics all demonstrate and highlight the growing shortage of health care workers (Pratt et al., 2019). The needs and concerns over this shortage have been highlighted and further discussed since the impact of the COVID-19 pandemic (Levine, 2021). Some allied health positions offer the opportunity for on-the-job training, which can benefit entry-level workers; however, this option may not be well-advertised or known to job seekers. On-the-job training also has a stigma that may deter certain labor force demographics (Osman & Speer, 2022). Many perceive on-the-job training that leads to a career as a lesser form

of career integration and consider this a lack of education (Holzer & Baum, 2017). Neurology is not at the forefront when one thinks of health care and allied health professionals. On the National Institute of Neurological Disorders and Stroke's (2019) website in the section on ND, it is not even the first field detailed or explained.

If an option for employment is not well-known to health care professionals, it could be lesser known to those outside of hospital employees, such as prospective students. Two leaders in the ND education community, L. Kelly (personal communication, April 2023) and F. McNall (personal communication, April 2023), stated there is an ongoing issue with education and health care administrators and the health care community at large not knowing what is done in ND or what it takes to be a qualified NDT. At a meeting for ND professionals in 2020, McNall (2020) discussed the ongoing lack of ND educational programs and the impact this was having on the known shortage of NDTs within the field. Higher education enrollment has declined (Aratani, 2021; Whitford, 2022). There are multiple theories for this phenomenon, including a decrease in allied health professionals, a smaller population entering the education pool (Perez-Vergara, 2019), and the cost/benefit ratio regarding quality of life, salary, and schooling to enter into ND (Song & Petracchi, 2020). Another factor in the decline in ND program enrollments is that some ND departments in many facilities offer on-the-job training as an option for an entry-level position, thus negating a need or motivation to enroll in a formal ND educational program.

Neurology

The technological aspect of ND was developed from 1959-1964; during this time, the organizations ASET and ABRET were formed (ASET, n.d., 2022b; Walbert & Ahn-Ewing, 2009). These organizations serve as the governing bodies of the ND professional community, provide standards of practice guidelines, and assist NDTs by offering resources for credentialing

and education within the field of ND. Different modalities within the field of ND serve different functions and perform different procedures. Technologists can specialize in these different modalities and prove competence by obtaining credentials specific to them. These include electroencephalogram (EEG), nerve conduction studies, and intraoperative monitoring. Advanced credentials can also be paired with these, demonstrating a more profound knowledge and understanding of a given modality. This research was concentrated solely on programs with a primary focus on EEG.

There is a nationwide shortage of formal ND programs (Kaylor, 2020; Probyn, 2018). This indicates a potential lack of adequate education and training of NDTs in health care organizations. NDT professionals work in a nebulous environment that is not easily defined (Savastano, 2016). When it is difficult to define the job position, it also may be difficult to define the educational expectations. It has only been recently that guidelines have specified potential expectations for various positions within the ND profession (see Lopez et al., 2023).

Although the ASET and ABRET act in supporting roles for ND professionals, because the field is smaller than other allied health professions, such as respiratory or physical therapy, there is a lack of advocacy to highlight this profession. The lack of dedicated advocacy and substantial support from governing bodies and medical directors creates a waterfall effect in the academic sphere of ND (Bothra, 2019). This effect is evidenced at educational institutions—nursing programs may draw student enrollments, while allied health programs are lesser-known and thus less likely to have enrollments and subsequent institutional funding (American Association of Colleges of Nursing, 2021; Weissman, 2021). When scrutinized further, accredited ND programs are harder to find than respiratory, pharmacy, and radiology programs

(CAAHEP, n.d.). In the effort to promote an institution with high graduation rates and job commitments, it can be difficult to market a lesser-known program such as ND.

In a struggling economy that is continuing to combat and clash with the effects of the COVID-19 pandemic, the rising costs of education also can contribute to the lack of higher education enrollments and retention (The World Bank, 2022). Although the focus of this study was not on the impact of the COVID-19 pandemic and its relationship with academic and health care institutions, it is discussed when applicable. The COVID-19 pandemic has been responsible for a downward trend in enrollments, which is being monitored (Whitford, 2022). An explanation for this trend is the decrease in motivation to continue or complete one's educational path, which may be partially traced to a lack of funds or other life events that may have occurred during the main course of the pandemic (Conley & Massa, 2022).

The term "neurology" is often assumed to include diagnoses such as seizures or Parkinson's disease. The field of neurology encompasses the processes that concern the brain and nervous system. As an adjunct to primary care, medicine that focuses on neurological actions is important for monitoring brain function; this segment of the health care field allows for potential prognostication of outcomes (Geocadin et al., 2019; Washington University School of Medicine in St. Louis, Department of Neurology, n.d.). As such, ND, the technical portion of neurology, is a necessary addition to the interdisciplinary team that cares for a patient. The testing performed by NDTs can offer valuable information for prognosis and diagnosis.

The role of an NDT is not well-defined. While larger facilities and teaching centers tend to have well-developed departments with distinct roles and career ladders, smaller institutions often house neurology under the umbrella of another department whose personnel can support testing in that facility as determined by hospital administration (ASET, 2022a). Also, there is no

requirement for licensure or certification at federal or state levels, adding another factor in the poor definition of the role of an NDT. Because of this, the education, training, qualifications, and competence of NDTs are hard to define and demonstrate a gray area (Savastano, 2016).

The Bureau of Labor and Statistics does not monitor or track the statistics specific to ND, but rather, the department includes them with the general medical technologist term "technologist, other" (American Institute of Medical Science and Education, 2019). In an interview with F. McNall (personal communication, April 2023), an expert in the field of ND and an advocate with the governing bodies of ND (ABRET and ASET), the name or title of the professional was one issue that was mentioned. Professionals in this job category can be titled with but not limited to EEG technician, NDT, and neurophysiologist. Nomenclature can create challenges with discoverability, not only for job seekers but also for students searching for prospective programs. When discussing the education, training, and entry-level requirements of ND professionals who fall into a gray area and the lack of sufficient data, research, and literature pertaining to the field of ND, the researcher used studies from health care as a whole (e.g., nursing) as well as specific allied health specialties, such as radiology, respiratory therapy, and medical laboratory sciences.

Statement of the Problem

The problem addressed in this study was low student enrollment in ND programs in the United States, resulting in an increasing shortage of ND professionals working in the field (Boldery, 2019; O*NET Online, 2023). Enrollments across all sectors of education have declined; however, the decrease in enrollments in allied health programs across the nation is concerning (Perez-Vergara, 2019; Whitford, 2022); therefore, it can be extrapolated from this information that ND program enrollment has declined as well. In a study on the use of

technology and its effect on education pertinent to ND, Marsh-Nation (2019) noted the need for more graduates of ND programs to fill the shortage of NDTs. While there are statistics demonstrating low enrollments in higher education, there is a gap in the literature regarding low enrollments in ND programs.

Limited scholarship regarding ND education has been published. Increasing the amount of research involving the education of those employed in ND can spread awareness of the field to health care organizations, educational institutions, ND professionals, students, and even patients. This study helped highlight low enrollments so this may not be overlooked and assisted in determining the cause so change can be implemented to prevent further decline. The impact of low enrollments is the added strain on an already struggling workforce experiencing insufficient staffing. This strain stems from staff preparing for retirement, burnout from workplace stress (compounded by the impact of stress due to the COVID-19 pandemic), and a need for a technologically advanced and prepared workforce (AHA, 2021b). If the trend persists, an already burdened workforce could continue to be stretched, decreasing patient care (McNall, 2020).

The quality of patient care is influenced by declining enrollments and subsequent decreasing staff (AHA, 2021a). When they enter a health care facility, each patient expects to be treated by someone capable and qualified in their field. To better serve patients, consideration and an attempt to understand the cause of low enrollments may help in the effort to combat the health care professional shortage. Not only is the organization affected by department management struggling to fill positions, but department employees are impacted by the lack of qualified staff (AHA, 2021a). This can place undue stress and an increased workload on qualified employees while creating division within a department (AHA, 2021b). An unprepared employee in a field hired without adequate training or education may be unable to communicate

effectively with the interdisciplinary team caring for the patient. Understanding the cause of low enrollments in ND programs can aid hospital administrators and educational leaders in providing a qualified workforce for health care organizations (McNall, 2020).

Purpose of the Study

The purpose of this descriptive qualitative study was to explore the perceptions of ND program directors and their views on the low enrollments in ND programs in the United States. Low enrollments can potentially impact ND departments in health care organizations. Understanding the causes of low enrollments may assist program directors in modifying and promoting their programs for prospective students. Low enrollments throughout the higher education sector affect the health care shortage (Whitford, 2022) and, more specifically, the ND sector (Boldery, 2019).

Low enrollments affect the field of ND, which creates difficulty in having sufficient, qualified personnel to conduct procedures (McNall, 2020). Low enrollments in ND programs subsequently produce low numbers of graduates; the current graduation rate is insufficient to supply the projected need (Boldery, 2019). The researcher used data concerning education administrators' perceptions to provide insight into the cause of low enrollments in ND programs in the United States. The research question was designed to help understand the perceptions of ND program leadership regarding low student enrollments in ND programs in the United States.

To ensure the interview questions' effectiveness, the researcher searched for volunteers to participate in a field test. This was done to determine the efficacy of the intended interview questions and to obtain feedback from this small group who had questions, comments, and suggestions used to amend the interview document. The field test provided a groundwork for assuring the rigor of the interview process of this study (see Malmqvist et al., 2019). This group

of volunteers were chosen from ABRET-recognized, nonaccredited NDT programs. Programs were selected from major regions of the United States to provide a representative sample. Each field test volunteer was contacted via the departmental email provided on respective program websites and asked for their willingness to participate (see Appendix A). After the volunteers agreed to take part, the researcher sent individual emails to set up meetings, conduct the interviews, and make necessary adjustments based on feedback. No data were collected during the field test.

While awaiting proposal approval, the researcher sought site permission from each potential educational institution (Appendix B) to conduct research with the program directors. This information was added to the Institutional Review Board (IRB) application of the University of St. Augustine. Once the research proposal was approved and the IRB granted permission to conduct the study, the researcher sought to obtain volunteers to participate in the formal portion of the study (Appendix C). These potential volunteers were program directors from ND programs across the United States. To obtain the necessary number of volunteers, ND program directors were contacted via email, asking for willing participants. When the participants agreed to be in the study, the researcher set up individual meetings via Microsoft Teams to conduct the interviews.

The subject matter reviewed and discussed in this study is allied health and low enrollments in ND programs. The interview questions were designed to help determine the causes of low enrollments in these programs and their effects. Low enrollments may affect the workforce and the patients being served; therefore, this was explored by assessing and analyzing the perceptions of ND program directors. Participants' responses were reviewed and analyzed for emerging patterns. The researcher further analyzed these patterns for connections with the

conceptual framework of this study. Program directors have a unique position within the field of ND, as they have a grasp of both academic and clinical aspects. The researcher, as an NDT, was able to use experience when determining significance when reviewing and analyzing the data and highlight the terminology and patterns as they appeared within the research (see Campbell et al., 2021).

Materials and Instrumentation

The instrumentation used in this descriptive qualitative study was an interview protocol (Appendix D) and a set of interview questions (Appendix E) predetermined by the researcher. This was done to promote consistency between each interview and maintain focus on the topic discussed. After agreement was obtained to interview the participants, interview appointments were set up with each and conducted via online meeting software. The researcher led semistructured interviews, using follow-up questions to probe deeper into the subject and obtain adequate responses. This method is considered effective for data collection in qualitative health care research (Kallio et al., 2016).

A predetermined set of questions guided the interviews to ensure the interviews were consistent and remained uniform for all participants. Although the researcher took field notes during each interview, the audio portion of the interviews was simultaneously transcribed with the speech-to-text software Tactiq for further review during the analysis phase. Although there was an interview protocol, there was some variability in the participants' responses. The researcher conducted simultaneous analysis throughout the interview process (see May et al., 2022); the formal analysis phase was the identification of the major themes that emerged from the perceptions of each participant.

During the interviews, transcription software (Tactiq) was utilized to create a record of the conversation to give the researcher an opportunity to review the information. Once each interview was completed, the researcher made a reflexive note to document and identify items or characteristics as significant for further analysis (see Renjith et al., 2021). The reflexive note was relevant to this research to strengthen the reliability and promote neutrality of the researcher's participation (see Campbell et al., 2021; Olmos-Vega et al., 2022). Although the researcher acted as an independent interviewer, the subject matter required insight into the significance of the information. As each interview was transcribed, elements relating to the specifics of ND stood out as significant and needed to be documented for the data analysis portion of the study. The researcher determined the significance of terminology due to their specialization and experience in the ND field (see Campbell et al., 2021; Garvey & Jones, 2021; Kiegelmann, 2002).

The researcher used inductive coding to determine common themes that emerged from the participants' responses. The coding occurred concurrently with the review of the data; themes emerged while the interviews were being analyzed and compared (see Chun Tie et al., 2019). There was the possibility of some variability of answers and themes based on geographical location, which could have affected students' enrollments in ND programs. A portion of the data analysis was done as it was gathered, which was part of the reflexive thematic analysis and included links to symbolic interactionism (see Chun Tie et al., 2019; May et al., 2022). Utilizing this approach allowed the researcher to construct and denote significance regarding emerging themes presented by the participants (see Campbell et al., 2021; Chun Tie et al., 2019).

Population and Sample Size

The population chosen for this descriptive qualitative study was ND program directors across the United States. For the field test, three volunteers were sought for participation from

major regions of the country, which provided the researcher with the ability to determine any potential problems that may have detracted from the interview process and the overall data collection and analysis (see Chenail, 2011; Roberts, 2020; University of Phoenix, 2015). These volunteers were program ND program directors found on the ABRET website. An email was sent to each via their corresponding school contact information to ask for assistance and willingness to volunteer for this part of the study.

The formal research interviews were conducted virtually through the video conferencing software Microsoft Teams. Participants were from across the United States; therefore, the research site varied. However, the structure of the interviews was maintained throughout regardless of the participant's physical location. Permission was received from each site director prior to conducting the interview and was submitted in this study's IRB application. Once IRB approval was received and necessary modifications were made to the interview protocol, the researcher recruited a formal study population of nine participants. This population size is considered adequate for qualitative research and allows for in-depth interviews while providing enough data for themes to emerge (Vasileiou et al., 2018).

Conceptual Framework

The conceptual framework for this study was made from the compilation of human capital theory (HCT; Galiakberova, 2019), self-determination theory (SDT; Battaglio et al., 2022), and the theory of planned behavior (TPB; Pourmand et al., 2020). The researcher used a descriptive qualitative study that did not include a single structured theory that set standards or framework for this study (see Kahlke, 2014). HCT, SDT, and TPB provided this study's framework and explanations for prospective students' motivations for choosing educational programs or career paths. The main concepts relevant to this study were individuals as human

capital, a person's choice of education guiding their career choices, and various career options causing an individual to choose other careers or return to education for more career options. Another concept that pertained to this research was the shortage of health care personnel and low enrollments in health care related education programs; this intersected with HCT, SDT, and the TPB, which were used to explore low enrollments in ND programs in the United States (see Boldery, 2019; McNall, 2020).

The conceptual framework for this study was constructed from elements of HCT (Galiakberova, 2019), which provided theoretical grounding for the study. SDT (Battaglio et al., 2022) was used to better understand a person's process in career choice, and the TPB (Bosnjak et al., 2020) was incorporated to explain human behavioral choices regarding education and career selections. By combining the strengths of these theories, the researcher created fluidity within the study to allow for a better understanding of the choices made when deciding to enroll in an educational program (see Garvey & Jones, 2021). In this descriptive qualitative research study, the researcher utilized portions of the three theories to create a solid foundation for the study.

The concept of health care professionals as the human capital of a health care organization prompted the researcher to investigate this topic of study. Placing value on health care professionals, as well as recognition of staffing shortages, specifically in the field of ND, and a devaluation of the human capital (specific to ND), also prompted this research. The urgent shortage of health care professionals demands an investigation of the underlying causes. The physician and nursing shortage is well-documented; however, the lack of allied health care professionals is also concerning (AHA, 2021b). HCT can be integrated with SDT and TBC to understand the complexities of the ND professional shortage. These theories provide a means for understanding an individual's decisions when determining education and career choices.

A person's career choice influences potential educational decisions, which can create a lasting effect on an individual's life (Sabouri et al., 2020). Some staff shortages can be attributed to low health care program enrollment (Boldery, 2019). Low enrollments in higher education are documented and are a cause for concern (Pratt et al., 2019). Low enrollment and shortages of workers are related, and each places stress on the other, causing a never-ending cycle of defeat (Ton-Quinlivan & Brown, 2020). In this qualitative study, the researcher utilized a descriptive qualitative design and applied HCT, SDT, and TPB as the conceptual framework.

Research Question

The research question addressed in this study was:

RQ. What are the perceptions of ND program leadership on the low student enrollment in the ND programs in the United States?

Significance of the Study

While low enrollments are an important trend to monitor across higher education as a whole, it is especially important to follow in the allied health sector (Hobson, 2021). This is especially significant as there is a need for individuals to enter the workforce as staff retires as well as fill the need as each health care sector, such as ND, grows and expands (Schwartz, 2022). The U.S. Bureau of Labor and Statistics (2022) determined that health care occupations will need applicants for approximately 2.6 million job openings through the year 2030, which demonstrates faster growth than other professions. As the year 2030 approaches, health care organizations and educational institutions need to urgently address this demand to develop and implement plans to combat the projected worker shortage. An aging workforce not only creates a shortage of health care workers but also forecasts an aging population in need of health care. By addressing this problem, health care organization administrators can strategize for necessary

labor costs, train and educate the next generation of qualified workers, and provide the aging population with the care they need (Cherry, 2014).

Assumptions

An assumption in this study was that those program directors who volunteered to participate were in their positions long enough to provide well-developed perceptions that could aid in the research. It was also assumed the participants had a background in ND to better understand the needs in the field and the workforce when providing answers to the interview questions. The investigator postulated that this study could provide educational institutions with valuable information regarding ND programs and that these organizations would use this research to aid program development. The material derived from this study would also be valuable to ND department administrators in health care organizations as this could offer guidance and insight into a projected workforce and their departments' needs.

The researcher presumed all answers and information provided in the interviews were honest to allow for accurate data analysis. The researcher reminded each participant that their responses and identity would remain confidential and provided an atmosphere where each could speak openly and honestly. It was presumed that the COVID-19 pandemic affected all areas of life, including education. While this significantly impacted the topic discussed in this dissertation, it was not meant to be the underlying focus. There was some intersection of the impact of the COVID-19 pandemic; however, the researcher sought information prior to the pandemic to establish a foundation for low enrollments based on pre-COVID-19 conditions. This, in conjunction with current issues of low enrollments, can be used by educational institutions to analyze the information and prepare their programs for a post-COVID-19 phase of education.

Limitations

Research studies inherently have limitations. One limitation of the current study was that it was designed to specifically examine low enrollments of ND programs throughout the United States. The ND field of health care is a small allied health field; it is common to have staff cross-trained in several specialties performing ND procedures. By using this group of professionals who perform these procedures but are not expected to complete formal training for this specialty, there was the potential to skew program enrollments numbers. Another limitation was that completion of an ND program is not a prerequisite for entry into the ND workforce, thus limiting the potential motivation of an NDT professional to pursue formal education. While there is no standardized educational requirement for an NDT, the lack of a requirement for education can factor into low enrollments. An additional limitation was that this study was focused solely on programs specializing in the EEG modality.

Although the COVID-19 pandemic has affected all areas of life, including education, it has impacted enrollments across all higher education (Whitford, 2022). Through this study, the researcher sought to understand the underlying reasons for declining enrollments. This research was designed as a descriptive qualitative study; therefore, a single theory was not used. Aspects from three theories were combined to produce a study as strong as other qualitative investigations (see Kahlke, 2014). Finally, there could have been a concern for potential inherent researcher bias; however, this was mitigated by developing a strong conceptual framework for the research study (see Johnson et al., 2020).

Delimitations

This study was limited to the field of allied health education and, more specifically, to the lack of enrollments in ND programs. All other allied health programs were excluded to provide a

scope of research that was feasible and specific to the research question. Programs not specific to training for the modality of EEG were omitted from this study to set boundaries for consistency with program analysis. Programs that have not graduated a cohort were excluded due to the lack of data that would have been useful for this study.

The methodological approach of reflexive analysis provided the foundation necessary for understanding why enrollments are low in these programs (see Harappa, 2021). This study also excluded program directors of ND programs outside the United States for consistency in data analysis. Another delimitation of this study was the research and review of the lack of enrollments in ND programs rather than a lack of the overall workforce in the ND profession. By pursuing an understanding of the perceptions of program directors instead of health care managers on the lack of enrollments, the researcher was better able to evaluate areas concerning educational institutions.

Definitions of Key Terms

Allied health. Specialty professions within the health care field that do not include physicians or nurses (Association of Schools Advancing Health Professions, 2015).

Allied health education. Programs designed to prepare health care professionals to enter into allied health professions (Association of Schools Advancing Health Professions, 2015).

Enrollments. Registering for a particular schooling program designed to train one to enter a desired profession (National Center for Education Statistics, n.d.).

