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Online Ultrasound Programs:

Program Directors' Perspective

A thesis

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the faculty of the Department of Allied Health

East Tennessee State University

In partial fulfillment

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Master of Science in Allied Health

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by

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ABSTRACT

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This study focused on opinions of diagnostic medical sonography program directors concerning online education within an allied health field that is clinically based. Although the study is centered around sonography, the findings can be applied to many online programs with clinical aspects. There was limited information concerning clinically based online education, therefore the literature review focused on distance or online education in general. The objective of this study was to identify factors that attributed to or hindered the progress of an online program in diagnostic medical sonography.

The question that guided this research was: What are the program directors' perception of face-to-face versus online program delivery in a clinically based subject? Individual interviews were conducted with three directors of online sonography programs. The responses showed that these directors saw improved overall outcomes in their online programs. This was ultimately attributed to a supportive staff and ease of access to resources.

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CHAPTER 1

INTRODUCTION

Background

The roots of ultrasound can be traced to the ancient Greeks and their use of the sonometer to study the sound of musical instruments (Orenstein, 2008). In 1877 the piezoelectric effect (pressure applied to crystals to create a sound wave) was discovered by French physicist Pierre Curie (Baker, 2005). Curiosity to understand how the body works and to see inside the body drove scientist to push the limits of imaging and 35 years after the discovery of piezoelectricity, sonographic equipment was developed (Orenstein, 2008).

Like most technological advancements, progress is spurred by problems that beg solutions. Ultrasound use evolved after the sinking of the HMS Titanic. Because ship makers did not want a catastrophe similar to that of the Titanic to recur, they developed new sonar equipment to detect underwater objects that could cause damage (Orenstein, 2008).

Sonography has evolved from basic uses for sonar applications to diagnostic capabilities that aid healthcare practitioners in diagnosing patients. This evolution accelerated during times of war and includes innovations such as the use of sonar on submarines in World War II and the use of higher frequency sonar for physical therapy and wound healing (Orenstein, 2008). Diagnostic medical sonography (ultrasound) was initially used in medical practice in the 1940s (Baker, 2005). Pioneers in sonography began to improve the equipment from the basic B-mode scanner (the earliest type of ultrasound machine that displayed dots in the place of reflectors with-in the medium being imaged) to today's advanced equipment that produces live time images (Baker, 2005). Clinical practices for sonography adapt and change based on the demand and capability of the machines and the skill set of the sonographers performing the exam.

Orenstein (2008) quoted Joan Baker, considered by some an innovator and matriarch of diagnostic medical sonography, saying, "but we witness so many times how history repeats itself. If we are to learn anything from our mistakes, we need to study our roots" (p. 28).

The early 1960s brought about the use of ultrasound in clinics on patients (Baker, 2005). Ultrasound examinations were carried out by either physicians or clinicians working under the direct supervision of a physician (Baker, 2005). Prior to formal training programs and the recognition of the sonography profession, sonographers were trained on the job either by other professionals working in the field or they were innovators in their practice and took initiative to train themselves on the equipment provided (Orenstein, 2008). As technology advanced and the equipment became more complex, employers mandated additional specialized, formal training and competency. Employees demonstrated this by completing the registry exams sponsored by the ARDMS and obtaining credentials in the specialty area in which they practice (Orenstein, 2008). The overall goal of the ARDMS and the AIUM is to have all personnel working within sonography to be credentialed in each subspecialty in which they scan (Baker, 2005). See Appendix A for a timeline of progression.

As medical sonography improves, practitioners ordering the exams, the sonographers conducting the exams, and educators preparing the next generation of sonographers may continue to experience change (Baker, 2005). As a result, the American Registry of Diagnostic Medical Sonographers (ARDMS) developed standards and objectives that must be in place and continuously evaluated in order for practitioners, sonographers, and educators to stay current with this changing technology. Faculty developing or involved in diagnostic medical sonography programs must follow these standards and objectives when developing curriculum to

be certain that there is consistency in didactic and clinical material between programs and to assure that this material aligns with the ARDMS standards (ARDMS, 2016).