Governing body. Mechanisms that provide guidance, regulation, and licensure/certification as needed or required (Institute of Medicine, National Academy of Sciences (US) Committee to Study the Role of Allied Health Personnel 1989).

ND The field concerning the neurological system of the body, monitoring the electrical processes of the body through the use of specialized equipment (ASET, n.d.).

ND program. A program specifically designed to train individuals to perform procedures relating to the brain and nervous system (National Center for Education Statistics, 2020).

ND technologist. Allied health professionals who are qualified and trained to gather and monitor patients' nervous systems (ASET, n.d.).

Organization of the Remainder of the Study

In Chapter 1, the researcher provided a broad overview of the study and background, detailing the conceptual framework and overall plan for the research. Chapter 2 is a review of the pertinent research literature. Chapter 3 includes the methodology used in this study and guides the reader through the process the researcher followed to collect and analyze the data. Chapter 4 provides an in-depth analysis of the data gathered through semistructured interviews with the participants. A summery, along with conclusions and recommendations, is provided in Chapter 5. Contributions to the literature as it pertains to the results of this study as well as implications for practice specific to ND are also discussed.

Chapter 2: Literature Review

In this descriptive qualitative study, the researcher explored the perceptions of ND program directors to discover the cause for low enrollments in these programs. ND is a specialty in the allied health category of health care. Allied health is a broad category consisting of colleagues who perform multidisciplinary duties other than those of nurses and physicians (Jaffe, n.d.). The personnel in this group make up 60% of the health care workforce of the United States (Ressler, 2022). Many specialties have well-defined requirements for entry into the field, while others are more ambiguous and based on facility needs and policies (Frogner & Skillman, 2016).

Entry-level requirements include completion of a formal program, proof of an earned credential, or an expectation of earning a credential within a specified allotted time; however, over the past several years, there has been a decrease in higher education enrollments, not only in general but also in allied health programs (Juszkiewicz, 2020; NSCRC, n.d.). In an already strained workforce (Perez-Vergara, 2019), this decrease can further exacerbate the shortage of health care workers (AHA, 2021b). The researcher framed the study surrounding the topics of allied health care programs, the shortage of health care workers, ND programs in the United States, allied health care training, low enrollments in allied health care programs, and the impact of patient care due to low enrollments and health care shortages.

The literature regarding ND as a professional field is sparse; therefore, support for the concepts of allied health enrollments and workforce training were obtained from nursing literature as well as other allied health fields more established and well-defined in the health care system. The researcher utilized the University of St. Augustine for Health Sciences and Indiana University library databases when searching for relevant content for this study. The following databases were used when searching for applicable literature: JSTOR, EBSCO, PubMed, ERIC,

Science Direct, ProQuest, and Taylor and Francis. Google Scholar was also utilized when searching for potential sources, followed by a search at either university for access to the desired documents. The researcher began with a broad search to determine the feasibility and availability of the literature resources. The following search terms were used when looking for relevant documents to support the research: *allied health*, *neurodiagnostics*, *higher education enrollment*, *allied health training*, *vocational training health care*, *health care shortages*, *descriptive qualitative research*, *qualitative research* (health care), and *reflexive thematic analysis* (qualitative research). To reduce the large number of sources, the researcher limited the search to the last 5 years. In some instances, it was necessary to include references published before this timeframe.

Conceptual Framework

In the conceptual framework for this study, the researcher used HCT (Galiakberova, 2019), SDT (Battaglio et al.), and TPB (Pourmand et al., 2020). Aspects of HCT and TPB were used to support the areas of career pathways, college choice, and the valuation of human capital. Concepts that guided the overall structure of the study included human capital, education choice impacting career paths, and career variability. These concepts factor into the perceptions of prospective students as they decide to enroll in further education or change careers. Another main focus of the study was the health care workforce crisis observed most significantly since the onset of the COVID-19 pandemic. Human capital as a factor in self-determination and planned behavior affects the health care workforce and was the driving force behind the creation of the research question for this study, which addressed low enrollments in ND programs across the United States (see Boldery, 2019; McNall, 2020). Combining characteristics of several theories is supported within descriptive qualitative research (Campbell et al., 2021; Williams et

al., 2022). Each theory applied in this study is reviewed and discussed in the following sections, after which there is a reflection on theories that were considered but not selected.

Human Capital Theory

A student's role in choosing their career path and corresponding higher education choices is explained by HCT; students may subconsciously use HCT when making choices that affect their future wage potential (Holden & Biddle, 2017). While the concept of human capital was introduced by Smith (1776/2000), who wrote about HCT and its impact on a nation's economic potential, the idea became better defined and understood in the mid-1900s (Stein & Sridhar, 2019). This same concept applies to health care systems (due to the valuation placed on the human capital of an organization) and, ultimately, individuals (demonstrated by career and higher education choices), which suggests a person's inclination for making a particular career choice. The perception of job outlook and growth can influence an individual when deciding on a path for joining the workforce (Holden & Biddle, 2017).

Students may choose to enroll in a higher education program based on the fundamentals of HCT, and their perception of need or desire for higher education may influence their decision (see Galiakberova, 2019). Students will naturally begin to build a foundation of knowledge and develop experiences and skillsets. A student's perception of education may change and cause them to seek additional education to strengthen their skillsets, thus pursuing formal education programs related to their career choice (Kuzminov et al., 2019). Students who choose a higher education option may have a greater impact on a health care organization's economic stability and progress (Wyatt-Elkins, 2020).

HCT contains a component regarding economic and productive advancement, both for the individual and the organization (Stein & Sridhar, 2019). Individuals may internally validate

their job productivity and outlook through subconscious knowledge of HCT (Marginson, 2019). Allied health training can support the use of HCT as it can give the individual a perception of self-worth and productivity. The sector of health care, including allied health, falls under vocational training as each of these specialties requires some type of skills validation and competency justification. Vlaardingerbroek and El-Masri (2008) suggested that those who complete vocational training develop a sense of accomplishment due to the practical nature of their job.

HCT allowed the researcher to gain a glimpse into program directors' perceptions while also understanding why students would choose to enroll in higher education or, more specifically, allied health programs (see Aliu & Aigbavboa, 2019). A study conducted regarding microcredentials detailed how a student might choose a vocational program (such as allied health) to obtain a practical job with a high degree of employability (Wheelahan & Moodie, 2021). This is highly significant to the career field of allied health and specifically to NDT. As students are subconsciously inclined to choose a useful career, they are utilizing portions of HCT. HCT fits with the concepts of SDT, which explains how and why individuals choose a particular career path.

Self-Determination Theory

An employee’s perception of career outcomes and viability may contribute to workplace engagement and provide an avenue for continuing education (Battaglio et al., 2022; Deci, 1971). When making choices to advance in a career, one moves from a phase of career choice into those of self-reflection, skills acquisition, and job satisfaction; then, the employee may employ SDT (Blanchard et al., 2019). While there is an underlying assumption of at least minimal motivation, an employee who also is a student can demonstrate a need and desire to further their education

and competence in the workforce; therefore, through education, the student becomes a more skilled health care professional (Meyer et al., 2022). SDT suggests that a person will increase their engagement in active learning, both on the job and potentially in academia, thus becoming a more qualified employee (Crary, 2011; Fagan et al., 2021).

SDT can explain the inherent motivation within a person. The theory was developed by Deci (1971) as a means to shift from the classical belief of Skinner's behaviorism. This description of motivation accounts for a person's desire to feel accomplished and fulfilled within a particular job (Deci, 1971). A person's motivation for advancing in a career by developing higher-level skills and various competencies within their chosen field can also demonstrate the use of SDT (Blanchard et al., 2019). The advancement of competency and skill level causes the employee to engage in daily learning while also applying the knowledge to their job activities more proficiently (Fagan et al., 2021; Meyer et al., 2022).

Theory of Planned Behavior

A person's fundamental thoughts about social behavior and its impact on future behavior can be explained by TPB (Pourmand et al., 2020). The concepts supporting this theory fit well into health care education research as TPB can help explain student behavior changes (Sabouri et al., 2020). The theory was developed by Ajzen (1985) and provides a framework for understanding how individuals choose a certain behavior or make a choice. TBP can serve as a predictive model, which can be utilized by educational institutions to postulate interest in various programs (Ajzen, 2020). Wang et al. (2022) noted the benefit of using TPB in conjunction with shared decision-making practices. This study demonstrated the responsibility an individual can maintain to change personal behaviors and outcomes. Through a change of this kind, a person can alter their education and career outlook. The Wang et al. study provided an opinion on the

choices an individual makes regarding education and how this may adjust their behaviors and viewpoints toward their job and the expectations surrounding their job responsibilities.

TPB pertains to an individual's higher education choices. Based on perceptions of behavioral consequences, positive and negative effects of such behaviors, and the expectations of accepted behaviors, this ultimately affects one's career choices (La Morte, 2022). Bosnjak et al. (2020) provided examples and discussed individuals taking responsibility for their goals as well as determining a path to accomplish them with an increase in perceived control of behavior (e.g., education and training in an allied health career in the context of this study). TPB is an explanation of an individual's attitudes and choices, which in turn can be a determinant of career choice (Fort et al., 2015). The medical field offers many career choices that have various trajectories. A person's initial choice to pursue one specialty may change over time and can be explained by TPB. Understanding the background of this theory and the drive that causes a person to change can assist health care administrators as they review staffing turnover and educational needs.

Researchers have suggested that TPB can explain an individual's likelihood to change based on the degree of commitment to a particular idea (Sussman & Gifford, 2019). The foundation of this theory is individual pride in one's stake in career development and choices; these choices can then impact higher education enrollments and an individual's future career path (Sabouri et al., 2020). Fort et al. (2015) conducted a study in the United Kingdom and found that TPB provided insight into the intentions of individuals to select a job with a particular company, indicating that the attitude and confidence of the participants were significant factors in their choice. Using this concept, ND program administrators can promote their program as

rigorous and worthy of higher education while seeking to inform others of the specialty of ND and its various attributes, thus influencing the attitudes and confidence of prospective students.

Although TPB provides insight into prospective students' and job seekers' thoughts and attitudes, it was not the strongest theory to support this research project. Limitations of TPB are in the measurement capacity of the research surrounding this theory (Moses et al., 2020). Another potential limitation of using TPB is the variability of context, time, and behavioral characteristics that leads to questioning the dynamic process of choosing a higher educational program or a career (Hatisaru, 2021). There is a push for further research and development of TPB to utilize its fullest potential (Fort et al., 2015; Hatisaru, 2021; Moses et al., 2020). However, for this research and when used in conjunction with the other theories presented in this study, TPB was sufficient to explain and conceptualize the perceptions and choices of students and job seekers.

Adjusting attitudes and behavioral choices could have the potential to be utilized in the education sector to promote student choice of educational programs. ND, as a subset of allied health, falls under the umbrella of vocational training. It is not uncommon for there to be a negative perception of vocational training (Yau et al., 2018). There can be disdain toward allied health programs (as a subset of vocational training) as a viable career option because many of these programs are offered at community colleges as vocational training rather than 4-year colleges or universities (Monk, 2018). A student’s choice of vocational education could be linked to their cost-to-benefit analysis (Perez-Vergara, 2019). One way to integrate TPB into the vocational training scenario is to change students' attitudes and confidence in these programs.

One significant aspect of TPB is the influence concerning attitude on an individual’s life decisions (La Barbera & Ajzen, 2020). This element can affect an industry based on accepted

social norms and ideas (Sussman & Gifford, 2019). One particular societal perception is that vocational training is a subpar field of education compared to the currently accepted viewpoint that a 4-year degree from a college or university is the standard for success (Holzer & Baum, 2017). In the health care sector, there are varying viewpoints regarding the value placed on allied health care professionals (Seaton et al., 2021). This can affect enrollments of various allied health programs, including ND. Attitudes concerning vocational training are based on societal norms and can be explained through TPB.

A fundamental shift in the perception of vocational training occurred in the 1950s–1960s (Holzer & Baum, 2017). This helped form the preconceived idea that vocational training was a lesser form of education and, subsequently, a lesser form of career achievement and accomplishment (Holzer & Baum, 2017). Perceptions of these types of jobs (such as allied health, including NDTs) can impact a student's choice of higher education and school. Because these programs are generally offered at community colleges, the perception that this schooling may lack the rigor of a 4-year college or university may deter some students and families. On the other hand, in countries outside of the United States, vocational training may be viewed as one where an individual can experience success and productivity (Vlaardingerbroek & El-Masri, 2008). To mitigate this perception, ND program administrators could promote and discuss with prospective students the benefits and job outlook for their graduates. This can potentially change attitudes regarding vocational training (La Barbera & Ajzen, 2020). Although TPB provides an explanation for long-term career and higher education choices, SDT provides the reader with the groundwork to understand the motivation behind pursuing and persevering in a chosen career or educational path (Maurer et al., 2012). HCT allows the reader to understand the valuation placed on a career and how it affects a student's career choice.

Framework

The researcher developed a framework that supported this study by combining the elements of the three theories, HCT, SDT, and TBD, and integrating them into the descriptive qualitative study design (see Kivunja, 2018). The flexibility of utilizing aspects of multiple theories provided an avenue for fluid interpretation of the data as they were collected (Kallio et al., 2016). The semistructured interview approach allowed the researcher to utilize prior experience in the field of ND to connect with each participant while also understanding the importance of each interviewee's perceptions to identify emerging themes (see Chun Tie et al., 2019). The researcher followed the protocol of May et al. (2022) when implementing a simultaneous approach to analyzing and drawing conclusions from the collected data.

Historical Framework

As a framework was developed for this study, a historical review was completed to support the descriptive qualitative design. The researcher reviewed the theories supporting qualitative methodology and how one can understand the participants' perceptions. Historically, qualitative research methods have been looked upon as an approach that is less than credible (Sandelowski, 2000). Because there is an element of abstract analysis and significance placed on terminology, reliability in this method of research has not been viewed by some as achievable; however, descriptive qualitative research provides the researcher and the reader with an avenue to interpret and understand the thoughts and perceptions of those participating in the study (Sandelowski & Leeman, 2012).

Although quantitative research has been the preferred methodology for health care research, many have demonstrated qualitative research's value, reliability, and credibility by studying and investigating topics in health care and related fields, such as health care education

(Al-Busaidi, 2008). Researchers have utilized some of the more commonly recognized qualitative design subcategories, such as grounded theory or phenomenology; however, Sandelowski (2000) suggested some of these designs are an inaccurate use of qualitative research. The more suitable design for this study was a descriptive qualitative approach; the researcher can use this design to create a well-rounded discourse and analysis of the collected data. The evolution of health care and health care education necessitates this progress and change in the advancing research, which causes a shift toward the increased use of qualitative studies within the health care field.

The elements of qualitative research are important in developing a study that allows readers to understand processes that occur in their own or similar health care fields. However, descriptive qualitative research has significant characteristics. The descriptive element presents to the reader the data collected in a manner that does not overly analyze or collate the results; rather, the reader can draw conclusions from the presentation of the data (Sandelowski, 2000). Part of this process includes triangulating the information and forming conclusions based on the previous research, emerging themes, and implications of the collected data (Cooper & Endacott, 2007; Sutton & Austin, 2015).

Triangulation

A strict interpretation of the triangulation method includes collecting data from multiple sources and through alternative methods (Cooper & Endacott, 2007; Guion, 2002). This method of evaluation and analysis can allow the researcher to demonstrate the rigor and reliability of the studied topic. Triangulation has been used in health care research to establish validity, explain human perceptions and choices, and reduce bias (Noble & Heale, 2019). Although this researcher utilized one method of data collection, the foundational sources, incorporation of

theories explaining human behavior, the choice to interview program directors of various ND programs across the United States, and the use of an independent expert in the field of ND to verify emerging themes, demonstrated triangulation that validated the findings and supported conclusions (see Guion, 2002; Noble & Heale, 2019).

Triangulation in research regarding health care topics is an effective method of studying phenomena, whether the subject is direct patient care processes or an extension of health care topics, such as administration or education (Moon, 2019). By providing a pathway to increase reliability and confidence in the formulated conclusions, the investigator offers an avenue by which future research on this topic may develop (see Renz et al., 2018). Due to the lack of previous literature in the field of ND, utilizing triangulation gave the researcher a foundation and path to develop current literature to support the research question of this study as well as future research questions.

Current Literature on Health Care Qualitative Research

The current literature regarding qualitative research demonstrates strong support for the rigor of using a descriptive qualitative design in health care education research (Colorafi & Evans, 2016). Although there is inadequate research detailing commonly used theories in ND, there are peripheral uses of qualitative studies within the health care spectrum of research that have utilized SDT, HCT, and TPB. This is demonstrated in literature sources; research from larger health care fields were used for this study (see Cooper & Endacott, 2007; Doyle et al., 2020; Garvey & Jones, 2021).

Research with discussions of phenomena in the nursing field is readily available. This also points to a portion of the problem when studying topics in the field of ND. Without adequate literature to review for the subject of ND education, it can be difficult to demonstrate direct

correlations; however, using other health care literature provided the researcher with the background to find appropriate frameworks and guiding sources for designing this study. Researchers examining the processes and procedures of descriptive qualitative research with a reflexive analysis component have suggested frameworks for those studying nursing topics (Campbell et al., 2021). The investigator used this information to design this study for ND.

In a study examining the need for continued support and supervision of allied health professionals, Snowdon et al. (2020) utilized an interpretive approach of descriptive qualitative research. This suggests that descriptive research was acceptable for this study, which required a description of the perceptions of program directors' views on low enrollments. Researchers conducting studies on health care topics seeking to understand human behaviors or phenomena regarding a specialized topic are encouraged to use this type of design as described by Sandelowski (2000). A specialized subject such as low enrollments in ND programs is one in which there is focused audience, a smaller grouping of health care professionals. Sandelowski (2010) noted they did not create or develop this particular approach but sought to clarify and promote its use in research studies relating to health care. When seeking to explore concepts and concerns within the health care sector using a qualitative approach, it is acceptable and encouraged to use a descriptive design to understand and concentrate on the responses of the participants and emerging themes from the data (Afaya et al., 2021; Renjith et al., 2021).

Although there is current research within the context of education for nursing and other allied health programs, there is little for the ND profession. This leaves a gap in the literature and suggests a need for more research. The researcher used literature from other medical fields to support the conceptual framework of this study. When seeking literature to support this study, the researcher found studies with descriptive research protocols for investigations regarding

health care processes, patient care, or educational initiatives used to teach health care professionals how to conduct research (Cooper & Endacott, 2007; Garvey & Jones, 2021). The gap in the literature was not only identified for this study's research question but also a gap was noted when searching for literature that contained investigations into health care education and training (Comer et al., 2022; King et al., 2022). Allied professionals have the capacity and willingness to learn and conduct research, but there has never been a priority or demand for continued research in these medical specialties (Cordrey et al., 2022).

Recent literature provides a discussion of the benefits and challenges of online learning during the COVID-19 pandemic. Other qualitative studies have been completed to understand student motivation in higher education (both general education and health care programs). Research also exists that contains reviews of higher education enrollment trends; however, peer-reviewed literature is lacking as the topic begins to narrow within health care specialties, particularly in subjects related to allied health. Delany and Bailocerkowski (2011) discussed the need for research on this group of professionals to aid in the ever-evolving medical field and to prepare health care professionals to implement evidence-based practices. It also has been stated by those in the field of physical therapy that there is a need for evolving academic practices and outcomes in allied health professional education as it pertains to the ability to conduct and implement current research (Sniffen, 2005).

Alternative Methods and Designs

Other methodologies and designs were considered for this study; however, they did not fit the nature of this research as effectively as those selected. The researcher contemplated using quantitative methodology; however, because the goal was to understand and examine the perceptions of individual program directors, the decision to use a qualitative methodology was

made. Although a mixed-methods approach could have been used, it was unnecessary as the research question could be answered using only qualitative methodology (see Halcomb, 2019; Wasti et al., 2022). Another reason these two methodologies were not selected was because of the small number of ND programs nationwide (see Sebele-Mpofu, 2020). The researcher decided there would not have been enough responses for a true statistical representation of this group, nor could it account for statistical anomalies or outlier responses. For these reasons, the researcher chose a qualitative study for this investigation.

Under the umbrella of qualitative research are multiple designs that could have been used: grounded theory, phenomenology, ethnographic, and historical (Renjith et al., 2021). As this study was developed, grounded theory was originally chosen as its design; however, the definition and concept of this approach did not fit the purpose of this study (see Cooper & Endacott, 2007; Garvey & Jones, 2021; Sandelowski, 2000). Ethnographic and phenomenology had elements that could have been useful in this study, but the researcher sought to describe a phenomenon pertaining to a specific population of health care professionals. However, neither of these designs would have provided the type of data to answer the research question.

Management and situational theories were considered potential contributors to the overall strength of the study; however, they were not selected for the conceptual framework as they did not provide information helpful for studying perceptions of the program directors as they pertained to low enrollments in ND programs. Theories relating to human behavior were reviewed, and three were chosen as they provided the researcher with a better foundation on which to build the descriptive framework. The student integration model was also reviewed as a potential option for this study, and it initially appeared to fit into the research framework. However, theories such as TPB and SDT provided a larger scope of the psychology of decision-

making in students and employees (see Dewberry & Jackson, 2018). Another reason the student integration model was not chosen was due to the many variables affecting students' integration, retention, and motivation (see Goegan & Daniels, 2021). If too many variables exist in a study, the goals, outcomes, and subsequent conclusions can become lost and questioned. The primary focus of this study was the low enrollments in ND programs rather than how to integrate students into college life or their chosen workforce; therefore, the student integration model was not selected.

As this study was designed to investigate enrollments in educational programs, the researcher also considered the progressivist perspective theory. This theory was not selected as its focus is on holistic learning rather than providing a means to understand why there are low program enrollments. Another reason this theory was not used was its fluid and dynamic nature as well as its placement of education into the political sector (see Cekrezi, 2022). Progressivist perspective theory has been utilized to review technology in the classroom and its impact on the educational system (Rosevear et al., 2021). For these reasons, the progressivist theory was deemed unsuitable for this study.

Framework as a Guide

The conceptual framework serves as a model and checklist to ensure the reader that the research study maintained rigorous standards of investigation with a literature review to support the concepts and processes within the study (Kivunja, 2018). Each study needs a blueprint for exploring and investigating the subject (Garvey & Jones, 2021). By closely following the chosen framework, the researcher provided the reader with an outline and the information necessary to understand the perceptions of ND program directors. Using the descriptive qualitative design allowed the researcher to follow a framework with flexibility in theory selection and application

(see Braun & Clarke, 2019; Campbell et al., 2021). The interpretive and descriptive foundational portion of this study allowed the researcher to convey the emerging themes in a manner that is conceptually understandable to the targeted audience.

HCT merges and intersects with SDT and TPB to demonstrate an individual's motives when choosing education or career paths. These concepts were used concurrently throughout this study as support for understanding individual choice in education and career decisions that create lasting impacts (Holden & Biddle, 2017). Not only do these theories help to explain career and education choices, but they also provide the reader with a foundation with which to understand the struggles facing health care organizations challenged by the allied health professional staffing shortage. HCT provides the reader with an understanding of a significant portion of the capital (employees) on which health care organizations may rely to promote progress and advancement within the industry (Stein & Sridhar, 2019).

Although the human capital is an important element within the health care field, there are many career options and choices an employee may select to change or grow in their career. This process integrates SDT and TPB as one considers the long-lasting implications of career choice. As mentioned previously, SDT provides the reader with an understanding of an individual's likelihood to stay within a particular career or to make a switch to another career path; this also factors into a person's view on the longevity of a career position or the stability of an occupation, thus connecting to HCT and the corresponding impact on the health care industry (see Battaglio et al., 2022). These concepts may provide an understanding of the underlying reasons affecting enrollments in various health care programs, such as ND.

Employee engagement in an organization is an important factor that may impact the affluence of a facility by affecting the organization's culture (Forner et al., 2020). SDT, along

with an employee's engagement with a job, allows one to understand the choices an employee makes regarding the need for more education or longevity within a chosen career (Battaglio et al., 2022; Blanchard et al., 2019). The longevity an employee foresees concerning their job may factor into their determination and motivation to pursue education. This type of motivation can affect higher education enrollments, such as allied health care programs and, more specifically, ND education programs. Employee engagement in an organization affects their plans when choosing to stay with a current career choice, advance their career with additional education, or change their career path.

Ajzen (2020) discussed the decisions a person can make when reviewing their potential within a chosen career path. The implications of these choices factor into an individual's view of a particular job field and its potential as a viable career, such as ND. The accepted norms and social viewpoints surrounding a specific career may affect enrollments in a health care program such as ND, thus demonstrating how individuals interested in health care careers may choose one specialty over another (La Morte, 2022; Wang et al., 2022). Regardless of one's initial decision to choose a higher education option after high school or directly enter the workforce, each individual is continually on a path of learning (Selingo & Simon, 2017). Within the health care industry, learning is part of the job where there will be constant changes, developments, and opportunities for learning and developing skills. These types of opportunities provide the reader with an understanding of the concepts of individual choice when making career decisions and behavior changes that may affect ND enrollments, as investigated in this study. The health care industry depends on human capital and is impacted by the various career choices and paths that its employees may pursue. Many of these decisions rest on an individual's choice of higher education and motivation to learn. The ND sector of allied health is one in which working

professionals and their education choices may affect the future of this specialty (Boldery, 2019; McNall, 2020).

Review of Broader Problem

Over the past several years, there has been a decrease in higher education enrollments, which has created a waterfall effect on enrollments in the allied health field (Juszkiewicz, 2020; NSCRC, n.d.). The rising cost of education is one factor affecting enrollments as well as family and financial support (Georgetown University Center on Education and the Workforce, 2018). Enrollments in health care related programs have been researched over the past few years. Although some programs, such as nursing, have begun to see a slight increase in program interest and enrollments (Noguchi, 2021), they are unable to grant admittance to the full number of applicants due to a lack of resources, faculty, or seats in the program (Weismann, 2021). Regardless of these increases, there is still a shortage of health care staff across all specialties, including nursing and allied health (Health Resources Services Administration, 2022; NSCRC, n.d.). Although there has been a documented and projected shortage of health care workers, the COVID-19 pandemic exacerbated the problem and highlighted issues within the larger health care organizational structure that needs to be reviewed to prepare for the future.

The choice to enroll in higher education programs may factor into one’s future decisions and affect career trajectory (Iloh, 2019). By understanding this process and the causes and effects of low enrollments in higher education, specifically health care programs, educational directors of health care programs can create long-term plans to increase enrollments, thus working to fill health care staffing shortages in hospitals and other facilities. Research in health care and education can be used to communicate participants' perceptions and demonstrate trends through descriptive qualitative studies (Cooper & Endacott, 2007). Studies in nursing and emergency

care have shown that this type of research is useful and applicable for providing information vital for procedural and policy change in this sector (Cooper & Endacott, 2007; Sandelowski, 2010). While the published articles are limited in the field of ND, the underlying concepts of descriptive and reflexive qualitative studies still apply to research and communication of results.

COVID-19 Pandemic Impact on Health Care

The recent pandemic has had lasting effects on the health care industry (Gooch, 2021; Levine, 2021). Health care organizations reported significant financial losses during the height of the pandemic; however, because the pandemic has switched to an endemic phase, these organizations are beginning to review and plan for the industry's future (Carbajal & Masson, 2021). Staff have resigned because of low wages, while others have left the industry altogether due to burnout and career fatigue (Bernstein, 2021; Levine, 2021). Rising health care costs have indirectly impacted the health care industry, as did the length of stay for many COVID-19 patients (AHA, 2021a). Many of these patients need a high level of care that strains health care facilities and resources, with some hospital stays requiring write-offs from health care organizations (AHA, 2021a). At the height of the pandemic, COVID-19 was not fully understood; however, many patients now report neurological symptoms that have remained since their diagnosis. This is affecting the ND departments and ND staff due to the increase in testing to search for answers for these patients (Shanley et al., 2022).

Another effect of the COVID-19 pandemic on the health care and educational communities is the motivation to continue education and learning. With the greater availability of online courses and at-home learning, a student’s motivation and drive to focus on academic material have been challenged (Chiu, 2022). In-class versus online learning environments have altered the traditional classroom atmosphere while introducing another level of distractions and

difficulty with maintaining student engagement in courses (Suliman et al., 2021). The COVID-19 pandemic introduced many elements of uncertainty and strain on health care professionals, some of whom were also students. Increased stressors include work/life balance and the added complications of utilizing online technology as a primary source for coursework. Those who struggled with continuing or completing their chosen program also had to determine their plan to persevere despite the challenges, thus utilizing SDT and TPB to stay motivated (Chiu, 2022; Suliman et al., 2021; Teixeira et al., 2020).

While there has been more interest in health care fields from potential students since the COVID-19 pandemic, one of the factors affecting enrollments has been the lack of adequate staffing (AHA, 2021a; Fawaz et al., 2018). This may deter an individual from entering a field in health care due to the lack of interest in working in an environment that may continuously be short-staffed. This shortage may factor into a person's college choice when selecting a program and planning a future career path (Iloh, 2019; Wang et al., 2022). Although there is always the probability that the unpredictable may occur, individuals still plan for the future and weigh options; this process of planning for the future is explained by HCT and TBP (Ajzen, 1985; Stein & Sridhar, 2019). The value an organization places on staffing or departments affects employee engagement and the overall company environment (Forner et al., 2020). Describing these practices can aid in advancing ND programs and promote an increase in graduates; through this process, there is the potential to effectively decrease the labor shortage in ND experienced nationwide (Cooper & Endacott, 2007).

Shortage of Health Care Workers

The baby boomer generation continues to retire and leave a void in the workforce, which is apparent in the health care sector (Pollack, 2022). It is estimated that one-fifth of nursing

personnel will retire by the year 2025 (American Nurses Association, n.d.). The shortage of health care workers is not only due to retirement; the shortage also is affected by the need for personnel to care for the baby boomer generation. As this generation ages, they will require more medical services and health care workers to care for them (Pollack, 2022). Some of the shortage can also be attributed to low enrollments in higher education (Juszkiewicz, 2020; NSCRC, n.d.).

During the height of the COVID-19 pandemic, there was a shortage of workers supplemented by retired health care workers and others who may not have worked in direct patient care, such as administrators (Sabath & Colt, 2020). The personnel most affected during the pandemic were doctors, nurses, and respiratory staff; however, COVID-19 has also impacted the specialties of allied health (AHA, 2021a). Some shortages have come from wage disagreements, while others have chosen to leave due to burnout (Japsen, 2021). Although the COVID-19 pandemic has officially entered an endemic phase in the United States, the impact on health care and the various specialties is long-lasting (Biancolella et al., 2022). There will be continuing research on the effect of COVID-19 on various aspects of health care, but the current need for increased staffing must be addressed.

Allied Health

Allied health care professionals consist of all specialties except physicians, nurses, or dentists and are organized and further divided into specialties and subspecialties. Allied health personnel account for 60% of the health care workforce (Ressler, 2022). There is not one method or standardized requirement for entry into the workforce, which can create confusion and misunderstanding about staffing needs, entry-level requirements, and compensation ranges of various specialties. Also, the differences in the hiring needs of rural versus urban health care facilities puts responsibility on educational organizations to prepare students for any situation

(Njoku, 2019; Patterson et al., 2022). The value a health care organization places on a particular specialty will factor into the investment, education, and encouragement for the continuing education they require of their staff (Kenton, 2022). Physicians are the driving force behind ordering testing for their patients and expect a certain quality and competency from each person performing the testing. The ND specialty is not readily understood or equally valued across all organizations.

Neurodiagnostics

The diagnostic sector of neurology surveys the nervous system for various diagnoses (Seidel-Marzi & Ragert, 2020). NDTs monitor and record a variety of data from patients in different modalities, including electroencephalography continuous electroencephalography, long term monitoring EEG, evoked potential, intraoperative neurophysiology monitoring, and magnetoencephalography (ABRET, 2014). Technologists can choose one procedure in which to specialize or stack specializations throughout their careers. As a result, many may be credentialed in multiple modalities depending on the facility. ND procedure outcomes and testing may be used in conjunction with other testing to provide the patient's care team with a better idea of what may be occurring with a patient. The procedures and practices within ND are monitored and governed by both a professional (ACNS) and a technical (ASET) component. Just as physicians are the driving force in procedure orders across the allied health field, neurologists, in particular, are an important component in ordering ND procedures.

Neurologists rely heavily on quality studies for review and analysis; therefore, ACNS and other governing bodies of the neurology field provide guidance on the expected standards of technologists and submitted procedures within the ND field. The most recent documentation on standards and qualifications of NDTs was a joint venture of multiple governing bodies and

provided specific details about training, education, and credentialing (Lopez et al., 2023). The training of an NDT can vary across states and facilities as well as educational institutions. There is a shortage of NDT professionals in the United States—a small part of the larger problem of the shortage of allied health professionals nationwide (Boldery, 2019). This shortage can be linked to low enrollments in allied health and ND programs throughout the nation (McNall, 2020).

With the shortage of allied health professionals and NDTs, hospital administrators and directors of these programs can utilize and capitalize on TPB to better understand the thoughts and perceptions of prospective students and work to encourage a change in attitudes and perceptions of vocational training programs. These training institutions can produce graduates who have verified skills that can promote job acquisition and further improve their skills, thus increasing confidence and self-efficacy (Arnold et al., 2006; Hatisaru, 2021; Yau et al., 2018). One difficulty with some of these programs is the lack of consistency, making it difficult to promote rigor and confidence in this type of learning institution. There is a need to encourage students to enroll in science and math programs, not only at 4-year colleges but also in allied health programs (Moses et al., 2020).

Allied Health Training

The field of allied health is categorized as a vocational job field, and often these programs may be found at various community colleges rather than 4-year degree-granting universities (Skillman et al., 2012). Allied health consists of a broad field of professional jobs that do not fall under the umbrella of dentists, physicians, or nurses (Jaffe, n.d.). Some of the more popular, well-known allied health professions are respiratory therapist, pharmacy technician, and physical therapist. Table 1 provides a list of common allied health positions that fall into this general category of health care.

Table 1.

Common Allied Health Professions

Anesthesiologist assistant/anesthesia technologist	Diagnostic medical sonography	Medical assistant	Pharmacists/pharmacy technicians
Athletic trainer	Dietitians/nutritionists	Medical dosimetrist	Physical therapists/assistants/aides
Audiologists	Emergency medical technician, paramedic	Music therapist	Physician assistants
Cardiovascular technologists/technicians	Genetic assistants	NDT	Radiation therapists
Behavioral disorder counselors	Histotechnologist	Nuclear medicine technologists	Radiology technologists/technicians
Clinical laboratory workers	Home health aides	Occupational therapists/ assistants/aides	Respiratory therapist
Cytotechnology	Lactation consultant	Ophthalmic medical assistants	Speech pathologist/language therapists
Dental hygienists/ assistants/laboratory technicians	Magnetic resonance technologist	Perfusionist	Surgical technologist

Note. From "What is Allied Health" by Association of Schools Advancing Health Professions (https://www.asahp.org/what-is). Copyright 2015.

Education and training for this group of professions can vary across specialties, but in general, there is a classroom component combined with a clinical portion for the hands-on instruction and experience needed to acquire particular skills. The most recognizable profession for clinicals would be in a program such as nursing. Allied health programs can last from 1–3 years, depending on the specialty; many of these programs are vetted and accredited by CAAHEP. Programs that focus on ND training also contain a didactic learning portion, which is then strengthened by the combination of clinical training both in the classroom and in a setting that facilitates training with patients. When a prospective student views the cost-to-benefit ratio

of working in ND health care, HCT and TPB concepts factor into decisions and long-term choices. Should a person not be aware of the potential of this career, there may be little-to-no interest and, therefore, smaller enrollments in these programs.

Neurodiagnostic Training. Training for health care professions requires an understanding of the concepts being taught along with the expectation of applying theory and modification of procedures as necessary (Hashemiparast et al., 2019). It can be difficult to find trained technologists who have completed an ND program; therefore, it is still common to find institutions that provide on-the-job training for NDTs (ABRET, 2014). Because ND is not a career path regulated by federal or state licensure, ND professionals have a myriad of educational and career backgrounds (ASET, n.d.). It is not uncommon for smaller hospitals to have ND testing completed by an ultrasound technologist or respiratory therapist who also functions as an electrocardiogram technician and an EEG technologist (ASET, 2022b). Because of this need for cross-training, ND specific training can vary from site to site.

On-the-Job Training. For the past several decades, vocational training has been viewed as a lesser form of education and training (Holzer & Baum, 2017). With this systematic viewpoint, many have turned to 4-year degree programs as their primary entryway into a vocation. Although this has paved the way for colleges and universities to train students for various degrees and provide them with theoretical knowledge, the technical and experiential knowledge that comes with on-the-job training is lacking in many students, causing companies to spend time and money on employees who then may take that training elsewhere (Wyman, 2015).

Companies employ HCT by promoting on-the-job training as a viable form of career placement; this type of learning can be a way to promote longevity in the workplace (Dietz & Zwick, 2022). This training can also function as a feeder into various educational programs, such

as ND. For instance, if an ND department staff trains a new hire through on-the-job training, that employee may feel compelled or encouraged to enroll in an ND education program to find and establish a strong theoretical knowledge of that field. Those employees who have been taught and trained on-site can utilize their experience and skills and further their knowledge by completing an ND program to obtain the credentials specific to their work modality.

Although administrators of various organizations have utilized HCT through the application of on-the-job training, TPB offers an explanation for why individuals choose various career paths. The data demonstrates that it is common for NDTs to be cross-trained in different specialties of hospital allied health fields (ASET, 2022a). When positions become available in ND departments, an individual will consider the potential benefits of adding or transferring into this health care field. Although this pertains to the in-house transfer process, there is also an element of prospective job seekers and students looking to decide on a career via on-the-job training. This type of decision-making process may play a role in ND staffing and enrollment shortages across the United States. Another element affecting enrollments is training, as discussed previously. If a facility does not require higher education or credentialing from an NDT as a condition of employment, an individual may decide to forego further training, affecting future ND program enrollments.

Low Enrollments in Higher Education

Although on-the-job training has not always been viewed as a viable education option in the health care sector, there has not been a definitive correlation between higher education enrollments and the decrease in hospital on-the-job training. On the other hand, there is definitive research documenting the decline in higher education enrollments over the last several years (Whitford, 2022). There are various explanations for declining enrollments in higher education,

including financial, motivation, and job expectancy (Aratani, 2021; Juszkiewicz, 2020). Low enrollments across all sectors of higher education affect the job market and outlook for organizations as the baby boomer generation heads to retirement. Over the last few years, the impact of the COVID-19 pandemic has also played a part in the enrollment numbers, which educational institutions are monitoring (Aratani, 2021; Lorin, 2021).

Although enrollments have declined over many years, the pandemic highlighted a trend already creating a problem (Conley & Massa, 2022). Higher education low enrollments have included those entering programs in the health care fields (Aratani, 2021). Nursing, physician, and advanced practitioner programs are among those that have struggled to maintain enrollments, which adds to an already struggling health care system's staffing problems (Krupnick, 2020; Noguchi, 2021). Just as physician and nursing programs are experiencing low enrollments, so are allied health programs (Whitford, 2022).

Allied Health Enrollments

Allied health falls under the umbrella of vocational training, with many programs offered at the community college level (Skillman et al., 2012). There is often the perception of vocational training as a lesser higher education option compared to a 4-year program at a more traditional college or university (Holzer & Baum, 2017). This perception of degree and career viability based on the status of a vocational school can potentially affect enrollments in these programs. As general higher education enrollments have declined, the trend has trickled down to allied health program enrollments (Fain, 2021). There are different potential causes affecting low enrollments in allied health and medical programs, which include the COVID-19 pandemic and the rising costs of education (Aratani, 2021; Castleman & Goodman, 2018; Dundar et al., 2011).

Another area that could affect enrollments is the cost-to-benefit ratio of some programs. The salary outlook for various allied health careers may cause students to choose a different career path over allied health (Perez-Vergara, 2019). Depending on the program, some students find it necessary to pay for their allied health career educational program with a loan only to find out their future salary does not support the repayment of the loan, which may cause students to choose a different program with a higher salary potential (Tretina et al., 2020). Finally, program and career option visibility or awareness for incoming students may contribute to some programs being selected over others. If students are unaware of the program or its potential as a career, they may overlook it as an option.

The shortage of graduates in allied health education programs is causing an increased strain on the health care workforce. Combined with the current shortage of health care workers due to multiple reasons such as burnout and wages, the inadequate number of allied health care program graduates has created an even bigger problem (Bernstein, 2021; Levine, 2021). Although health care administrators are working to fill advanced practice position vacancies for physicians and nurse practitioners, positions that involve the allied health field are increasingly becoming harder to fill (Japsen, 2021). This creates a concern for health care administrators for several reasons. As the baby boomer generation is nearing retirement and leaves a void in the workforce, the age and size of this generation also contribute to an increased need for additional health care staffing (Pollack, 2022). Low enrollments in allied health programs causes a shortage of graduates entering the field of allied health (Weissman, 2021; Whitford, 2022).

COVID-19 and Allied Health Enrollments. The pandemic of 2020 caused health care personnel shortages in the present and affected its future outlook (AHA, 2021a). The added effect on allied health enrollments due to COVID-19 increased the shortages in the workforce.

(Aratani, 2021). Some allied health faculty returned to clinical work to assist in alleviating the burden on already overworked staff, which created a shortage of faculty able to educate upcoming allied health students (Fawaz et al., 2018). Program changes became fluid as many educational institutions sought to implement online learning to maintain enrollments as well as keep students progressing through their current programs (Aratani, 2021).

Another reason COVID-19 impacted allied health program enrollments was that thousands nationwide were furloughed, either temporarily or permanently, from their jobs, creating a lack of income to pay for school tuition (Conley & Massa, 2022). The effect of COVID-19 on allied health enrollments also caused program directors to work to redesign programs and recruit staff to fill the needs of a new generation of students (Aratani, 2021; Hashemiparast et al., 2019). Although the COVID-19 pandemic affected allied health care enrollments as a whole, the impact has reached ND program enrollments, highlighting a shortage in NDTs that is becoming more apparent as the pandemic has moved into the endemic stage (Boldery, 2019; McNall, 2020).