Accrediting agencies such as Joint Review Committee on Education in Diagnostic Medical Sonography (JRC-DMS) and Commission on Accreditation on Allied Health Education Programs (CAAHEP) develop and implement standards to help streamline and improve the training of sonographers. Since its inception in 1975, the ARDMS has been the gold standard in ultrasound practitioner credentialing (AIUM, 2016) and the ARDMS (2015) noted, "Revolutions in computer technology, changes in clinical practice, and increasing medical needs around the world over the past 40 years necessitated the continual adaptation of ARDMS" (p. 3). This revolution has resulted in advanced training and higher education opportunities for practitioners. The ARDMS also implemented standardized testing or board examination for professionals practicing sonography to certify their competency in sonography (ARDMS, n.d.).

At an AIUM meeting in 1974 the initial board exam was given to volunteer physicians and clinicians who were in good standings with the American Society of Ultrasound Technical Specialists (ASUTS) (Baker, 2005). This exam was comprised of a hands-on or practical portion, oral case study presentations, and a written portion (Baker, 2005). This was the foundation for the first ARDMS sponsored exam which was provided the following year. These exams were only offered at ten designated sites around the nation (Baker, 2005). It was financially taxing for individuals to travel to take these examinations, so in 1983 the ARDMS restructured the exam so that all questions were in written format and no practical or oral portions would be required (ARDMS, 2019). Subsequently, in the late 1980s the ARDMS wanted to ensure that the exam was comprehensive and current so they brought in physicians and physicists to their Board of Directors in order to use their expertise on the examination questions.

They created item-developed workshops (IDW) to confirm that the written questions were current with practices used within the field of sonography (ARDMS, n.d.). This practice is used to this day when creating the ARDMS examinations. As technology has progressed, exam developers have used the materials from these workshops and explored ways to integrate technology into the examination. This exploration led to the first computer-based examination in 1991 (ARDMS, n.d.). In 2012 and 2014 computers were integrated into the examination itself with the implementation of programs such as picture archive and communication simulation (PACSim) and an interactive console for sonography principles and instrumentation (SPI) testing (ARDMS, 2016).

Stringent standards put in place by the ARDMS have resulted in poor national pass rates on the examinations, although there has been a slight improvement in the outcomes in the last couple of years (ARDMS, n.d.). These examinations are validated through a rigorous process to ensure that the knowledge and skill base of the individuals taking the exam is adequately assessed (ARDMS, n.d.). A professional in the diagnostic medical sonography field can choose to specialize in categories such as vascular (Registered Vascular Technologist, RVT), cardiac (Registered Diagnostic Cardiac Sonographer, RDCS), musculoskeletal (Registered Musculoskeletal Sonographer, RMSKS), or general (Registered Diagnostic Medical Sonographer, RDMS), which in itself has multiple subcategories (ARDMS, 2016). Each subspecialty requires documented scan time and specialized exams comprised of focused questions within the desired field of study. Given the poor national pass rate on ARDMS examinations, faculty must use andragogy (clinical and didactic) that works best for their students to prepare them for their initial credentialing. Program directors and faculty must provide a comprehensive education, so students are prepared for the workforce and well prepared

for success on the ARDMS certification exams. Program directors' perspectives may provide information concerning innovative didactic and clinical training that have fostered student success in changing and challenging academic settings.

Statement of the Problem

Faculty members at educational institutions have observed the need to transition from face-to-face education to online, hybrid delivery methods. It is important to prepare individuals entering health care professions with andragogy that is appropriate for a clinically based program. Instructors are stressing to the students the importance of continuousness of learning throughout their career. With the variation of didactic material and clinic sites experience, there must be continuity of material taught in an online environment compared to a traditional setting. Can this continuity be achieved similarly through an online classroom?

Purpose of the Study

The purpose of this study was to examine the perceptions of program directors of diagnostic medical sonography programs concerning face-to-face, on campus classroom education versus online education.

Research Question

A single question guided this research:

What are the program directors' perception of face-to-face versus online program delivery in a clinically based subject?