The current staffing crisis relates to the need for support from hospital administration. To create an outline for planning for the future and other potential pandemics that may affect the health care community, hospital administrations need to view and understand the changes to individual departments and staffing needs. Part of the support needed is encouragement regarding research and learning for the health care professionals who are persevering in their current positions (Wenke et al., 2020). Although an environment of support and encouragement for continued education and learning is important and necessary to increase employee engagement, implementation of research outcomes is key to providing a pathway that may cause employees to enroll in higher education programs with the goal of career advancement.

Neurodiagnostic Program Enrollments. The field of ND is not well known or understood, which can factor into the enrollment statistics of programs dedicated to training NDTs. Although ND falls under the umbrella of allied health, it is not in the radiology category. Radiology technicians can be trained in a program that covers the broad category of radiology, allowing the student to specialize after graduation and have been in the workforce; other students can enroll in individual specialty programs such as X-ray or ultrasound (Radiology Schools 411, 2023). With college enrollments declining, enrollments in smaller programs such as ND are even slighter and can cause education administrators to question the viability and longevity of the program; however, without enrollments, there would not be graduates entering the allied health field. Educational program directors and hospital administration have examined the causes of decline and searched for methods to alleviate the burden on current staff (Barfield et al., 2011; Carbajal & Masson, 2021). This burden can contribute to staff burnout and ultimately affect patient care. Directors of ND programs can utilize concepts from SDT, HCT, and TPB to assist in discovering and understanding the causes of low enrollments in ND programs.

Statistics regarding student drop-out rates in ND programs could be contributing to the low enrollment statistics bottom line. Administrators may view drop-out rates as reasons to close a program or students may view the program as too difficult or the ND profession as one which may not be a viable career future. The principles of SDT can help explain why students are not enrolling in ND programs and can help program directors create a plan to increase enrollments. It could be concluded that COVID-19 has played a part in lower-than-normal enrollment rates, which has roots in each person's intrinsic motivation (Suliman et al., 2021). During the COVID-19 pandemic, many made life choices that may have affected their career path and trajectory. These types of decisions can reflect the principles of both HCT and TPB. Some may have chosen

a field such as ND to build skills and gain more job security by demonstrating competence in the workforce (Wheelahan & Moodie, 2021). Understanding this thought process can be useful to program directors when determining how to effectively recruit more students for their programs.

Quality of Patient Care Affected by Low Enrollments

Without sufficient graduating students entering the workforce, the strain on the overburdened health care workforce will only increase. The impact of this can be seen in the quality of patient care as there is insufficient staffing (AHA, 2021a; McNall, 2020). The lack of staffing is partly due to low enrollments and an aging workforce entering retirement. Despite an increased interest in nursing programs, various factors limit the number of accepted students, which factors into low enrollments (Noguchi, 2021; Weismann, 2021). This struggling workforce is unable to fill posted nursing positions across the nation. The same is occurring in the allied health fields, including ND departments.

The lack of graduates across all health care fields has created a greater problem that is currently under review and acknowledged by health care administrations across the United States (Carbajal & Masson, 2021). The problem of low enrollments should be addressed jointly by educational institution administrators and health care organizations (Noguchi, 2021). A collaboration of this sort could provide a plan for quality patient care while preparing a workforce to take over as the generation of baby boomers retires and requires more health care themselves (Pollack, 2022). The combination of low enrollments and health care shortage plays a part in the development and future of the health care system (Carbajal & Masson, 2021). The theories applied in this research help explain the potential reasons affecting low enrollments and provide a framework for the study.

Summary

Through a review of the research literature, one can see how understanding low enrollments in ND programs is a topic that needs to be studied and discussed among higher education and hospital administrations. Although there is a lack of information surrounding enrollments in ND programs within the United States, there is a demonstrated need for an increase in NDT graduates from these programs (Boldery, 2019; McNall, 2020). Although there is a lack of literature pertaining to the ND specialty, there is research on career choice, higher education choice, and the motivation to continue within one's career or pursue further education. There is also literature outlining health care in general and the benefits of using descriptive qualitative descriptive research when performing studies concerning health care education and similar topics (Gale et al., 2013; Renjith et al., 2021; Sandelowski, 2000).

The foundation of the design for this study rested on a descriptive model of qualitative research, which has been shown to be applicable to studies involving health care research (Sandelowski, 2000). Using a descriptive research design provided the researcher with guidance to create a study that demonstrated rigor and credibility yet was flexible in its structure. By performing a descriptive interpretation of each of the individual interviews, the researcher identified emerging themes from the various responses given by the participants. Because this research centered around the perceptions of program directors and their views on low enrollments in ND programs, it is reasonable to conclude that some motives behind a person's choice of school or career can be traced back to thought processes that can be explained by HCT, SDT, and TPB. Each of these theories and their role in the career decision-making process was discussed, linking theory to job choice.

The descriptive qualitative approach provides the reader with a pathway to understand the thought process of interpretation given by the researcher, while HCT, TPB, and SDT provide an explanation to further understand the needs and desires of individuals as health care professionals. The researcher approached this study with reflexivity (Cooper & Endacott, 2007), simultaneously gathering and analyzing data (see Braun & Clarke, 2019; Campbell et al., 2021). HCT allowed the researcher to demonstrate and explain the value placed on higher education by individuals and employers, while TPB was applied to explain an individual's perception of social norms and their impact on higher education and career choices. Based on Doyle et al. (2020), Hunter et al. (2019), and Sandelowski's (2000) research, following a descriptive qualitative research design allowed the researcher to create a foundation for a rigorous study.

Through the foundation provided by HCT, TPB, and SDT, the researcher was able to develop a framework that supported this study (see Kivunja, 2018). The flexibility of utilizing aspects of these theories provided fluidity within the research process as the data were collected (Kallio et al., 2016). The semistructured approach to interviewing allowed the researcher to utilize prior experience in the field of ND to connect with each participant while also identifying and understanding the importance of emerging themes and ideas provided by the interviewees (see Chun Tie et al., 2019). The researcher followed the concepts of May et al. (2022), implementing a simultaneous approach to analyzing and deriving conclusions from the collected data. The concepts of human capital intersecting with that of individual choice and workplace engagement created a framework that gave the researcher an avenue to follow when proceeding with the completion of this study.

The three theories used as the framework provided a foundation for the descriptive design so the researcher could provide explanations of the information provided by the participants in

this study. HCT was applied to demonstrate the value placed on human capital as well as the value placed on higher education by individuals and employers. TPB was utilized to explain an individual's perception of social norms and their impact on higher education and career choices. SDT was used to provide insight into the motivation of a student or employee's likelihood to enroll in or complete a program once it has begun. By combining aspects of these theories, the researcher built a study and provided results that may raise awareness of the issue at hand in the ND community. Chapter 3 provides a discussion of the methodology used in this study and details of the design, which provided a blueprint for the study.

Chapter 3: Methodology

Low enrollment in the higher education sector is a concern for health care organizations across the United States (AHA, 2021b; Fawaz et al., 2018). Health care personnel shortages exist across all fields, but one of the most notable shortages is in the allied health professions. Within this broad field of medical professionals, ND is one group that has cited significant shortages (McNall, 2020). There is a problem with low student enrollments in ND programs in the United States, which has resulted in an increased shortage of ND professionals (Boldery, 2019). The purpose of this descriptive qualitative study was to explore the perceptions of ND program directors and their views on the low enrollments in ND programs in the United States. The research question provided the direction and focus of the study, while the methodology and design outlined the pathway followed.

For this study, the researcher acted as the primary investigator and data collector, thus playing an integral part (see Chun Tie et al., 2019). The predetermined population for this study was a group of academic leaders within the field of ND education. The researcher demonstrated ethical care when interacting with the volunteers in this study, utilizing interviews as the instrument of choice for this study. Once the data were collected and stored, they were analyzed for common themes to gain a better understanding of low enrollments in ND programs. This allowed the researcher to draw conclusions from this study's data and form ideas for additional research that may benefit the academic community addressing low enrolments in health care programs.

Research Question

The research question addressed in this study was:

RQ. What are the perceptions of ND program leadership on the low student enrollment in the ND programs in the United States?

Methodology

In this qualitative research study, interviews were the primary method of data collection. Qualitative methodology was chosen for this research due to its characteristics that permitted the exploration and understanding of perceptions and viewpoints of the research subjects (see Merriam & Tisdell, 2016). Within the context of this research study, a qualitative methodology allowed for inductive interpretation of the data (see De Villiers et al., 2021). According to Renjith et al. (2021), using qualitative methodology in health care research enables the investigator to better comprehend the social-behavioral experiences of the study subjects.

Using qualitative methodology, the researcher simultaneously collected and analyzed the data (see Chun Tie et al., 2019). Qualitative methodology allows for focused attention on the study topic rather than interpretation through the lens of the investigator (Al-Busaidi, 2008). This type of research methodology permitted the researcher to function as one of the analysis instruments by using inductive reasoning (see Garvey & Jones, 2021). There is value in using a qualitative research methodology in connection with health care research as it allows for open-ended questions to determine the “how” and “why” (Renjith et al., 2021).

Qualitative Methodology in Health Care Research

According to Al-Busaidi (2008), qualitative methodology is useful in research studies investigating health care processes, procedures, or education, as it allows for conclusions about a person or group’s experiences. Quantitative research was considered; however, documentation of the participants' perceptions could not be achieved using this type of methodology. The researcher used three theories to form the conceptual framework for this qualitative research,

thus creating a stronger foundation to support the study (Garvey & Jones, 2021). Qualitative research in health care studies has been shown to be an appropriate methodology to obtain the thoughts and perceptions of a group of participants. For this research study, the investigator utilized a multidisciplinary approach to combine the topics of health care and education (Gale et al., 2013). In line with this multidisciplinary approach, the three theories were combined to provide a framework for the study (see Campbell et al., 2021).

The overall study and research question did not fit into any of the traditional subcategories of qualitative research methodology, such as phenomenology or grounded theory. Therefore, a descriptive qualitative design for health care research pertaining to education was used; this is supported by past and current peer-reviewed research (see Auta et al., 2017; Garvey & Jones, 2021; Kahlke, 2014; Renjith et al., 2021). Descriptive qualitative studies have been used to study nursing and pharmacy students, which demonstrates the rigor of this type of research in the context of health care (Auta et al., 2017; Hashemiparast et al., 2019; Helaß et al., 2021; Johnson et al., 2020). In following established research focusing on health care education studies, a descriptive qualitative approach provided the mode for necessary reflections on the data while the investigator was able to demonstrate the process of thematic analysis (see Campbell et al., 2021). Utilizing qualitative methodology in health care education research is beneficial to understand the underlying reasons for low enrollments and the perceptions of those involved in the study. It also provides an effective design for the use of reflexive thematic analysis to describe findings (Renjith et al., 2021).

Descriptive Qualitative Research

A descriptive qualitative design allowed the researcher to maintain flexibility when using HCT, SDT, and TPB to explain the results from the collected data. Specifically, a descriptive

qualitative study allowed the researcher to focus on the perceptions and experiences of the participants (see Doyle et al., 2020). This type of design was appropriate for this study based on the research of Sandelowski (2000, 2010) and Hunter et al. (2019). As this study was developed to investigate a topic related to health care processes and workflow, a descriptive qualitative design was appropriate (see Doyle et al., 2020; Sandelowski, 2000). By using this design, the reader can see the significance of the data—the perceptions and descriptions of the participants (Hunter et al., 2019). Because this study was focused on a specific group of allied health professionals, this design allows readers to better understand the struggles and issues concerning the ND profession due to low enrollments and its effect on the shortage of NDTs. Because this study did not fall into a more traditional subcategory of qualitative research, a descriptive qualitative study was selected for its design. The descriptive approach provided the researcher with a process to describe the study topic's context and the participants' perceptions (see Doyle et al., 2020; Kahlke, 2014).

A descriptive approach to the qualitative study allowed the researcher to explore the phenomenon of interest, obtain insight, and use this to inform or educate (see Sehularo et al., 2012). A descriptive design allowed the researcher to focus on the emerging themes from the participants, using the three chosen theories as a lens to explain and interpret the collected data (see Colorafi & Evans, 2016). This concentrated focus on the answers to the interview questions and the perceptions of the participants fit into a research model to collect information to inform the health care sector (Hunter et al., 2019). Kim et al. (2017) suggested that descriptive qualitative research was a viable method of conducting studies where the material would be significant to a targeted reader group familiar with the topic. A descriptive research approach

allowed for flexibility in choosing the three theories that formed the framework of this study (see Colorafi & Evans, 2016).

In a changing health care environment, the research associated with health care education must maintain the flexibility to evolve with the updates and changes in health care and education (Colorafi & Evans, 2016). The standard and accepted designs in qualitative research, such as phenomenological, grounded theory, or ethnography, did not support this study, which was focused on investigating ND program enrollments (see Cooper & Endacott, 2007). In the primary research of Sandelowski (2000), the author suggested using descriptive research when studying and exploring the outcomes of investigations surrounding health care and adjacent topics. This type of study has been promoted in health care research circles to enhance the training, understanding, and evolving practice of nursing (Doyle et al., 2020).

Research Design

This study was conducted using a descriptive qualitative research design. Descriptive research retains the flexibility to focus on the subjective opinions of the research subjects (see Doyle et al., 2020; Hunter et al., 2019; Sandelowski, 2000). As a descriptive study, this research contained a conceptual foundation of three theories, HCT, SDT, and TPB, to support it while creating a foundation to further analyze the collected data (see Kahlke, 2014). The nature of a descriptive qualitative study allowed for fluidity as the researcher used a conceptual framework composed of the three theories to support its design (see Susilo et al., 2021).

The descriptive qualitative approach allowed for a concentrated interpretation of ND program directors' perceptions of the causes of low enrollments in ND programs across the United States. An ethnographic study was considered; however, because the study was conducted across the broad geographic demographic of the United States, it was not localized

enough for this type of approach. Case study was also not applicable for this study. The investigator used a descriptive qualitative approach, which best fit the goal of this study to provide the reader with insight into the thoughts and perceptions of the participants in this research. In this study, the researcher explored program directors' perceptions of low enrollments in ND programs (see Cooper & Endacott, 2007; Sandelowski, 2000).

Population and Sample

The problem and purpose of the study led the researcher to investigate low enrollments in ND programs and the impact of shortages on the ND sector of health care. ND program directors were chosen for the field study and the formal study population sample. The researcher utilized a sample size of nine participants. Hennink and Kaiser (2022) and Vasileiou et al. (2018) researched appropriate sample size; their findings indicated that nine was adequate for the population of this type of study and for use in descriptive qualitative research. ND program directors have the unique characteristic of understanding both the clinical and academic portions of the ND sector. Based on the problem and purpose of the study to explore perceptions that involve both clinical and academic characteristics of the ND field, this particular group of participants enabled the researcher to form reliable conclusions based on the information provided.

ND program directors offered unique perspectives in this study; they presented insight into the clinical and educational aspects of ND as a whole. Many of these program directors held credentials demonstrating comprehension of ND, allowing the researcher to utilize this population's knowledge of the allied health specialty's clinical and academic areas. This population could influence students and future generations of the ND workforce.

When choosing the sample population for this research study, the investigator selected individuals who possessed credentials relevant to the ND profession as well as those who held a position as an ND program director (see Collins & Stockton, 2018). Purposive sampling was used when selecting the sample population. The sample size was limited to program directors with ND credentials in EEG-specific programs. Using purposive sampling in qualitative research is considered acceptable and, at times, necessary based on the study design and a need for specific information from a given sample population (Campbell et al., 2020; Staller, 2021). The researcher chose this demographic rather than new graduates or participants who were solely clinical to gather information that was also reflective of the educational sector. Program directors have a background in clinical ND but can also offer insight relevant to academic institutions. Selecting a group with these characteristics allowed the researcher to bridge the gap between the education sector and the health care field, thus discovering correlations between the two.

Because the researcher focused the study solely on ND programs specifically designed for teaching the EEG, the total number of programs to choose from was small. The total number of CAAHEP-accredited programs equals 30 with a handful of nonaccredited ABRET-approved programs; therefore, a sample size of 10 would have provided a grouping of approximately one-third of the total population of accredited program directors. Each program director was contacted; however, nine agreed to participate. This sample size corresponds with other qualitative research, and the population sample was considered adequate for this type of study (see Vasileiou et al., 2018). According to Hennink and Kaiser (2022), a sample size of nine to 12 is adequate to obtain data saturation. By limiting the study to EEG-specific programs, the researcher provided consistency as these programs have similar goals for their students. Each program director was recruited through the email address provided on the CAAHEP website or

via the email provided by the university on their website using a standardized email template (see Appendix C). After each program site agreed and IRB approval was granted (Appendix B), the researcher set up a virtual interview with each participant. Should the study need to be replicated with additional program directors, these could be selected from ND programs specializing in other ND modalities and provide a larger sample population.

The researcher had no personal affiliation with the organizations from which the program director's information was obtained. The researcher also did not have any affiliation with the educational institutions where the program directors were employed. While the researcher sought to ensure an environment of objectivity, Kiegelmann (2002) and Campbell et al. (2021) suggested that each researcher's knowledge and viewpoints need to be examined and then incorporated into the data analysis to highlight the elements significant to the study and to those reading it.

Role of the Researcher

The researcher functioned as the sole data collector. Each interview was conducted by the researcher, who then stored the information in a secure location; this will be kept for 3 to 5 years per standard guidelines (see Berenson, 2018; Coulehan & Wells, n.d.). The researcher participated in the study by encouraging the participants to speak freely regarding their thoughts and perceptions of the topic being studied. The researcher also reassured the participants that their identities and comments would remain confidential. Throughout the interviews, the researcher gathered sufficiently thorough information for data analysis (see Sutton & Austin, 2015), which was completed and presented in the written report. Although the investigator has a background in clinical ND, she does not have experience in academic ND. The researcher's

experience in ND allowed for insight into the field, but there was no bias concerning the academic portion of the study.

Instrumentation

The researcher acted as the primary data collector, gathering and analyzing data from individual interviews. Because there was a lack of literature on this subject, there was also a lack of data regarding the low enrollments in ND programs and program directors' perceptions of low enrollments. This negated the ability to obtain data from a centralized depository. Due to these considerations, interviews were selected for data collection.

Using interviews as the primary source of data collection also aligned with the population sample size for this study. The researcher used semistructured interviews to elicit in-depth answers from each participant, gaining valuable insight into their perceptions (see De Villiers et al., 2019). Because both the researcher and the participants had backgrounds in ND, the researcher worked to build a rapport with each to promote a willingness to share their perceptions as well as collect data relevant to the context of neurology (see Collins & Stockton, 2018; De Villiers et al., 2021).

In this study, three data collection instruments were utilized: semistructured interviews, field notes, and the interview protocol. The interview protocol (see Appendix D) guided the researcher to ensure consistency throughout each session (see Kallio et al., 2016). Interviews were conducted with each participant. A list of prepared questions was used to guide the researcher and provide consistency for all interviews (see Appendix E). Interview questions were designed based on the study's problem, purpose, and conceptual framework. The focus of the study was to understand the participants' perceptions of low enrollments in ND programs and its impact on the field of ND. The researcher prepared open-ended questions that did not lead the

interviewee to a specific answer (see Kallio et al., 2016; Sikov, 2020). Because the researcher has a background in the ND field, the questions did not form a “tour” of the subject matter but focused strictly on ND program enrollments and the “why” of the low enrollments (see Roberts, 2020). The interview questions were designed around the central idea of low enrollments; topics included perceptions on student knowledge of the ND career path, education budgets regarding ND programs, and career outlook for ND graduates.

After the initial interview protocol and questions were created, the researcher determined the need to run a field test to ensure cohesiveness to the overall process. The field test allowed the researcher to assess the interview questions' structure and ensure the interviews would flow from one topic to another. To determine the instrument's feasibility, a trial interview process was conducted before formally initiating the interviews with the participants. Three volunteers participated in individual interviews with the researcher; feedback was logged, and necessary changes were made to ensure credibility and reliability of the interview questions (see Bagdady, 2020; University of Phoenix, 2015). The group of volunteers were chosen from ABRET-recognized nonaccredited NDT programs. No data were collected during this portion of the process.

Programs are listed on the ABRET website as a guide for NDTs to further their education. Although no contact information was provided, the researcher investigated each program and searched out the leader for the respective ND programs. Each field test volunteer was contacted via the departmental email provided on the program website, asking for their willingness to participate (see Appendix A). The participants were from nonaccredited ND programs from major regions of the United States. After each volunteer agreed to participate, the researcher set up an interview appointment to review the questionnaire. Once this had been done,

and the necessary changes were made to the interview protocol and questionnaire (Appendices D and E), the researcher proceeded with the formal study process to obtain IRB approval to conduct the study.

Data Collection

The first step in the data collection process was to contact prospective educational institutions and gain permission to conduct a study with their program directors. The researcher sent emails describing the study and the intention to gain site approval for the IRB application. Each email was sent to representatives from major regions of the United States. After IRB approval was obtained from the University of St. Augustine to conduct the formal research study, program directors were contacted via the information provided on the CAAHEP or institutional websites. These potential participants were ND program directors from across the United States. The researcher sent individual emails (see Appendix C) asking for their willingness to participate in this study.

After site approvals were achieved, consent forms (see Appendix C) were sent, asking each participant for their willingness to join the study. Once consent was obtained, the researcher set up interview appointments for 30 minutes with each participant. Interviews were conducted in an online format via Microsoft Teams to allow data to be collected from the different geographical sections of the United States. Online interviews were conducted using video conferencing tools; this is considered appropriate and logical as it can allow for greater sample size and reduce the researcher's cost and time (see De Villiers et al., 2021). The interviewer followed the interview protocol (see Appendix E) and began the session by introducing herself, explaining her background in ND, and her goal for the interview and study. Once this had been accomplished, the researcher formally began the question-and-answer portion of the session.

Each interview was simultaneously transcribed with speech-to-text software (Tactiq) and saved as a digital file with the date and participant's alphanumeric identifier (e.g., P1, P2, P3, etc.) as the file name. Field notes were taken throughout the interview. This allowed the researcher to review insights when analyzing common themes that emerged from the data.

Data Analysis

During the analysis phase, the researcher used inductive analysis to review and search for recurring themes that appeared in the data obtained from the interviews (Vears, 2022). The researcher used reflexive thematic analysis, supporting inductive analysis (see Braun & Clarke, 2019; Campbell et al., 2021; Thomas, 2006). Reflexive thematic analysis allowed the researcher to obtain insight and note the significance of the emerging themes from the participants' data.

Reflexive Thematic Analysis

According to Braun and Clarke (2019), qualitative research studies centering on health care topics may warrant reflexive thematic analysis. Health care professionals are familiar with reflection, change, and evolution in health care (Colorafi & Evans, 2016). The process of reflexive thematic analysis allows the researcher to analyze, reflect, and apply significance to the various themes. These actions may change over time as more research is completed, and the researcher then reviews and reflects again, making modifications as necessary.

As a part of the reflexive analysis portion of this study, the researcher connected the information gathered from the participants to the theories presented in the conceptual framework. Through the reflective thematic analysis process, the theories introduced in this study helped explain the emerging themes. Reflexive analysis of the participants' responses enabled the researcher to provide a thorough evaluation of the emerging themes. This analysis process was

also used to provide recommendations for future studies and potential changes in program administration of future ND programs (see Campbell et al., 2021; Colorafi & Evans, 2016).

Self-review and analysis in research promote the contextual importance of the researcher in the data collection process (Dodgson, 2019). Although the researcher must remain aware of the balance between assumption and theory, the reflexive thematic analysis process can illuminate areas of concern and the need for change in subject areas with which the researcher is familiar (Collins & Stockton, 2018). Through reflexive thematic analysis, the researcher can use the study's outcomes to promote change within the field of ND. Other students researching similar studies may be able to do the same when utilizing this type of research approach (see Doyle et al., 2020).

The researcher who understands the subject area being studied and can analyze and discern significant data can perform reflexive analysis of the collected data (Birks & Mills, 2015; Dodgson, 2019). The researcher in this study is employed as an NDT in a health care facility and was able to understand the thematic significance of the participants' responses. A subjectivist, inductive approach allowed the researcher to better understand the phenomenon of low enrollments while also gaining insight into possible solutions to the problem of a shortage in the ND workforce (see Varpio et al., 2020). The researcher used this process to connect the concept of human capital as it pertains to the health care industry and its intersection of planned behavior and self-determination of employees.

Due to the nature of the study and the fact that the researcher played an active role in the data collection, there was an element of subjectivity surrounding the study; however, this type of research has been used as a tool to minimize researcher bias and subjective representation of the data (see Olmos-Vega et al., 2022; Varpio et al., 2020). The researcher had expertise in the

subject matter, which lent significance to the emerging themes to provide clarification for readers (see De Villiers et al., 2021). In health care research, a study directed toward a specific group of professionals presenting an inductive descriptive narrative can be useful for health care professionals seeking literature specific to their specialty (Kim et al., 2017).

The field of health care is constantly developing due to emerging medical research; as such, the research surrounding health care education, as an avenue of training and analysis, should also emulate progress and development (Cooper & Endacott, 2007; Doyle et al., 2020). By incorporating reflexive analysis, the researcher assigned significance to emerging themes based on previous experience (see Braun & Clarke, 2019). Reflexivity promoted introspective analysis as well as helped the researcher focus on a discussion of the data in a manner the reader may find relevant and straightforward (see Sandelowski, 2000). By employing reflexive analysis, the researcher could examine and probe the implications of the data while providing a discussion of the results for the readers.

Coding

An inductive approach to coding was used to determine emerging themes from the data; this type of coding is consistent with a descriptive qualitative study design (see Dodgson, 2019; Thomas, 2006). Philipps and Mrowczynski (2021) suggested that interviews can be reviewed and reconstructed to provide context to the researcher and reader about the common themes that emerge through the compilation of interview data. The coding process involved the researcher reviewing each interview transcript and highlighting words and phrases as significant (see Gale et al., 2013). Their significance was based on the researcher's experience in the field of ND, which provided insight into the themes that eventually emerged (see De Villiers et al., 2021). In this descriptive qualitative study, it was important to recognize context as a key part of the

coding process (see May et al., 2022). The researcher reviewed each transcript to search for emerging and repetitive phrases or words discussed throughout each interview. When reviewing the transcripts, the researcher also examined the field notes on each interview for a record of nonverbal cues and used them as part of the coding process (see Gale et al., 2013).

Triangulation and Saturation

During the reflexive analysis process, the researcher identified emerging themes while using triangulation to strengthen the study, ensured the credibility of the study, and determined saturation. Due to the nature of the study, it was important to utilize triangulation to promote its reliability and legitimacy (see Moon, 2019). Triangulation was also used when analyzing the data (see Abdalla et al., 2018). Triangulation is commonly used to strengthen the research and assure validity (Galiakberova, 2019). Specific types of triangulation are environmental, data, and theory (Guion, 2002). Triangulation was performed throughout data collection and analysis to assure the study's credibility, dependability, and quality and to minimize bias (see Moon, 2019; Noble & Heale, 2019; Renz et al., 2018).

Collecting data from different research sources, such as peer-reviewed literature and interviews with experts in the field of ND from across the United States, demonstrated environmental triangulation. Using different theories in the framework of this study as a lens to explain the perceptions and explanations given by the participants demonstrated theory triangulation (Galiakberova, 2019; Sabouri et al., 2020). Using triangulation, the researcher gathered data and observed trends and common themes across different geographical locations, and accounted for various components that may have influenced enrollments in these areas.

Based on the information provided by the participants, the significance placed on various phrases and terminology by the researcher, and triangulation (see Moon, 2019), the researcher

used the formula described by Guest et al. (2020) to determine saturation. The process included identifying significant terminology or phrases to be used as the codes. To use the formula, a base number of interviews was chosen as the foundation for the calculation, and a goal of ≤ 5% change in new data was designated to determine saturation. The base number of interviews for the calculation was four; these were the first four interviews conducted. The researcher took the data gathered from these interviews to create a foundational data set of new thematic information. Through the use of this formula, the researcher determined saturation. Although the sample size was small, this is considered acceptable in qualitative research (see Sebele-Mpofu, 2020).

Ethical Assurances

Prior to the beginning of any data collection, approval was obtained from the University of St. Augustine's IRB. This was done to ensure ethical consideration of the participants. Once approved, consent forms were sent to each participant. Confidentiality was maintained by storing the consent forms and data on a secure, encrypted drive that will be kept for 3 to 5 years per standard guidelines (see Berenson, 2018; Coulehan & Wells, n.d.). When referring to participants in the analysis phase of the research, no personal identifiers were used to protect confidentiality. The researcher did not know any of the sample population, which could have aided in giving them a sense of confidentiality. The researcher did not have the same role as the sample population, which may have limited a potential halo effect.

Although the researcher has a background in ND, the experience does not transfer to the ND educational sector. Although this could have created bias, the researcher made every effort to minimize this and to ensure objectivity when gathering and analyzing data. To reduce bias, the researcher followed the study's conceptual framework to ensure the rigor of the design, allowing

themes to emerge from the collected data (see Johnson et al., 2020). Another method to reduce bias was to follow the interview protocol, which created standardization in the interviews. The rigor of the study and lack of bias can be verified by providing adequate detail of the study, evidence of the process undertaken, the context of the study, the potential of the study to be used in other research, and sufficient information to allow the reader to view the interpretation of the results as based on the data rather than through the lens of the researcher (see Guba & Lincoln, 1994). Other methods used were intersubjectivity (i.e., the relationship between individuals' cognitive processes) and reflexivity (see Poerwandari, 2021); these were combined with triangulation to strengthen the thematic analysis while helping the researcher focus on the information collected rather than personal interpretation of the data.

Summary

In this descriptive qualitative research study, the investigator sought to explore the perceptions of ND program directors across the United States and to understand their views on low enrollments in these programs. Using a descriptive qualitative design allowed the researcher to collect and analyze the data and describe the participants' perceptions. Through this study, program directors experiencing low enrollments in ND programs had their ideas heard (see Garvey & Jones, 2021). The design of this study was intended to provide a foundation and pathway from which the reader may understand the study's goals, concepts, and conclusions.

Using a descriptive qualitative design, the researcher analyzed and conceptualized the information for the reader (see Doyle et al., 2020; Hunter et al., 2019; Sandelowski, 2000)). The researcher followed ethical guidelines for using human subjects and utilized the interview protocol to provide a framework for the interview process. A field test using three volunteers allowed the researcher to amend the interview questions before the formal interviews. To obtain

a representative sampling of the overall population, the participants were program directors from various ND programs across the United States. Once all data had been compiled, the researcher began analyzing the information to search for common themes and formulate conclusions.

Chapter 4: Analysis of Data

This descriptive qualitative study was designed to explore the perceptions of ND program directors and their views on low enrollments in ND programs across the United States. General demographic information was collected from each participant referencing their expertise in the field of ND as well as the size of each program cohort. This information provides the reader with insight into the type of programs offered, the acceptance availability within programs of this type of health care specialty, as well as general information about the program directors' experience within the field of ND. Program directors were interviewed individually to create an atmosphere of confidentiality and allow each to express their views and perceptions without the influence of other directors.

This chapter contains a description and review of the sample population, the process followed to analyze the data, and the results of the study. The researcher made decisions on the importance of terminology found in the transcripts of the interviews based on personal experience and expertise within the field of ND (see Campbell et al., 2021; Kiegelmann, 2002). The reliability and trustworthiness of the data and sample population demonstrate the study's strength and reproducibility; triangulation in the analysis process provides the reader with confidence in the results. The interview questions are reviewed and discussed in reference to the research question of this study, demonstrating the connection and relevance to the purpose of this research study. Based on the collected data, the themes that emerged are presented in this chapter and tied to the literature in Chapter 2 to provide the reader with a foundation to base their understanding of the material. Although a synopsis of the data is presented, the interpretation and findings will be discussed in Chapter 5.

Data Preparation

After IRB approval, the researcher contacted potential participants via email addresses provided by educational institutions or the CAAHEP website. A description of the study was provided, as was a consent form. Each participant indicated consent by replying to the email and stating their willingness to participate. Once consent was achieved, the researcher and participant agreed on a date and time for an interview; the researcher sent an individual electronic meeting invitation via Microsoft Teams. Data collection occurred over approximately 3 weeks. Reminder emails were sent to obtain the necessary number of participants to complete the study. Each interview was simultaneously transcribed using Tactiq software. At the beginning of each interview, a brief introduction of the researcher was given as well as an overview of the research study and interview process. The interview protocol was followed to provide standardization of the research process. Field notes also were taken throughout each interview to document nonverbal communication and expressions and highlight significant content and terminology for further review during the analysis phase. As a specialist within the field, the researcher made determinations on the importance of content or terminology relevant and significant to the field of ND and the research topic (see Campbell et al., 2021; Kiegelmann, 2002).

After each interview, the researcher opened a document for the transcript and changed the participant's name to an alphanumeric code. A review of the transcript was done to find vocabulary and phrasing that contained a high level of significance to the study and logged for further review once data collection was complete and for review during analysis. This information was put into the field notes of the individual interviewee for review along with the subsequent interviews of other the participants in the study. To maintain the confidentiality of each participant, the researcher changed any terminology in the transcripts that would indicate

the location or institution of the participant. Once this process was complete, the researcher saved the document with the participant's alphanumeric code and date of interview as the file name. As interviews were completed, the individual transcript with corresponding field notes were reviewed along with any previously completed transcripts and field notes. The researcher used this process to become familiar with the transcript information, searching for commonalities and themes from the compiled transcripts.

Trustworthiness of the Data

Although the participants' credential(s) were self-reported, the researcher verified these using credential verification sites available on governing body sites such as ABRET. Verifying credential information provides the reader with a sense of the reliability of the expertise of the sample population. While data saturation was determined to be completed with seven participants, the final sample count was nine. The additional two participants helped provide study reliability and finalized the data collection and content (see Guest et al., 2020). Although each interview was set at 30 minutes, the average length was 37 minutes and was determined by the participant. This allowed the participant to vocalize and elaborate individual views on the questions asked in the interview protocol.

Credibility

This descriptive qualitative study achieved credibility based on its rigor. Although the interviews were not video or audio recorded, a transcription of each interview was used to review the information. The transcription software Tactiq was used, a tool listed as an official partner with Google Cloud as an effective method of artificial intelligence-generated transcripts of meeting conversations. Because the transcripts were available for review, member checking was unnecessary. Factors incorporated into the data collection and analysis to increase credibility

included having an expert in the field of ND check the codes and emerging themes, triangulation, information power, and reflexive analysis. Due to the nature of this research study, information power was a significant factor in creating credibility and reliable answers dealing specifically with enrollments in ND programs (see Sebele-Mpofu, 2020). The researcher utilized both triangulation and reflexive analysis to determine viable codes that could be used and repeated in other studies, while prolonged engagement with the transcribed data and field notes gave the researcher the ability to demonstrate and explain the themes that have emerged (see Stahl & King, 2020).

Information Power

The sample population was chosen based on the expertise they could offer to this research study, which was confirmed based on the information gathered throughout the interviews. The information power of the sample was strong based on the number of years in the clinical sector and as instructors within the field of ND, which was 19.3 years and 5.7 years, respectively. The information power of the sample size allows for a smaller sample in qualitative studies. Sebele-Mpofu (2020) noted that in a homogenous group of volunteers, the sample size could be sufficient and saturated with six to 12 experts in their field. Because the sample population was narrowed to program directors, it provided more concrete data on this topic, and saturation was achieved with a small sample. Due to the strength of the information power, data saturation was reached with seven interviews; however, the final total of participants was nine. Data saturation was determined by a formula provided by Guest et al. (2020). The additional two participants reiterated and confirmed the themes that emerged in the first seven interviews.

Triangulation

Triangulation was used when analyzing the data (see Abdalla et al., 2018). Triangulation is commonly used to strengthen the research and assure validity (Noble & Heale, 2019). A more specific type of triangulation is environmental triangulation (Guion, 2002), which fits best with this study due to the various programs that span the United States. This allowed the researcher to gather data, see trends and common themes across different geographical locations, and account for various components that may have influenced enrollments in these areas. Multiple types of triangulation were used in this study: data triangulation, environmental triangulation, and theory triangulation.

Gathering data from multiple sources, such as the research literature and interviewing staff from the governing bodies of ND, provided the researcher with a historical perspective and knowledge of the long-standing issues with ND staffing and academic enrollments. The researcher pursued environmental triangulation by requesting and seeking out program directors across the United States. This provides the reader with the variability of different regions (affecting graduation and hiring rates), demographics of the ND programs, and the program directors. Theory triangulation was done using HCT and TPB to help explain low enrollments (see Galiakberova, 2019; Sabouri et al., 2020).

Reflexive Analysis

Throughout the data collection process, the researcher participated in reflexive analysis (see Harappa, 2021). The process began with the initial interview and continued through the writing and completion of this dissertation. During each interview, the researcher made notes of pertinent terminology; after each interview, the transcript was reviewed in addition to those from previous interviews. Terms and phrases were written for further review and comparison with

future interviews. This portion of the data acquisition and analysis process was important as the researcher has a background in ND, thus providing insight and implied importance of terms based on contextual factors in the interview. Through reflexive analysis, the researcher was able to identify information redundancy in the feedback from the participants.

Dependability

The data acquired through this study was reviewed and verified by an independent expert in the ND field. The de-identified transcripts were provided to the expert for review and analysis. Once the transcripts were reviewed and processed by the researcher, the coding and themes were compared with the expert's to assure reliability and the lack of researcher bias. The structure of the study was developed to ensure the reader of the intent to eliminate researcher bias. The interview protocol was introduced at the beginning of the interview and followed closely to maximize standardization for all interviews.

Transferability

Information in this study can be used to further the cause of ND programs when recruiting potential students as well as other allied health care programs struggling with enrollments (see Moon, 2019; Renz et al., 2018). The value in determining problems with enrollments is that this knowledge can be beneficial across the educational sector in promoting new thinking in this area, understanding students' cost-benefit analysis, and help educational administrators be creative when developing programs to promote enrollments to help fill the need for this workforce. This study and its implications can be extended to intraoperative neuromonitoring program enrollments, a modality of ND often with a separate program pathway or educational program.

Confirmability

As each interview was conducted, the researcher kept field notes of terminology that was repeated or stood out as pertinent to the study. After the interviews, the researcher reviewed the transcripts and highlighted words or phrases for potential coding and analysis. As each subsequent interview was completed, the researcher reviewed the previous interview for overlapping phrasing or terminology. The researcher followed the basic formula provided by Guest et al. (2020) to verify data saturation. Based on this formula, data saturation was achieved in the seventh interview. The researcher had already created interview appointments with two additional participants, which confirmed the emergence of the research themes; the additional information demographically broadened the study (see Saunders et al., 2018). The interview protocol was followed to stay on topic during each session. The interviews were semistructured to avoid participant or researcher bias (see Bergelson et al., 2022). The regional demographic differences provided a variety of answers and perceptions regarding the questions posed to each participant.

Results

This study was conducted to understand the perceptions of ND program directors and their views on low enrollments in these programs across the United States. The purpose of this descriptive qualitative study was to explore the perceptions of ND program directors and their views on the low enrollments in ND programs in the United States. This study followed a descriptive qualitative design. The framework used for the study consisted of HCT, TPB, and SDT. These theories supported and supplied explanations for the low enrollments of ND programs. During and after the data collection process, three main themes emerged.

Sample Population

The researcher chose ND program directors from the United States for this study. Each director was provided information regarding the study and allowed to ask questions about the design before an interview appointment was created. Initially, the researcher sought to limit the sample to program directors of CAAHEP-accredited ND programs; however, due to a lack of responses, the study was broadened to include non-CAAHEP-accredited ND programs. While this was a slight variation from the original study design, this sample gave the researcher insight into the needs of other programs that may not have the same marketing potential as accredited programs. One participant reported that their program was new and they had not graduated a cohort; for this reason, this director was excluded from the sample.

During the interview process with simultaneous analysis (see Chun Tie et al., 2019; May et al., 2022), the researcher determined that data saturation had been met with seven participants. After the ninth interview, the transcripts and field notes were again reviewed to search for terminology or phrases suggesting themes. After completing this process, the researcher compiled tables with shortened participant responses for the various categories of questions. Upon completion of the tables, the final data processing included reviewing the transcripts in random order to search for themes and terminology, using this process to prove data saturation with the seventh participant (see Sebele-Mpofu, 2020).

There were nine participants in this study: two males and seven females. The unequal male-to-female distribution was due to the overall disparity of ND program directors as well as the agreement to participate. The major regions of the United States were represented as follows: East (two participants), South (two participants), Midwest (three participants), and West (two participants). Table 2 provides an overview of the demographic information, demonstrating the

expertise of the sample population. Each program director held at least one ND credential; six participants had two or more credentials. The average clinical experience background equaled 18.7 years, while the average time spent as program director was 5.7 years.

Table 2.

Sample Population Demographic

Participant	Credential(s)	Approximate clinical experience tenure	Time as program director	CAAHEP-accredited program	Average cohort size
1	R. EEG. T.	30 years	15 months	No	6
2	R. EEG. T. R. EP. T.	30 years	6 years	No	10
3	R. EEG. T. R. EP. T. CNIM	24 years	3 years	Yes	10
4	R. EEG. T. R. EP. T. CNIM	35 years	4 years	Yes	12
5	R. EEG. T.	4 months	2 years	Yes	15
6	R. EEG. T. R. EP. T. CNIM	13 years	19 years	Yes	8
7	R. EEG. T. R. PSG. T.	25 years	7 years	Yes	11
8	R. PSG. T.	2 years	2 years	Yes	10
9	R. EEG. T. CNIM	14 years	7 years	Yes	20

Note. R. EP. T. = Registered Evoked Potential Technologist; CNIM = Certified Neurophysiologic Intraoperative Monitoring; R. PSG. T. = Registered Polysomnographic Technologist.