Significance of the Study

Today's student population has a diverse learning style but Willingham, Hughes, and Dobolyi (2015) argued that the content learned should dictate the teaching style and not the learning preference of the student. Most allied health programs, including diagnostic medical

sonography, require didactic as well as clinical components. This study may provide individuals within any clinically based profession, insight into online delivery methods that produce an entry level clinician. It may also help to alert educators to any struggles that would hinder progress.

Delimitations

Based on information retrieved from the Commission on Accreditation of Allied Health Education Programs (CAAHEP, n.d.), this study is delimited to only three online or hybrid diagnostic medical sonography programs in the United States (Kansas, Michigan, and Missouri). This case study is delimited to the perspective of the current program directors at those programs.

Limitations

This study may have limited reproducibility due to variations in the length of tenure of the program directors participating. Given the small number of online or hybrid diagnostic medical sonography programs in the U.S., the results may not be transferrable to other non-clinical educational programs.

Assumptions

Assumptions made during this study are that the program directors answered all questions to the best of their ability and in a truthful manner. An additional assumption is that data collected from the institution's diagnostic medical sonography's program websites are up to date.

Definition of Terms

For the purposes of this study, the following definitions apply:

- Hybrid courses are a blend of face-to-face classroom interaction and online, distance learning (E-learning, 2015).

- Online pedagogy is an instruction style that uses a web-based program for instructional purposes. Students are able to obtain instruction with the flexibility of not having to come on campus and have face-to-face interaction (E-learning, 2015).
- Asynchronous e-learning is a style of classroom with an on-demand student learning style that requires internet communications. There is not a need for the student to have a predetermined time to log into the web facilitated classroom. The student can determine a convenient time for themselves. These courses can be instructor facilitated or self-paced (Partnership, 2013).
- Synchronous e-learning is a style of classroom that requires geographically dispersed students to log into a web-facilitated classroom at a predetermined time. This type of learning is usually facilitated by video conferencing or chat (Partnership, 2013).
- American Society of Ultrasound Technical Specialist (ASUTS) was the first society for professionals within the medical sonography field (Baker, 2005).
- American Registry of Diagnostic Medical Sonography (ARDMS) is an independent, not-for-profit organization that administers examinations and awards credentials to qualified ultrasound professionals (ARDMS, 2016).
- The Joint Review Committee on Education of Diagnostic Medical Sonography (JRC-DMS) is a nonprofit organization in existence to establish, maintain and promote quality standards for educational programs in Diagnostic Medical Sonography (DMS) (JRCDMS, 2016).
- Commission on Accreditation of Allied Health Education Programs (CAAHEP) is the largest programmatic accreditor in the health sciences field (CAAHEP, 2016).

*For the purposes of this study terms such as online education and distance education courses may be used interchangeably due to the varying definitions found in the research content and the terminology used by the interviewees.

CHAPTER 2

REVIEW OF LITERATURE

Emergence of Distance Learning

Higher education was originally considered a privilege and meant solely for those with elite status in society. Although many of the early correspondence courses were not affiliated with institutions of higher education, educators soon realized that the elite were not the only individuals who sought to further their education. For this reason, institutions began to offer off-site classes where on-campus or dormitory living was not mandatory (Mathews, 1999).

Prior to the advent of correspondence-based pedagogy, it was believed that the most effective method for learning was to bring students together in a common place with the instructor present to provide information. Early pioneers of distance learning were mocked due to their desire to offer higher education to those in society without elite standings. Because of the pioneers' diligence and belief that everyone should have an education, correspondence courses were offered to those who could not attend campus gatherings or could not afford full-time residence at a college or university (AECT, 2001). "However, the need to provide equal access to educational opportunities has always been a part of our democratic ideals, so correspondence study took a new turn" (AECT, 2001, para. 1).

In first-generation distance education (1850s to 1960) simple communication, such as letters, radio, and eventually television, was used for correspondence between students and instructor (Simonson, 2009). Forerunners of distance education used the postal system as an avenue to relay their information and to communicate with their students (Carlsen, Holmberg, Neghina, & Owusu-Boampong, 2016). As radio broadcasts became more advanced and the introduction of television simulcast became available, these technologies were integrated into

distance education pedagogy (Simonson, 2009). Women, individuals with physical disabilities, people with jobs during normal school hours, and those who lived in remote regions benefited most from the emerging distance education. Distance learning is not a new concept in education, but it has gained more attention in recent years and this has resulted in a more streamlined delivery of information (Carlsen et al., 2016).

In 1892, the University of Chicago was the first accredited educational institution to have a documented major correspondence program (AECT, 2001). William Rainey Harper (1856 – 1906) an advocate of distance education, served as the first president of the University of Chicago, and began an extension program creating opportunity for a diverse student body (Simonson, 2009). Greater success was seen following World War II when soldiers returned from battle and wanted to complete the education they missed while serving their country. The growing success of the Chicago program was recognized by other educational institutions and others began to implement distance education courses based on their observations of the success of the Chicago program (TechTrends, 2008).

As instructors became more comfortable with distance learning and as more technology became available both were integrated into the education process. During the 1960s through 1985 instructors transitioned from using letters, written content, and radio broadcasts to audiocassettes, television, videocassettes, and fax (Matthews, 1999). This mixed-media approach helped instructors make available material that covered broader subject matter so students could gain more knowledge (Matthews, 1999). The Public Broadcasting System (PBS) was introduced during this movement. Early years of PBS were dominated by the National Educational Television (NET) (Encyclopedia Britannica, 2017). The National Educational Television was originally founded for the distribution of educational programs; no production

took place (Brooks, 2017). Material was produced off site by educational institutions and the NET, acting as an exchange center, distributed the material to interested parties for educational purposes (Brooks, 2017).

Third-generation distance education (1985 to 1995) was marked by changes brought about by computers and networking systems that resulted in a more streamlined level of communication (Simonson, 2009). Tremendous changes in internet access and networking facilitated new teaching and learning opportunities (Halverson, 2009). Distance learning progressed because of the emergence of technology and an increasing need for flexible schedules. Although the technology has progressed greatly, Bates (2011) stated that it is not about the technology alone, but instructors and students must know how to properly implement these tools to their greatest potential.

Fourth-generation distance education (1995 - current) allows instructors to implement wikis, blogs, and podcasts within their classroom to foster student learning and interaction (Belldarain, 2006). The current technology also provides students and instructors the capability to videoconference and use web-based media and interactive capabilities while not in the same room and often with an asynchronous pedagogy (Kennedy, 2015). Most institutions have integrated discussion forums or video conferencing into their curricula to encourage communication among students and instructors (Kennedy, 2015). Almost all educational institutions now offer distance education or online opportunities to accommodate the needs and wants of students (Kennedy, 2015).

The new technologies allow for online education to have outcomes that compare to traditional face-to-face instruction, but online learning may not always be applicable in a clinical based field such as those found in allied health professions (Milanese, Grimmer-Somers,

Souvlis, Innes-Walker, & Chipchase, 2014). Melanese et al. (2014) discovered that there is not only a growing need for flexibility in the initial instruction in allied health fields but also in the continuing education of professionals in a clinical based healthcare setting. This need has prompted healthcare and educational institutions to collaborate and provide better opportunities for professional growth for employees and students (Melanese et al., 2014). Continuing education requirements vary among healthcare professions, and flexibility and accessibility of learning tools is essential for continuing to practice in specialty areas (Alsop, 2013).

Models of Instructional Delivery

In a response to the evolving education delivery model and student population, higher education faculty and administrators are taking a more aggressive approach to engage students (ANA, 2017). Distance learning is a pedagogical method where lectures are broadcast or classes are conducted by correspondence or over the internet, without the students' regular attendance in a classroom environment (Webster, 2017). While there is a considerable difference in delivery methods among instructors and among institutional standards, methods of information delivery in higher education are classified into four basic types; traditional, web facilitated, blended or hybrid, and fully online (Allen, 2013).