Research Question

The research question that guided this study was: What are the perceptions of ND program leadership on the low student enrollment in the ND programs in the United States?

The problem addressed in this study was low enrollments in ND programs. The research question was created as a pathway to understand the problem of low enrollments in these programs. TPB, HCT, and SDT provided a framework used as a lens to view the subject of study while also providing an explanation for the reasons why this trend occurs. Through the results of this study, administrators at higher education institutions and health care facilities can work to overcome a shortage in ND health care providers by understanding the factors impacting low enrollments.

While formal analysis was done after all data were collected, some analysis was done during the data collection phase. This process allowed the researcher to perform reflexive thematic analysis while simultaneously gathering more data with subsequent interviews (see Chun Tie et al., 2019; May et al., 2022). The researcher, being familiar with the field of ND, provided insight and designated significance to terminology and themes, following the previous studies of Campbell et al. (2021) and Garvey and Jones (2021). Terminology was noted and highlighted during each interview, reviewed again after each interview, and once more after the data collection phase. The formula provided by Guest et al. (2020) gave the researcher a method of determining data saturation. Calculation began with a base number of interviews to search for new information, and the threshold was set at a goal of $\leq 5\%$ new data for the study to be considered saturated. The first four interviews were used as the foundation to determine new information (see Guest et al., 2020). It was through the use of this process that three main themes emerged.

Coding

During the interviews, the researcher noted significant terms for further review and reflexive analysis (see Campbell et al., 2021; Chun Tie et al., 2019). After each interview, the

transcript was reviewed along with previous interview transcriptions; notes were recorded for terminology and coding. A tally was kept of the significant terminology. Through this process, the researcher also determined data saturation and significant themes. The themes that emerged in this study are ordered in this document hierarchically based on the number of participants who voiced the same or similar opinions. Table 3 demonstrates the codes developed from each participant's responses. Table 4 documents the code count for each category.

Table 3.

Codes From Data Assigned to Participants

Participant	Codes		
P1	Licensure Visibility Budgets Class size Staffing Incentive Unknown field Lack of programs Support	Support Marketing Background Qualified staff Promotion Clinical site preceptors Low revenue Educational program	Background of techs. Perceptions anyone can be assigned to this job Recognition Hands-on training No entry-level requirements Consistency
P2	Lack of schools Attrition Student quality Name	Salary Subject matter difficulty Student comprehension	
P3	Educating about ND Recruiting Personal drive Base knowledge	Standards Career growth/ladders Not first choice program	
P4	Lack of student understanding Other countries have higher education standards	No enforcement	
P5	Lack of value on profession Multiple paths into the field	More potential as 4-year degree	
P6	Fear of name/subject matter Consistency with educational requirements		
P7	Funding		

Table 4.

Code, Count, and Category

Code	Count	Category
Visibility	14	Marketing, low enrollments
Licensure	24	Marketing, education, career, HR standards, low enrollments
Lack of support/understanding of ND	25	Education, low enrollments, requirements, career path, marketing, lack of knowledge of ND
Clinical sites	28	Low enrollments
Standardization	13	HR standards, Low enrollments, ND knowledge
Low enrollments	8	Education path, career path, marketing, HR requirements

Theme 1: Lack of Visibility of Neurodiagnostics as a Career Field

The first theme to emerge was a consensus that the field of ND is not understood as an educational career or a valid job path. There was unanimous agreement that there is a lack of visibility of ND as a career. The participants noted there is a lack of understanding of what ND is. P9 mentioned, “Nobody knows what we do.” P2 similarly stated, “No one knows what it [ND] is.” There is a lack of understanding regarding what is needed to be a technologist, what is done in the job, and the type of education needed to perform the job. P2 explained, “Nobody promotes it; nobody cares to take the time to know what it is and how important it is.”

The recurrence of the terminology visibility, lack of knowledge, and to a lesser degree, fear of the subject matter was brought up by several participants. P4 stated, “We're so far from people even understanding that this is a career path, and we're small.” P3 further explained:

> Everyone knows what a nurse does. Respiratory therapy. Ok, it sounds like what the name is [but], neurodiagnostic, most people are like, “I don't even know what you would do with that.” So, I think that's more of just the unknown. They have no idea.

P8 discussed visibility in this manner:

> I think the career as a whole doesn't have enough visibility. And I mean, I think the school is trying to help me promote it as much as possible. They want me to succeed. But it is. It's an uphill battle because you're right—people do not know about this field.

The other four participants had similar or identical. The idea of administrators in both educational and health care settings having a difficult time describing or defining the role of an NDT was demonstrated in the responses provided by the participants. The lack of understanding of what ND is as a profession establishes a need within the field to further educate administrators so they have a fundamental grasp of the job role.

The responses from program directors specifically involved in the field of ND deliver insight into the problem of low enrollments. Based on the information provided by the participants, those within the medical community are unsure or lack knowledge of the career of ND. The participants also mentioned a lack of knowledge of the ND career field on the part of those outside of the medical community. The concept of invisibility of the profession led to two subthemes that emerged from some of the participants’ responses.

Theme 1a: Low Value Placed on Neurodiagnostics as a Career or as a Needed Educational Program

A subtheme of the lack of visibility corresponds with the low of value of the ND profession. Some participants commented on the lack of value placed on the profession by administrators, whether educational administrators or those in health care facilities. In an

interview with F. McNall (personal communication, April 2023), an NDT educator and expert in the field of ND, the issue of nomenclature was highlighted. Until recently, the Bureau of Labor and Statistics did not formally recognize NDTs as a separate profession. Those who needed to report their profession were relegated to citing it under “technologists, other.” This type of valuation has trickled down into educational and health care administrations. Some participants voiced concern and frustration with the lack of support and value placed on the profession. When asked about the support from employers and their opinions of the value placed on colleagues in this profession, P5 stated:

> I think that when the techs aren't feeling supported, they don't, even if they're working with students, they don't promote the profession as much because they're, they don't feel appreciated. It's hard to really cheer someone on and to entering [*sic*] a profession that you don't necessarily always feel valued in.

The correlation between value and support given to ND departments, both educational and in medical facilities, was also highlighted. The lack of understanding of the complexities of the ND profession creates challenges when contrasting smaller facilities and their resources with larger institutions with well-developed neurology programs. When discussing the support from employers and its effect on the value attributed to the field of ND, P3 noted:

> In the employers especially, you know, if you’re in a big facility, I think you have more support. The smaller facilities, they think that you know anybody can do it, and they can just throw anybody in that role, and it'll be fine. Um. So yeah, I don't think in, you know, in some facilities you get enough and, and again I think it goes back to, we don't have enough visibility as a career. People don't understand all the things that we do, even in health care, people don't understand what we do.

Theme 1b: Lack of Marketing Causes Neurodiagnostics to be an Unknown Option for High School Students Entering College

Because of the lack of visibility, a second subtheme also emerged; students often enroll in ND programs due to their inability to enroll in their first-choice program (i.e., nursing, respiratory, sonography, etc.). When asked about the top reasons for low enrollments, P5 responded: “I think Number 1 is the lack of awareness as a, a career field.” Some of the lack of awareness and visibility was attributed to budgeting, marketing, and the fact that high school students looking for allied health programs did not know this was an option, as indicated by P8: “It didn't get as much marketing as some of the other higher profile because we are a smaller program. So, they don't—they didn't market it as much as they do like nursing, respiratory, things like that.” ND, as a second-choice option, was discussed by P4: “I get the fallout when they [students] fail in other [programs].” This explanation from the program director supports further discussions regarding marketing and knowledge of the ND as an educational program. As a second-choice option, this relates to the value placed on this career and its educational promotion as valued less than other allied health care professions. This is uppermost in the thoughts of colleagues within the field, the administrators overseeing them, administrators of smaller hospital organizations, and potential students.

Theme 2: Lack of Clinical Sites for Students

The term “clinical sites” emerged early in the research process and reoccurred throughout each interview. Clinicals are not foreign to the health care field. Within each health care profession, it is recognized that experiential learning is as important to developing and honing a skill as the didactic portion of learning. A major requirement for each of these clinical phases is the necessity of oversight, either by an instructor or a colleague employed by the hosting site.

Clinical sites can impact the student and their perceptions of the health care arena as a career. The perceptions and views of the organization and the preceptors can influence a student's views on continuing in a specified major or concentration (Battaglio et al., 2022; Blanchard et al., 2019; Holden & Biddle, 2017).

The participants in this study commented on the definitive need for more clinical sites to host students and also mentioned the need for more qualified staff to train and precept these students. P8 said, "There's not a ton of preceptors. So, we couldn't send five or six students to one site." Due to accreditation standards, students from accredited programs need to be proctored by a registered R. EEG. T. Although there are registered technologists throughout the United States, being a registered technologist is not a requirement to hold the position, nor is there a push to cause an employee to complete the registration exam. Because of this, in smaller institutions that may not have the support of a well-developed ND medical staff, oversight may not be available to provide preceptor opportunities and options for educational institutions. P6 mentioned the overall size of the many ND departments:

> So, the departments are small. You know the staff there then so that we'd have to really expand out of, of the region to even be able to take more students. So, it's kind of dual—it's, it is limited by the number of students your clinical sites will accept.

Another topic regarding a lack of clinical sites was administrators determining the number of students any ND department could accept. Some potential reasons for the limitations stated by the participants were productivity, workload, and fear of teaching. P9 noted the inability to begin a new cohort each year due to the limitation of a lack of clinical sites. P4 reiterated this when referencing enrollments: "Oftentimes, we're limited by how many clinical sites we have." On the same subject, regarding the question of class size, P3 asserted: "I think

what plays a role more in my class size is, at least at this point, is available clinical sites because I have to be able to place them." Finally, the need for registered (credentialed) technologists to serve as the preceptor for the students was discussed. P5 expressed the need to find registered technologists: "A real limiting factor for us [with accepting more students] is finding clinical sites that have registered techs to work with the students."

Theme 3: Lack of Standardization

The final theme to emerge in this research was the lack of standardization for ND. This included the name of the job title, education/training, wages, and entry-level requirements for job placement. As mentioned previously, the position can be referred to as EEG technician, neurophysiologist, or NDT, among others. This can create problems when searching for an education program if the name varies from one program to another, creating challenges for potential enrollments. This was mentioned by P6: "Everybody else's name has been there forever, and ours, I feel like they've changed [multiple times] since I started the field 30 years ago." P4 also provided input regarding the lack of name standardization creating problems in the ND community:

> And then another issue is that we don't all call ourselves the same thing. You know, they get these statistics from your, your taxes. So, when you write down what your profession is, think of all the different things that [you] could say. EEG technician, technologist, NDT, neurodiagnostic technologist, IOMN, neurophysiologist. There's just a whole bunch of titles out there, and these are all people working in our field.

Another standardization concern was entry-level requirements; this is multifactorial as it has different components affecting standardization. If an individual applies to a large academic facility, the requirements could be more rigorous (e.g., education requirement, credential(s), the

requirement to pursue additional learning), whereas if someone applies to a smaller institution, the only requirement could be a high school diploma with no further demands or expectations. P1 described the problem this way:

> We are the only people that do not have to take a test before we start working. They don't get that. You know, what other profession in health care did you lay your hands on a patient [that] you do not have to have a registry or licensure or some kind of credential before you lay hands on [them].

Salary standardization and educational requirements or expectations also factored into the discussion of consistency and regulation of the career field. One of the most vocalized methods of stabilization within the field of ND noted during data collection was licensure.

Theme 3a: Licensure

Within the standardization viewpoints, there was significant agreement that state licensure would benefit the profession. Because this is a state-by-state regulation, it can be a difficult problem to overcome; however, support from employers and basic entry-level requirements could assist in the progress of licensure. Although seven of the nine participants agreed that licensure would solve many problems, one participant was against its use and stated it was a means to gain more money from the application fees. Another participant was noncommittal and suggested that licensure would not affect enrollments and passing a state bill to achieve it could be difficult. The agreement among the participants was that licensure would provide validation for the field.

Wages and entry-level requirements were the components most discussed in relationship to licensure. P9 noted, “Licensure gives protection. It standardizes wages. It standardizes entry-level requirements. Kind of across-the-board type. Yes, right. Right, which, which is something

that we don't have right now." On the other hand, P6 articulated the need for licensure to present competency for hiring committees to use as a foundation for entry-level requirements and correlated this to a potential increase in enrollments:

> To practice in the field, you would need to have a license. If, if that license then is tied to an educational minimum, [licensure would] positively [impact enrollments] as it would give more authority to neurodiagnostics or that type of thing. It would give more recognition because then those HR [human resource] departments go to those licensures to see what it takes to hire a tech.

Theme 3b: Difficulty Promoting Education Programs Versus On-the-Job Training

One factor concerning the problem of standardization is the contradiction in the promotion of ND education programs versus on-the-job training and expectations post hire. To demonstrate competency, an NDT completes an exam and obtains credentials specific to their practice modality; however, employer support is lacking. P9 described it this way:

> I also kind of feel, too, if the hospitals don't support the, the fight that, that not even just the licensure, just having the registration as a basic component of qualifications [demonstrates] that you have a base foundational knowledge of what you're doing.

Impacting rigor in entry-level specification is also regional. Two participants mentioned higher level hiring standards based on their local region. Influencing factors were the number of larger facilities nearby, the length of time their program had been established, and producing quality graduates with strong background knowledge of the technical portion of ND. P7 noted that over time, their region has begun to have stricter requirements and, as a result, has produced quality students from this particular program:

> If employers don't support, then you know, [it could affect enrollments]. So, in our region, the standards are kind of high, uh, as far as, like, who they want to hire. So, like, OJT's [on-the-job training] and nonregistered OJT's; if they come from, you know, from another state to this area, they're gonna have a hard time getting hired.

This is not the case everywhere; ND colleagues can still be trained on the job without a formal education requirement. This can produce enrollment challenges, as program directors mentioned the lack of motivation for on-the-job colleagues when faced with the prospect of attending a program without any personal benefit. Facilities have asked for a colleague to become an R. EEG. T., but for fear of losing them and the difficulty of filling the position, they do not follow through with the requirement nor enforce the original demand. P1 stated the problem in detail:

> Because our profession—and nobody gets it here at the college—we are the only people that do not have to take a test before we start working. They don't get that, you know. What other profession in health care would you lay your hands on a patient [that] you do not have to have a registry or licensure or some kind of credential before you lay hands on? I can't think of one, and so there's no incentive. I mean, I've got people tell me that all the time . . . you know, "Why? I don't have to." I've been doing this for over 30 years; why [should I]? It wasn't going to increase my pay any. I mean, I didn't need it. Why [should] I put myself through all that work and that hardship?

When asked about the benefit of obtaining some type of an education from an ND program, P5 stated:

> I don't think that [there's] a clear benefit to getting an associate degree [for those who are already techs]; they already have a job. They're already doing the job. There is a registry

> pathway for just, for experience without, without actually having a degree. And it in our area; [the] job posting when you hire says you need to be registered within 2 years usually. But they don't, the, the employers don't hold you to that because they can't fill your seat, your space anyway. So, there's not even a big push to be registered.

A similar statement by P1 also included the lack of enforcement for a requirement for technologists to obtain credentials.

> They said you got [a deadline to complete your exams and become registered, otherwise] we don't have position for you [this was the ultimatum given to all the technologists], but then they had to back off because of the shortage, you know they didn't hold people to it, because we'll have nobody.

Theme 3c: Lack of Monetary Incentive or Support (Education or Career) Impacts Staff Quality

Some of the participants mentioned that a standardization of the job position could have a positive effect as well as standardization of wages. P2 noted the lack of adequate compensation for the current job by stating, “I think the, the salaries are too low for the amount of work and knowledge they have to do.” P9 referenced licensure as a means to standardize wages: “Licensure gives protection. It standardizes wages. It standardizes entry-level requirements.” The variations in salary in different regions for the same position are demonstrated by the most recent salary survey posted by ASET (2022a).

P5 cited the direct link to wages and acquiring credentials: “There's not a monetary benefit. I've heard very few instances where you get a raise for getting becoming registered.” There was also agreement that there is no incentive for an employee to pursue education or registration as a technologist due to employers' lack of support or motivation. The lack of

support was also mentioned by P9 when discussing salary: “Just having them back us up as ‘look we-we wanna support you as being qualified and competent technologists.’ There's really no requirement [incentive, or expectation] for students to hold or for workers to hold an R. EEG. T.”

Having a properly educated staff in theoretical and clinical knowledge can benefit an organization through higher quality patient care. Some of this lack of support and incentive is due to a lack of knowledge or recognition of the job. The problem of inadequate recognition of the job details and skills necessary to do the job was detailed by P4:

> Instead of being under “technologist other,” that was—that was where we were. And that's why *whenever you looked at government statistics for salaries, they were always way off* [emphasis added] from what they really are because we were lumped in with phlebotomists. Well, I think even phlebotomists have a, have a number of their own. But just “technologist other,” you know, and, and they are lumping in, you know, people as though we're just all one generic group.

P1 added,

> So, um, there's just, you know, there's not enough incentive, and [this facility] did start [incentivizing], and that's how I ended up getting registered. They said you’ve got [a deadline to complete your exams and become registered, otherwise] we don’t have position for you [this was the ultimatum given to all the technologists], but then they had to back off because of the shortage, you know they didn’t hold people to it, because we’ll have nobody. But then they had to back off [for other people] because of the shortage, you know. They didn't hold people to it because we'll have nobody. They still encourage it, *and they do offer a small extra pay when you get that registry, but—it's, it's, it's—very minimal, very minimal* [emphasis added].

Evaluation of the Findings

The findings from this study provide an explanation and reasoning for why there are low enrollments in ND programs across the United States. Many participants were frustrated and discouraged by the difficulties their programs were facing due to low enrollments. They mentioned the impact low enrollments might have on the field of ND and its influence on the quality of studies being performed by inadequately educated NDTs as well as the care patients are receiving. Data collected and analyzed from the nine interviews resulted in three main themes highlighting the needs within the field of ND, both educational and clinical.

Theme 1: Lack of Visibility of Neurodiagnostics as a Career Field

HCT provides a foundational explanation for the value placed on career choices based on job outlook or projected growth (Holden & Biddle, 2017). If the path to becoming an NDT is not known or promoted, then the perception of an incoming student can be skewed or nonexistent. Students reviewing potential careers and educational programs base some of their decisions and motivation on the potential to advance in their careers through the principles of SDT (Blanchard et al., 2019). For those educational and career paths that are invisible or overlooked, the advancement and need for personal progression within a career would be nonexistent, and therefore other career choices would be made. TPB can be used as a predictive agent by educational institutions when projecting program interest (Ajzen, 2020); however, due to a lack of visibility or knowledge of the program, interest in ND programs can be minimal or lack an increase in enrollments. Although visibility is crucial to enrollments and promoting its increase, one factor that impacts enrollments is the number of clinical sites prepared to accept and mentor students.

Theme 2: Lack of Clinical Sites for Students

The lack of clinical sites was a strong and definitive reason for low enrollments, either self-inflicted by the individual program administrators or because potential sites were unavailable to accept students. The challenge with the lack of clinical sites caused the researcher to review the conceptual framework to find a reason this could have presented as a problem. The theories applied in this research connect the problem with the lack of clinical sites to Theme 1: lack of visibility. With the allied health field struggling to demonstrate and define itself as a separate and necessary field of health care, the lack of visibility and resulting lack of value placed on the profession can affect the sufficiency of clinical sites for enrolled students.

Clinical site preceptors can promote and encourage students to become excited about the career they are beginning; however, if the precepting technologist does not view the career as viable or feel motivation for advancement, the perceptions of the proctor can then transfer to the student (Battaglio et al., 2022; Blanchard et al., 2019). Without the support of administrators to value education and the incoming generation of allied health care colleagues, educational institutions may struggle to promote their programs and increase enrollments (Marginson, 2019; Stein & Sridhar, 2019).

Theme 3: Lack of Standardization

Based on the information provided by the participants of this study, consistency within the field of ND would benefit enrollments as well as technologist quality. There were multiple reasons for a lack of standardization, including the motivation to enroll in an ND program. The motivation to pursue further education and benefit oneself in a particular career path is based on SDT, as described by Blanchard et al. (2019). The findings from this study regarding the need for standardization reflect a potential reason for low enrollments. Without consistency of entry-

level requirements or expectations, once a person has been hired, the value placed on the human capital within an organization is called into question (Holden & Biddle, 2017; Marginson, 2019; Stein & Sridhar, 2019). As potential students or job seekers review positions and the monetary return for the job, their choices of career or education paths can be influenced (Holden & Biddle, 2017).

Once a standard has been set and is enforced, educational institutions can better predict enrollments in their ND programs (Ajzen, 2020). The education of a technologist can improve the quality of the staffing while also providing a foundation for increased motivation for future continuing education (Blanchard et al., 2019). Although there are many factors and implications for the standardization of any field, creating a more qualified staff and providing better patient care can ultimately stabilize and equalize the job description and stabilization.

Summary

The results of this study provide the reader with an overview and better understanding of some of the causes of low enrollments in ND programs across the United States. These causes can be attributed to a lack of visibility of ND as a career field, standardization, and clinical sites for students. Each participant was interviewed for approximately 30 minutes by the researcher. Throughout each interview, there was simultaneous transcription and analysis (see Chun Tie et al., 2019; May et al., 2022). The researcher highlighted terminology and phrasing significant to the study and performed reflexive analysis (see Campbell et al., 2021; Chun Tie et al., 2019; Garvey & Jones, 2021). Once the interviews were completed, the researcher reviewed each individually and collectively to search for emerging themes to present as the results. Triangulation was performed throughout the data collection and analysis to ensure credibility, dependability, and quality of the study while minimizing bias (Moon, 2019; Noble & Heale,

2019; Renz et al., 2018). The results of this study provide a pathway for change in current practice as well as future research within the field of ND.

Chapter 5: Conclusions, Implications, and Recommendations

The research conducted for this study centered on the problems of low enrollments in ND programs across the United States and the shortage of NDTs. The purpose of this descriptive qualitative study was to explore the perceptions of ND program directors and their views on the low enrollments in ND programs in the United States. The insights and results of this study can be used to grow and expand the ND workforce and highlight it as another allied health career pathway.

A descriptive qualitative design was used for this research. Descriptive qualitative research is important in health care studies to provide insight regarding the perceptions of those studied (Merriam & Tisdell, 2016). A qualitative approach allows the investigator to understand the social-behavioral actions of the participants in the study within a scientific context (De Villiers et al., 2021). The researcher used an inductive approach when analyzing and interpreting the data (see Garvey & Jones, 2021). A descriptive qualitative design provided a method for the researcher to study and analyze the perceptions of the participants study (see Doyle et al., 2020). This type of design allowed the researcher to view the significance of the data collected through the participants' responses to questions in the context of each interview (see Hunter et al., 2019; Sandelowski, 2000). Using a descriptive approach in this qualitative study, the researcher gained valuable information to further educate and enlighten others in this field of study (see Hunter et al., 2019). Because the subject matter was from a specific allied health sector, descriptive qualitative research was significant for the intended audiences (see Kim et al., 2017).

Throughout the data collection process, the researcher performed reflexive analysis to identify relevant themes as they emerged (see Chun Tie et al., 2019). The researcher functioned as the data collector and analyzer when utilizing a qualitative research approach (see Campbell et

al., 2021; Garvey & Jones, 2021; Kiegelmann, 2002). The researcher as an analysis instrument is important as their expertise is needed to identify significant terminology and themes as well as focus on the answers to the open-ended interview questions, thus providing insight into the "how" and "why" of the research (Renjith et al., 2021). This type of study is promoted in health care research circles to enhance the training, understanding, and potentially evolving practices, such as nursing (Doyle et al., 2020; Sandelowski, 2000).

The results of this study show the lack of visibility, clinical sites, and standardization within the ND field. The participants unanimously stated the lack of visibility as a significant factor in low ND program enrollment. The literature provides discussions on the value of HCT and its use for understanding career choices based on individual perceptions of projected growth or career outlook (Holden & Biddle, 2017). The lack of visibility creates a problem and correlates with HCT; if a potential workforce does not know about ND, it may not be a career choice for a job seeker. Blanchard et al. (2019) considered the motivation of potential students through the lens of SDT and its impact on educational program choice. When education program leadership is factored into program enrollment and growth, TPB can be used to project program interest (Ajzen, 2020). However, if there is a lack of visibility of the profession, the interest in ND programs can be minimal, creating a lack of enrollment. Although visibility was determined to be a significant factor in low enrollments, the availability of clinical sites was also stated to be an issue.

The second theme that emerged from the participants' responses to the interview questions was the lack of sufficient clinical sites, which correlates with Theme 1, lack of visibility. Participants cited that some of the challenges with low enrollments were due to a lack of clinical sites. Several factors contributed to insufficient clinical sites, including a lack of

qualified technologists to proctor students, a lack of nearby facilities, a small department size limiting the number of students, and a lack of willingness from management due to potential lower productivity within the department. When reviewing potential programs and outcomes, students who have decided to enter the field of ND may question the availability of clinical sites. For educational program directors needing to place a student in a clinical site, the absence of a sufficient number of credentialed technologists can make a site difficult to find, thus creating problems with promoting this allied health field to students (Ajzen, 2020). ND programs may not be able to accept as many students into a cohort due to a lack of sufficient clinical sites, which may also factor into low enrollments.

When highlighting the need for clinical sites, there may be misconceptions surrounding the role of an ND department and the preceptors. The misconceptions may come from health care administrators who may feel there is little need to participate as a clinical site and that it could also decrease the productivity of the department and its procedures. This can devalue the profession (Battaglio et al., 2022) and cause employees to view their chosen profession negatively (Blanchard et al., 2019). By changing the perceived valuation of the ND profession, health care administrators can support, encourage, and potentiate the value of ND programs to promote the increase of enrollments (Marginson, 2019; Stein & Sridhar, 2019).

Similar to devaluation, there is a lack of support for current technologists to pursue higher education in the field of ND. In many facilities, an individual can hold a job without credentials or education, and they are not required or expected to pursue the didactic portion of learning for ND; this can demonstrate a lack of value placed on the need for education, correlating with the concepts of HCT (Galiakberova, 2019; Holden & Biddle, 2017). TPB also correlates with this result by highlighting inconsistencies in the perceptions of ND employees

and the value of obtaining education or credentials within the field (Sabouri et al., 2020; Wang et al., 2022).

Career and education options can result from a student or job seeker's consideration and be influenced by perceived monetary gain or job outlook (Gillies, 2015). An applied standardization can cause increased accuracy in enrollment predictions of ND programs (Ajzen, 2020). The participants of this study discussed the potential to improve technological quality through the completion of education programs specific to ND. This demonstrates a basis for increasing motivation for continuing education within the field of ND (Blanchard et al., 2019). The standardization of the field, starting with a designated name for each job description along with specific guidelines for entry-level requirements, was an area the participants collectively agreed upon through the interview process.

The limitations of this study included a small sample population from which to recruit participants. Another limitation was that education is not, at this time, a requirement to enter the workforce of ND, creating a potential problem with enrollment statistics. Another limitation of the study was only exploring programs specified to EEG; this modality is not the only procedure performed by many NDTs. Lastly, a limitation of this study was the ambiguous nature of the subject matter and the lack of knowledge by many regarding the complexities of this portion of allied health. ND is a poorly defined allied health sector, yet it includes multiple highly specific modalities, each with precise needs and requirements.

The conclusions and resulting implications will be discussed based on the research question and subsequent themes that emerged through the data collection process. The researcher details the impact this study may have on the current literature, not only for ND but also its potential extrapolation into other health care sectors. Due to the findings of this study, some

implications may affect current practice as well as further research that can be done to highlight this area of allied health. Recommendations are included that may be brought to various administrative bodies to further the cause of increasing enrollments, thus seeking to create change within the health care field of ND.

Conclusions

The research question that guided this study addressed the perceptions of ND program leadership on the low student enrollment in the ND programs across the United States. The results of this study provide answers to this question and information that can be used to offer insight and update and enlighten ND programs program directors of potential areas of improvement to promote increased enrollments. Although Theme 1 was expected, the researcher did not anticipate unanimous agreement among the participants that visibility was a definitive issue within the field. The other two themes were unexpected by the researcher and prompted a review of the literature to explain them. Although there could be questions surrounding the researcher's ties to the ND field, the conceptual framework was used to mitigate bias or influencing factors within the study (see Johnson et al., 2020).

Potential Influences on the Results

Although the researcher works in the field of ND, every effort was made to reduce and eliminate bias when interpreting the results. The researcher followed the methodology, data collection process, and interview protocol closely during the data collection phase of the study. The transcripts provided a means to review the participants' responses multiple times to verify significant terminology and emerging themes. To increase credibility and dependability as well as provide the reader with a confirmation of data reliability and analysis, the researcher asked for

input from an independent expert in the field of ND to review the de-identified transcripts of each interview.

Results Within the Context of This Study

The results of this study provide an avenue to discuss the need for recognition, visibility, stability, and support from hospitals for the field of ND. Each of the emerging themes represents an aspect of the study problem and purpose, which can promote further research within the field of ND education and clinical practices. The fact that literature referencing ND education is minimal at best presents an opportunity to expand the sources of this literature to increase knowledge and understanding of this lesser-known field of allied health. This study contributes to the body of knowledge of qualitative health care research as described in Chapter 2, encouraged by the primary work of Sandelowski (2000). Several other researchers have also described and promoted research combining health care and education (Gale et al., 2013) using a descriptive qualitative design (Auta et al., 2017; Garvey & Jones, 2021; Kahlke, 2014).

Although there is significant research within the nursing field, the lack of studies pertinent to ND demonstrates the need for more current and ongoing exploration. The results of this study can serve as a template or guide for future research within the health care field even as it extends into other fields of study or allied health care (see Auta et al., 2017; Gale et al., 2013). The descriptive approach provides the reader with a background and understanding of the diagnostic sector of neurology, thus engaging others who may have previously been unknowledgeable and unaware of the needs within this specialty (Campbell et al., 2021; Renjith et al., 2021).

Theme 1: Lack of Visibility of Neurodiagnostics as a Career Field

The lack of visibility of ND as a career field was stated unanimously among the participants, indicating a direct link to low enrollments. This particular theme addresses the study's problem: If potential students are unaware of the program, it can be hard to sustain or increase enrollments. Those ND professionals who may have trained on the job may be unaware of ND programs that could enhance their knowledge within the field and help them to become more knowledgeable technologists and offer improved patient care. Although it could be assumed that a lack of awareness of ND programs may not be the root cause of low enrollments, TPB can be applied to support this conclusion regarding an individual's decision-making based on career potential and job outlook (see Ajzen, 2020; Sabouri et al., 2020).

This theme was based on the answers provided by program directors, which is a lack of value assigned to the profession by education and hospital administrators and that there is also a need for qualified and educated technologists within this field. This stems from a lack of value placed on the human capital of an organization and the understanding of this allied health field (Galiakberova, 2019; Holden & Biddle, 2017). The more value assigned and allotted to a profession, the more resources are provided and proportioned to that field. Without the support of administrators, program directors, faculty, and colleagues are bound to suffer the consequences of this field's continued lack of visibility. Without sufficient promotion, low enrollments will continue, with students choosing other programs by determining job outlook and viability (Sabouri et al., 2020; Wang et al., 2022).

Theme 1a: Low Value Placed on Neurodiagnostics as a Career or as a Needed Educational Program

The subtheme to emerge within the context of low visibility suggests a link to the framework concerning the value place on the human capital of an organization (Holden & Biddle, 2017). The literature referencing ND education is minimal, and the low value placed on ND as a career or educational program can serve as a talking point for educational and health care administrators. By opening the conversation, ND professionals, program directors, and managers can seek to promote the value of a lesser-known field of allied health while also serving to create a future highly qualified and educated workforce through the advancement of ND programs. The value placed on the human capital of any organization can also link to trends in motivation and self-efficacy to further one's education (Galiakberova, 2019; Sabouri et al., 2020). Low value and ND programs align with the research question and problem statement and suggest a reason for problematic low enrollments due to the lack of value placed on the profession and subsequent education.

Theme 1b: Lack of Marketing Causes Neurodiagnostics to be an Unknown Option for High School Students Entering College

One of the most easily understood reasons for a lack of visibility is the shortage of marketing or promotional funds, which can lead to a lack of visibility of an educational program. Unless a student is specifically looking for an ND program, they may never be aware of the option for education or career. The lack of marketing for programs with known small enrollments can cause push-back by education administrators as it could be perceived as a poor return on education investment. However, with a well-developed program, subsequent knowledge of the program can increase enrollments through alumni and clinical site preceptors

encouraging prospective students. Although the intent is not to oversaturate the workforce, ND graduates need to be increased. This aligns with HCT and the overarching value placed on this profession (Galiakberova, 2019; Holden & Biddle, 2017). The research question was designed to guide an investigation of the causes of low enrollments. This subtheme demonstrates a need for adequate marketing of the ND educational program.

Theme 2: Lack of Clinical Sites for Students

Many health care programs are struggling to find clinical sites with which to place their students, and this is also a problem for ND students seeking to complete their clinical rotations. Accredited programs are required to place students with a registered technologist, which can be difficult if a program is in a region where registered technologists are hard to find and if clinical sites are unwilling to accept students or are only willing to take a small number of students. This constrains the enrollment numbers an ND program could accept for each cohort. It also ties directly to the research question regarding low enrollments as low clinical sites constrain program enrollment trends. On the other hand, unaccredited programs may have more flexibility in placement; however, they then have to determine the quality of the technologist who would be proctoring their students.

The lack of clinical sites is multifactorial and connects to different portions of the framework in Chapter 2. The reluctance of health care administrators to permit students to complete clinicals due to a perception of increased work for technologists or decreased productivity can be explained by the lack of value placed on the human capital of the organization (Holden & Biddle, 2017). Current technologists may be reluctant to proctor students, fearing they may be asked difficult questions. This mindset suggests a link to SDT and the fear of negative feedback (Blanchard et al., 2019). Mentoring and proctoring students can

allow students and teachers to effectively learn and develop a deeper understanding of the material and concepts. TPB provides a foundation for understanding how mentoring can change behavior and perceptions (Wang et al., 2022). This action could go a long way toward promoting the increase of clinical sites across the United States for ND program students.

Theme 3: Lack of Standardization

The last theme that emerged is the most difficult to directly connect to the study problem; however, there are elements of this theme that suggest a link to the study's framework. This theme also correlates with the value placed on an organization's human capital in that the worth or significance imparted to a profession can be found in the expectations and standards to which the workforce is held. Galiakberova (2019) suggested the value placed on a profession can be reflected by the organization's input and understanding of the necessity and required education of the occupation. This theme indicates a connection to TPB as well provides an understanding of low enrollments in ND programs. NDTs who have been trained on-the-job struggle to see the benefit or need for education without any return on their investment of time and money (Ajzen, 2020; Sabouri et al., 2020).

Theme 3a: Licensure

The subtheme of a lack of standardization that was most prominent was licensure. Many participants mentioned licensure as an avenue to lend stability, value, and authority to the profession of ND. Licensure was a suggestion of the participants, who indicated that if required, HR departments would be compelled to review the requirements of the job and potential education for this profession. This process would promote specific entry-level requirements that could encourage education and basic standards for the profession. With implementation, there is the potential for increased self-motivation and career choice within the field of ND (Blanchard et

al., 2019; Sabouri et al., 2020). While this subtheme does not directly answer the research question, it does suggest a change in protocols and current practices, which would entail health care organizations promoting and requiring entry-level conditions or expectations upon hire. This type of procedure would also rely on the perceived value of the profession as a whole (Holden & Biddle, 2017).

Theme 3b: Difficulty Promoting Education Programs Versus On-The-Job Training

Without basic entry-level requirements of ND job positions, including education, it can be hard for educational institutions to promote or even increase their enrollments. Currently, the ND profession does not require anything beyond a high school education to enter the field, and many places still offer on-the-job training. Although this is and can be a viable learning method and has the potential to produce quality technologists, there may still be the lack of theoretical knowledge and background that could increase a technologist's ability and quality. This portion of the standardization theme aligns with the research question in that there is a dichotomy of prerequisites or conditions of employment depending on the region or organization where a job seeker applies.

Varying expectations create an inherent problem within the field, as there is a need for further education and training to complete complex procedures. Although on-the-job trained employees can be adequately trained to perform difficult procedures within the field of ND and advanced credentials can be achieved, the motivation to complete this additional educational work is lacking in many colleagues, which links to SDT and TPB (Ajzen, 2020; Blanchard et al., 2019). Without support from employers and encouragement to complete this education, ND programs will struggle to maintain or increase enrollments, much less expand their programs to include advanced certificate programs for additional technologist credentialing.

Theme 3c: Lack of Monetary Incentive or Support (Education or Career) Impacts Staff Quality

Many participants mentioned the problem with promoting further education and credentialing within the profession due to the lack of recognition or career growth after achieving additional credentials. Without even a small monetary incentive for completing education and credential acquisition, technologists lack motivation (Wang et al., 2022) to pursue further instruction pertaining to ND. TPB and SDT provide a foundation for understanding the decisions of employees and potential students regarding the job outlook as a career (Ajzen, 2020; Blanchard et al., 2019; Sabouri et al., 2020). This subtheme provides a potential reason for low enrollments in ND programs. The correlation associated with the lack of incentive and subsequent lack of motivation of an employee or potential student to pursue education and enrollment in various ND programs demonstrates a relationship to all three theories listed in the framework: TPB, SDT, and HCT (see Blanchard et al., 2019; Galiakberova, 2019; Sabouri et al., 2020).

Compare and Contrast Themes

The three main themes present similar yet different aspects of the conceptual framework. The first overarching theme, lack of visibility of ND as a career field, supplies a clear link to the research question and problem statement. This first theme provides the reader with a foundation to understand and conceptualize the other two themes. The visibility problem is one that educational institutions and governing bodies can address individually or collaboratively to promote their programs. On the other hand, licensure and entry-level requirements (discovered as a part of Theme 3) would be handled at each employment institution or state-by-state. More visibility for ND has the potential to create and educate others on the need for increased clinical

sites, but this can also be handled with advocacy and educating administrators on the need and potential for a better workforce through the promotion of clinical sites and proctoring.

Although educational components factor into entry-level requirements on which it is necessary to focus, it is also important to note that some of the problems stem from the value and importance placed upon the profession by medical institutions. Each theme has components of the three theories discussed in Chapter 2; however, different aspects of each theme can be addressed individually. Education, on the local level, needs to support students, such as offering a clinical site, which encourages further education. Standardization across the field of ND would provide an easier process for finding qualified staff and clinical sites. This standardization process would offer increased visibility, a pathway for creating designated career ladders, and increased motivation for education for NDTs. The link between a lack of visibility or value placed on the ND profession and the deficiency of clinical sites can be explained by HCT. Without sufficient support and recognition, there can be misperceptions of the knowledge and education needed to perform procedures within ND departments (Holden & Biddle, 2017; Stein & Sridhar, 2019). Increased identification of ND as a career path creates the potential for standardization and validation.

Significance of the Themes and Implications

The importance of the themes developed through this research study are noteworthy and factor into potential changes within ND programs. The three themes together highlight the necessity for advocacy and promotion of this allied health sector. The themes that emerged indicate a need for a change to entry-level requirement practices handled through HR departments. Although any potential changes to entry-level requirements may create concern from current noncredentialed technologists, there has been a provision to grandfather in these

technologists currently working in the field of ND. A joint statement produced by the governing bodies of the various ND modalities suggests basic entry-level requirements and expectations upon hire for colleagues employed in ND positions (Lopez et al., 2023).

The implications surrounding the standardization and increased visibility of the field of ND suggest a fundamental shift in marketing strategies for educational institutions. The combined themes also promote the need for change in the valuation of the ND field. With increased value placed on this job field and its complexity, a review of entry-level education requirements may be necessary and potentially stabilize wages and create a clearly defined career ladder for a multifaceted allied health sector.

Contributions to the Literature

The findings of this study highlight a need for consistency within the ND profession as well as increased visibility, which has the potential to create an increased workforce in the ND field of allied health. From the inception of this project, there has been a significant lack of literature on ND education. There has only recently been a push to create a designated job description for those who work in ND (Boldery, 2019), which is further complicated by the fact that many who perform ND procedures are often primarily employed by a separate department in the health care institution, thus making it difficult to identify the true number of those working in ND.

This study can contribute to the literature as a source of qualitative research specific to allied health care; it demonstrates the strength of this type of research and its benefit to the field. Another way it contributes is by the nature of the subject matter—ND education—as there was a gap in literature specific to ND education and enrollments. As a lesser-known field of allied health, this study underscores an issue administrators may not understand. More specifically, this

research and its findings can be submitted to the ND governing bodies, such as ASET and ABRET, for use in campaigns to raise awareness of the need for qualified NDTs. This study can also be submitted for publication in *The Neurodiagnostic Journal* to promote ND education and used to explain low enrollments and perceived values of the ND profession and personnel.

Theme 1: Lack of Visibility of Neurodiagnostics as a Career Field

As a contribution to the body of research, this study can serve as a foundation and template for the furtherance and growth of the field of ND. By highlighting a need within the education community for increased enrollments, this study can add to the body of knowledge while emphasizing the need to fill the current shortage of NDTs (see McNall, 2020). The lack of literature specific to this area of ND was discussed in earlier portions of this paper and pointed to the gap in the literature. The addition of this research to the literature may help increase the visibility of ND within the health care and educational community, which may prove useful as marketing and developmental tools for the maintenance, growth, and advancement of the ND workforce. As a correlating factor in health care research, this study supports documentation to encourage motivation and education within the field of ND.