Traditional instruction is delivered using no online technology. Instructors are in a classroom setting and the attention of their pupils is directed toward them. This type of environment allows students to interact in a classroom with their peers and with their instructor. The instructor is readily available to address any questions the student may present (Allen, 2013).

Web facilitated instruction is a method commonly used by faculty at colleges and universities. Faculty use web-based systems to post syllabi and/or assignment information.

There is often an interactive forum in these web facilitated courses that is integrated with face-to-face lecture time (Allen, 2013). This type of instruction can be synchronous or asynchronous (Partnership, 2013).

Blended or hybrid courses combine traditional methods with technology-based or web-facilitated options in lieu of a traditional setting. These courses often meet during set days of the semester and additional course material not covered during these meeting is a self-study styled pedagogy (Allen, 2013). Online courses use technology for all or most didactic material (Allen, 2013). The students enrolled in online courses may never be on the campus.

Effectiveness of Distance Learning

McGready and Brookmeyer (2013) wrote of the proliferation of online learning and the constant need to evaluate its effectiveness. They studied biostatistics within a public health undergraduate program and found that the overall outcome was similar in both the online and on campus programs. This conclusion showed the effectiveness of the online vs. on campus programs for a somewhat difficult didactic material (McGready and Brookmeyer, 2013). Institutions considering the adoption of an online curriculum must factor in the keys to success (ION, 2018). Writers for ION (2018) stated, along with the elements mentioned by Keegan (1996), that students must be motivated to succeed in a non-traditional classroom. Researchers suggested that there is no difference in the educational outcome of distance education and the traditional face-to-face atmosphere (Casey, 2004). According to Russell (2001) the technology is a neutral aspect, and the value of education is in the teaching style. Russell (2001) also coined the phrase “no significant difference phenomenon” meaning there is no difference in outcomes or results from the distance classroom versus the traditional classroom.

All modes of education have produced similar outcomes no matter the method of delivery (Allen, 2013). Russell (2001) suggested researchers are creating a biased outcome based on their study and what they want the outcome to be. In reference to Russell's earlier research, Twigg wrote a letter to The Education National Learning Infrastructure Initiative in 1992 stating that Tom Russell kept his focus during his research centered on effective learning and not evolving technology (Russell, 2001). Russell's view and research stresses that the outcome was no different when high-tech (modes that used cutting edge, costly technology) vs. low-tech (more traditional non-technology based) modes were employed for education (Russell, 2001).

High-tech education is time consuming and often confusing. Some staff members struggle with newer concepts during training. High-tech education is less cost effective when the purchase of the newest technology and training for the technology is factored in (Kim, 2012). It is costly to build new campuses and lab facilities to support evolving technologies. Utilizing more cost effective, low-tech education methods and implementing digital learning allows institutions to cycle more students through existing campus' and this model will help create a more balanced budget (Kim, 2012). This cost savings provides opportunities for increased course offerings, fulfills more community needs, quicker trained staff, and an increase in revenue (Kim, 2012). Russell (2001) suggested that we stop asking questions about effectiveness, that is substantiated in multiple studies, but begin asking questions such as why do students learn just as well in a distance education program compared to a traditional setting.

The generational progression of information delivery, as mentioned in the previous section, demonstrates the evolution of technology (Simonson, 2009). Clark (1983) stated it best when referring to media delivery of didactic material:

> The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in nutrition . . . only the content of the vehicle can influence achievement. (p. 445)

When evaluating the effectiveness of programs, student assessment should be tied to specific objectives that are clearly outlined (Kolowich, 2012). Objectives provide predetermined goals for the student and instructor and set expectations for the class. Goal achievement is more obtainable when the student and instructor are well informed of expectations concerning course work. In an online setting, these objectives can be difficult to obtain if they are not specifically designed for online or distance education. Instructors must have obtainable goals for the students to achieve within their realm of resources (Kolowich, 2012). Distance learning or online learning can be as effective as any other mode of instruction (Simonson, 2009). The success of the student is not solely reliant on the mode of information transformation but relies heavily on the interaction of the student with the material. "The keys to successful distance education are in the design, development, and delivery of instruction, and are not related to geography or time" (Simonson, 2009, p. 9).