Within this first theme of visibility, there are components that suggest the lack of value and subsequent lack of marketing efforts or insufficient budgets to promote the visibility of the ND profession or ND programs. This perception and theme align with HCT, discussed in Chapter 2, regarding human capital and its inherent impact on an organization (see Wyatt-Elkins, 2020). An increased value placed on a profession will influence employees, subconsciously pushing them toward increased productivity (Kuzminov et al., 2019; Marginson, 2019; Stein & Sridhar, 2019). Beginning with leaders, this can encourage colleagues to pursue further

education within their chosen field, thus developing a stronger, more qualified workforce (Galiakberova, 2019; Kuzminov et al., 2019)

Theme 2: Lack of Clinical Sites for Students

There has been documentation stating the need for clinical sites for students in programs such as nursing; however, the literature concerning the need for clinical sites in ND is lacking. The subject was addressed in a dissertation by Marsh-Nation (2019), but it was not the focus of that investigation. Although it emerged as a theme in this study, a need for clinical sites affecting low enrollments was not a finding this researcher anticipated. This research can serve as a foundation to further expand and develop clinical sites to support students pursuing an ND education. This study can be used as a basis for descriptive qualitative research on health care education topics for future researchers to extrapolate and design other investigations correlating to health care education research. The literature offers researchers information to help them pursue further studies regarding the need for clinical sites for health care students.

The significance of this theme and its relationship to the body of literature suggests a link to SDT when describing a student's perception of a viable career (Battaglio et al., 2022). If the lack of clinical sites is trending across the United States, this could indicate to potential students that the profession is struggling and may not be a wise occupational choice. La Morte (2022) discussed an individual's decision-making process when considering a potential vocation or educational path; this process is impacted by positive and negative influences of societal norms based on TPB. As such, the lack of clinical sites and adequate staff to support incoming students factors into this thought process. This study corroborates the need for increased clinical sites while also contributing to the exploration of individuals' perceptions of education choice.

Theme 3: Lack of Standardization

The results of this study present health care researchers with the opportunity to advance the body of knowledge and research not only within the field of ND but also in other health care specialties. Standardization and consistency are important to patient care in all areas, and this study suggests the need for further research on the effect of standardization for ND. This addition to the research links to the valuation of the field of ND and the impact that can be derived from uniformity within a field, not only for an organization but also for the employees and, ultimately, the patient population.

By creating more consistent standards for ND, there is the potential to increase motivation for current technologists to further their education within this allied health field, which is linked to SDT (Crary, 2011; Fagan et al., 2021; Meyer et al., 2022). Developing a skillset within a career path potentiates higher-level skills and paves the way for ND departments to expand and grow (Blanchard et al., 2019). Standardization is also connected to the significance of the study, which indicates the need for more NDTs, as this field of allied health is already growing and expanding due to changes in health care and technology (Schwartz, 2022). The standardization of ND (name, wages, job descriptions, etc.) can set a precedence for placing increased value on this field, validating this profession's career potential (Gillies, 2015; Holden & Biddle, 2017; Stein & Sridhar, 2019).

Implications for Practice

The findings of this study can be used to promote understanding of the allied health care field of ND and provide program directors with information to express the need for these programs to exist. As many of the participants stated, the knowledge and understanding of the field of ND is lacking and has a far-reaching impact when enrolling students or hiring new

colleagues. Although there is room for improvement within the practice, steps to achieve the change may need to start locally and then progress for greater change potential. Some modifications to practice include valuation of the profession, increased advocacy to add clinical sites, and standardization of the field, including licensure. The most discussed and highlighted area concerning the lack of enrollment was the lack of visibility of the ND profession both as an educational path and a career field.

Theme 1: Lack of Visibility of Neurodiagnostics as a Career Field

Hospital and education administrators can participate in a movement to increase the knowledge of ND professionals. The findings of this study can be submitted to various ND educational and health care institutions to elevate and promote the need for more ND technologists in this allied health sector. The findings of this study may be used to encourage the development of ND programs. With an increased number of ND programs, there could be a rise in their visibility as well as an increase in knowledge surrounding what it means to be an ND technologist. One change in educational admissions practice would be to educate admissions advisors on ND programs so they can inform prospective allied health students regarding all options.

This first theme to emerge through this investigation demonstrates a need for increased visibility and knowledge of ND. Perceptions and knowledge of known career and educational paths can impact student choice. Without knowledge of the ND educational pathway, enrollments can be lacking; therefore, there is a relationship between this knowledge or its lack and student choice when selecting a career path and weighing earning potential from any given vocation (Gillies, 2015). The value placed on the profession also indicates a need for practice change to increase employees' perceptions of their need for personal development and education

(Galiakberova, 2019). Through the increased visibility and sustained recognition of ND, potential students may discover an otherwise unknown career with a promising job outlook (U.S. Bureau of Labor Statistics, 2022). Some options to increase familiarity with ND could be high school and vocational job fairs that include other allied health professions, promote job shadowing opportunities, and advocate for the education of administrators on the skills and knowledge necessary to perform ND procedures. These options can promote the valuation of ND and increase motivation for further education options (Battaglio et al., 2022; Holden & Biddle, 2017).

Theme 2: Lack of Clinical Sites for Students

The theme of a lack of clinical sites that emerged from this investigation indicates a limitation regarding enrollment in ND programs. Some ND programs cannot accept the maximum number of students to a cohort without sufficient clinical site placement opportunities. This could be dealt with by program directors (who can promote the need for clinical sites) and health care institution administrators (who can allow clinical site development), who can partner with and support ND program needs. Hospital administrators often have a misconception of increased workload and decreased productivity when asking employees to proctor students through clinicals (L. Kelly, personal communication, April 2023). To mitigate this, instruction on education and productivity needs to take place with management, paving the way for in-house education by the ND staff (Marginson, 2019; Wang et al., 2022).

Theme 3: Lack of Standardization

Finally, consistency within the field of ND would provide better standardization for professionals as well as educational programs struggling with enrollments. The participants of this study posited that standardization of entry-level requirements such as education or licensure

would stabilize wages and expectations across the United States, resulting in a potential increase in enrollments and the workforce. A lack of motivation to enter a profession shows a correlation with SDT, as described by Blanchard et al. (2019). Low enrollments indicate and reflect the need for standardization within the field of ND. The entry-level requirement inconsistencies as well as expectations upon hiring a colleague across the United States, reveal a relationship to the value placed on the profession and correlates with HCT (see Holden & Biddle, 2017; Marginson, 2019; Stein & Sridhar, 2019).

Information from this study can be provided to hospital administrations to demonstrate the need to standardize entry-level requirements for NDTs across the United States. As some participants suggested, licensure is one way to promote and encourage standardization. The avenue to licensure has been in process for many years yet has not been realized. However, this study may be a tool for education and instruction on the need for licensure. It was proposed that licensure would influence and enforce entry-level requirements for job seekers applying to ND positions.

Basic standardization of entry-level requirements could provide an avenue to increase enrollments, improving the quality of NDTs and subsequently improving the patient care experience. The standardization of entry-level requirements set by HR has the potential to stabilize wages across the United States, creating a better job outlook for potential students choosing these educational paths (Holden & Biddle, 2017). This type of standardization also can highlight the field of ND and create an environment that promotes a career field for entry-level applicants.

To encourage standardization and expectations of NDTs, monetary incentives through salary increases and reimbursements for demonstrated completion of higher skill levels within

the ND profession may promote motivation for continued education among ND staff (La Morte, 2022; Wang et al., 2022). Through these actions, staff may feel valued and incentivized to be more productive and engaged in the workplace (Battaglio et al., 2022; Forner et al., 2020; Marginson, 2019) while also creating an environment for learning and education. Each of the three themes is independent yet related to the framework of this study. The practice changes and implications suggested can be used to promote a more engaged ND workforce.

Recommendations for Future Research

This study was limited by the small sample size of program directors. Future research could benefit from additional program directors to strengthen the sample size and reach a broader regional demographic. Another way to improve upon this study would be to conduct focus groups with multiple program directors. This would allow them to interact and discuss problems and needs, providing the researcher insight into common areas and receive feedback. A different option would be to interview management personnel of hospital ND departments to discuss variations in colleague performances and abilities; this could provide insight into skill levels and educational needs. To broaden a similar study, faculty of ND programs and NDTs could also provide information on their views of the support and encouragement they received when seeking further education.

Several future studies could be conducted using this research as a pattern and framework. The study could be broadened by including hospital-run NDT programs; a different study could combine standard ND programs with intraoperative monitoring programs. Each of these programs has similar yet unique needs and student populations. Another approach might be to compare and contrast the certification board pass rate of graduates of formal ND education programs versus hospital-sponsored NDT programs.

A more difficult research study to conduct would be to determine, based on a compare-and-contrast study, the quality of technologists from formal ND education programs versus hospital-sponsored NDT programs or on-the-job trained NDTs. An additional study could include the perceptions of ND technologists on why the field is struggling to replace an aging workforce or colleagues leaving the field. Finally, a study could be conducted on productivity versus the valuation placed on ND as a career path while comparing and contrasting the perceptions of those within the field of ND and their thoughts on the administrators' views of their job's value, extrapolating from research by Marginson (2019).

Summary

The problem addressed by this study was low enrollments in ND programs across the United States. The purpose of this descriptive qualitative study was to explore the perceptions of ND program directors and their views on low student enrollments in ND programs in the United States. This research study was designed to highlight a need within the allied health community and to provide an avenue for future discussions on the prospects of ND education and the ND workforce. Nine participants provided valuable insight and contributions to this investigation. Three main themes emerged through the data collection and analysis processes and provided the researcher with the information necessary to draw conclusions relating to ND education. Each theme was linked to the research question and supported by the literature provided in Chapter 2.

The conceptual framework consisted of HCT, TPB, and SDT. Components of each of these theories provided a foundation and focus from which the researcher could explain the study's results and practice implications. Low visibility or understanding (by administrators or students) of the ND sector of allied health was the unanimous conclusion of the participants and significantly affected the study's results and conclusions. The lack of value placed on the

profession was a subtheme rooted in HCT and suggests a need for a change in behavior or expectations. A lack of clinical sites with qualified staffing to proctor students demonstrates a need within the field of educational ND. If clinical ND departments can partner with the educational sector for support and student mentoring, there could be an increase in motivation and self-determination to expand the educational component of ND (Battaglio et al., 2022; Crary, 2011; Fagan et al., 2021).

The standardization of ND is a significant undertaking for governing bodies, such as ABRET, ASET, health care organizations, and educational institutions. This would take the mutual effort and support of each to promote basic entry-level requirements; however, this process could increase the workforce, strengthen the quality of the current labor force, and escalate and encourage the quality and growth of those seeking additional education within the field of ND. With standardization procedures, such as licensure or basic entry-level requirements, HR departments would need to review the educational standards and guidelines set by the governing bodies of ND to project wage stabilization and current compensation trends.

The results of this study highlight the need for more NDTs in the workforce yet demonstrate the dichotomy of the push for education while pointing out the lack of motivation on the part of current colleagues to pursue higher education in ND. The results also reveal a need to create a more visible and recognizable career path for those interested in enrolling in an allied health care program. Research pertinent to the field of ND is lacking, and that which exists does not provide a background for comparison with this study. Those in ND education and clinical ND would benefit from the information of this study. The results and information can serve as a backdrop for discussions regarding the need for entry-level requirements based on the job description, the support and promotion of increased clinical sites for students, the observation of

enrollment trends and marketing strategies to project enrollments, as well as advocate for licensure with state representatives as needed.

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Appendix A

Email Request for Field Study Participants

Dear Participant,

My name is Daniella Krantz and I am currently working on a dissertation project to complete the requirements for an Ed.D. from the University of St. Augustine. I am researching the perceptions of neurodiagnostic program directors to gain an understanding of their views on the low enrollments in neurodiagnostic programs. The results of this study may increase awareness of the need within the field of neurodiagnostics for qualified staff and graduates from these programs. The purpose of this study is to understand each participant's viewpoint on their program's enrollment trends. Participation is completely voluntary, and all interview responses will remain anonymous.

I have prepared a set of interview questions and am asking for three to five volunteers to participate in a field study. To maintain the closest similarities to the projected study, I am asking for volunteers who serve as program directors or program chair of your organization's neurodiagnostic program. Participants are asked to participate in an approximate 30-minute video interview. Your participation will consist of feedback on the interview process and questions. Those who volunteer for this project will participate in an individual, online, 30-minute, video interview session with me. If you have any further questions regarding the study or process, please feel free to contact me via: d.krantz@usa.edu

If you are willing to participate, please respond back to this email, and I will reach out to set up a meeting with you.

Thank you,
Daniella Krantz
d.krantz@usa.edu

Appendix B

Site Approval Request

To Whom It May Concern:

This letter acknowledges that I have reviewed a request by Daniella Krantz to conduct a research project titled *Neurodiagnostic Program Director Perceptions on Low Enrollments* at _____ (site name). I approve this research to be conducted at our facility.

By signing this approval, I am aware that Daniella Krantz will be conducting a research project that includes: an interview with the program director/chair of the Neurodiagnostic Program regarding their perceptions on enrollments in the Neurodiagnostic Program.

When the researcher receives approval for her research project from the University of St. Augustine for Health Sciences Institutional Review Board, I agree to provide access for the approved research project.

_____	_____
Print name, credentials	Role at the facility
_____	_____
Email	Phone number
_____	_____
Signature	Date

Appendix C

Email Request for Volunteer Participation

Dear Participant,

My name is Daniella Krantz and I am currently working on a dissertation project to complete the requirements for an Ed.D. from the University of St. Augustine. I am researching the perceptions of neurodiagnostic program directors to gain understanding of their views on the low enrollments in neurodiagnostic programs. The results of this study may increase awareness of the need within the field of neurodiagnostics for qualified staff and graduates from these programs.

Those who volunteer for this project will participate in an individual, online, 30-minute, video interview session with me. The purpose is to understand each participant's viewpoint on their program's enrollment trends. Participation is completely voluntary, and all interview responses will remain anonymous during and after the study. Please see the attachment to this email regarding information on this study.

If you have any further questions regarding the study or process, please feel free to contact me via:

Email: d.krantz@usa.edu

Phone: [redacted]

If you are willing to participate, please reply back to this email. Once I have received your email, I will contact you to set up a time for the interview and then send a link for the session.

Thank you,
Daniella Krantz
University of St. Augustine for Health Sciences
Doctoral Student

Consent for Research Participation

Title of Project: NEURODIAGNOSTIC PROGRAM DIRECTOR PERCEPTIONS ON LOW ENROLLMENTS

IRB Number: 23-0221-120

Principal Investigator: Daniella Krantz

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[redacted]

[redacted]

You are being asked to participate in a research study. The box below highlights key information about this research for you to consider when making a decision whether or not to participate. Carefully consider this information and the more detailed information provided below the box. Please ask questions about any of the information you do not understand before you decide whether to participate.

Key Information for You to Consider
• **Voluntary Consent**. You are being asked to volunteer for a research study. It is up to you whether you choose to participate or not. There will be no penalty or loss of benefits to which you are otherwise entitled if you choose not to participate or discontinue participation. • **Purpose**. The purpose of this research is to explore the perceptions of neurodiagnostic program directors and gain an understanding of their views on the low enrollments in neurodiagnostic programs. The results of this study may increase awareness of the need within the field of neurodiagnostics for qualified staff and graduates from these programs. • **Duration.** It is expected that your participation will last 30 minutes. • **Procedures and Activities.** You will be asked to complete a 30-minute interview giving your perceptions of low enrollments in neurodiagnostic programs. • **Risks.** Some of the foreseeable risks or discomforts of your participation include possible discomfort using video technology. • **Benefits**. Some of the benefits that may be expected include increased awareness of problems surrounding low enrollments in neurodiagnostic programs, insight into possible roadblocks to enrollments, potential actions that could increase enrollments. • **Alternatives.** Participation is voluntary, and the only alternative is to not participate.

Why Is This Research Being Done?

This research is being done to explore the perceptions of neurodiagnostic program directors and gain an understanding of their views on the low enrollments in neurodiagnostic programs. The results of this study may increase awareness of the need within the field of neurodiagnostics for qualified staff and graduates from these programs.

What Will Happen in This Research Study?

Those who volunteer for this project will participate in a one-time, individual, online, 30-minute, video interview session with me via Microsoft Teams. The interview will not be video or audio recorded, but it will be transcribed for review by the researcher. The purpose is to understand each participant's viewpoint on their own program's enrollment trends. Participation

is completely voluntary, and all interview responses will remain anonymous. The ways we will protect your privacy and confidentiality are described in a separate section later in this form. You will be one of approximately nine to 12 subjects who will be asked to be in the study.

Potential Benefits

The benefits of being in this study may include increased enrollments at a later date; however, you may not receive any benefit. Being in the study may help the investigators learn causes of low enrollments in neurodiagnostic programs and its impact on the shortage of neurodiagnostic professionals.

Costs

There are no costs to you for being in this research study.

Payment

You will not be paid for being in this study.

Confidentiality

We will not record your name or any information that shows your identity. You will not be signing this form. We will store your information in ways we think are secure. We will store electronic files in computer systems with password protection and encryption. However, we cannot guarantee complete confidentiality. We will share research data where we have removed anything that we think would show your identity. There still may be a small chance that someone could figure out that the information is about you. Such sharing includes publishing results in a professional book or journal.

Subject's Rights

By consenting to be in this study you do not waive any of your legal rights. Consenting means that you have been given information about this study and that you agree to participate in the

study. You will be given a copy of this form to keep. If you do not agree to be in this study or if at any time you withdraw from this study, you will not suffer any penalty or lose any benefits to which you are entitled. Your participation is completely up to you. Your decision will not affect your ability to get health care or payment for your health care. It will not affect your enrollment in any health plan or benefits you can get.

Questions

The investigator or a member of the research team will try to answer all of your questions. If you have questions or concerns at any time, contact Daniella Krantz at [redacted].

You may also call [redacted] or email lkupczynski@usa.edu. You will be talking to Lori Kupczynski, the chairperson of the IRB at the University of St. Augustine for Health Sciences. The IRB is a group that helps monitor research. You should call or email the IRB if you want to find out about your rights as a research subject. You should also call or email if you want to talk to someone who is not part of the study about your questions, concerns, or problems. By agreeing to be in this research, you are indicating that you have read this form (or it has been read to you), that your questions have been answered to your satisfaction, and that you voluntarily agree to participate in this research study.

THIS PROJECT HAS BEEN REVIEWED BY THE UNIVERSITY OF ST. AUGUSTINE FOR HEALTH SCIENCES INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS. IF YOU HAVE QUESTIONS OR CONCERNS, THOSE QUESTIONS OR CONCERNS SHOULD BE DIRECTED TO THE INSTITUTIONAL IRB CHAIR, DR. LORI KUPCZYNSKI, EMAIL: LKUPCZYNSKI@USA.EDU [redacted]

Appendix D

Interview Protocol

Introductions: 5 minutes

Hello. Nice to meet you. Thank you for volunteering your time to assist in my research study. I'd like to spend the first few minutes introducing myself and giving you an overview at this time. I have been working as a neurodiagnostic technologist for the past 10 years and have been registered since 2016. I began my health care career in the pharmacy, which paved the way into neuro and opened the doors of allied health education. I am interested in trying to understand the reasoning and causes for low enrollments in neurodiagnostic programs across the United States. I think we all know there is a shortage of neuro techs. across all modalities, and the shortage is only getting worse as years continue to pass and staff begin to retire.

Brief overview of interview process and goals: 5 minutes

For this interview, I would just like to ask you a few questions as to your perceptions regarding neurodiagnostics as well as the education portion of these neuro programs. I will be taking notes throughout the interview for later review and data analysis.

Begin questions: 30 minutes (Appendix E).

Use prompts or secondary questions if necessary.

Conclusions and thank you to each participant: 5 minutes.

That was the last question. Do you have any questions for me? I want to thank you for time and willingness to participate in this study. It was very nice to meet you and to connect with another educator, specific to neurodiagnostics.

Appendix E

Interview Questions

1. How long have you been in your current position?
2. Which neurodiagnostic credential(s) do you hold?
3. How long were you in clinical neurodiagnostics prior to moving into academics?
4. How well do you think neurodiagnostics is known or understood as a career path?
    a. Do you feel that visibility of neurodiagnostic programs has a role in enrollment statistics? Why/Why not?
    b. How do you feel about the role a formal neurodiagnostics program may have on the quality of tech. knowledge? Do you think the knowledge or lack of support by employers of these programs affect enrollments?
5. What are your thoughts regarding the enrollments in neurodiagnostic programs?
    a. What would you say are the top three reasons for low enrollments in neurodiagnostic programs?
    b. How do you feel about the perceptions of neurodiagnostic technologists and their views on education creating a better career arc as a technologist?
6. If this program were offered as a 4-year degree, what do you think the impact would be on enrollments?
7. What is your opinion on the number of programs offering a neurodiagnostic education across the United States?
    a. Do you think there is a sufficient quantity? Why/Why not?

b. If you think there is insufficient quantity of programs, do you feel this is impacting low enrollments or a low number of graduates entering the field, or would you feel there are other reasons?

8. How do you feel about low enrollments in neurodiagnostic programs and the effect on the overall shortage of techs. in the field?

9. What are your thoughts about licensure of the field and its potential impact on enrollments or filling the need of neurodiagnostic techs. across the United States?

10. What are your perceptions about the availability of faculty and its effect on enrollments?

a. What are your thoughts regarding the available faculty to teach neurodiagnostics courses and how this plays a role in class size or enrollment possibilities?

b. In a specialized field such as neurodiagnostics, do you think the clinical part of the field can support a loss of staff to the educational sector? Why/Why not?