Faculty Training and Preparation for Non-Traditional Classroom

Simonson (2009) argued that it is important for instructors to have proper training in distance education and the use of technology that will be implemented throughout their courses. Careful planning and development should be taken when creating an online course; visualization of ideas and concepts is critical to the student's success in the program. Instructors and students must have adequate support systems and be properly trained to function within an online classroom. Although courses are marketed and designed for distance learning, the students and

instructor must have the availability to interact, if needed, whether that is via phone conversation, video chatting, or email. This communication allows for brainstorming among students and feedback between the students and the instructor (Simonson, 2009).

Physical separation exists in a distance education program and instructors must be aptly trained in socioemotional support and how to foster a democratic educational atmosphere while not having direct contact with the student body (Irani, Telg, & Place, 2003). Similar to a traditional classroom, it is important that distance education instructors are able to maintain an appropriate pace to see that objectives are met (Olmstead, 2010). A hands-on approach with didactic or clinic material will help instructors develop instructional material that will aid in goal achievement within the classroom and will also allow for the instructors to be familiar and comfortable with the material being covered in the online course. This first-hand encounter will also allow for the instructor to see which material works best and how to improve as the students progress in the virtual class (Irani et al., 2003).

Customized training, for both traditional and online faculty, and customized support are critical components of quality online programs (Kim & Bonk, 2006). Olmsted (2010) noted that the individuals developing such programs should have a sound knowledge of online education and not base their development of the programs on outside pressures such as time constraints placed on them by their institutions and peer pressure. The lack of planning leads to poor outcomes and proper research of online course material and training for use of technology platforms must be obtained when developing a distance learning course (Olmsted, 2010). Institutions must be willing to offer support in terms of an instructional design team or informational technology team to provide an environment for the growth of courses that produce positive measurable outcomes. McVey (2014) conducted a study of best practices for training

and found that a self-assessment was helpful for most of the educators surveyed. This self-assessment enlightened the educators to tailor their training to their specific area of need or comfort level with available technology used. Educators must broaden their learning to acquire ample information and tailor the design to be universal for the material being taught (Irani et al., 2003).

Adjusting to Change

Educators who were more resistant to distance education seemed to have more difficulty learning the best practices and additional training can cause an excessive use of resources. Healthcare is being transformed by widespread implementation of electronic medical records, decision support systems, web-based videoconferencing, and advancing imaging technologies (Kushnurik, 2012). Kushnurik (2012) claimed that these advances are far beyond what education has integrated into its curriculum. The advancements in healthcare occur so rapidly that educational institutions struggle to update their curriculum and by the time they do, it is outdated. Kushnurik (2012) reviewed a number of studies concerning the modernization of healthcare education and the integration of health information systems and professional training. Based on his review, he suggested that customization of continuing education go even further into the subspecialties of the field (Kushnurik, 2012). This customization is particularly important for the different subspecialties within diagnostic medical sonography because of the vastly different content within each specialty. Alsop (2013) indicated that providers must be taught how to use and implement the ever-changing healthcare technologies. Therefore, access to education must be easily obtained for professionals and this ease of access can be achieved by e-modules and internet-based learning. New distance education pedagogies are integrating

material to aid in the understanding of the disconnect between educators and the evolving technologies (Alsop, 2013).

Higher education administrators must carefully consider the rapid development of technology when choosing what would work best for their institution. Often, investments in newer equipment will be made to assist in the didactic or clinical portion of the program and less than five years later the technology is obsolete (Bates, 2011). "However, the focus in discussions of educational technology tends to be more on actual technology itself, the information highway, the hardware, new software, and the potential for change," (Bates, 2011, p. 2). Educators must consider the strengths and weaknesses of available technology and how to optimize its impact in the virtual classroom. Administrators must also realize how to best utilize faculty (Bates, 2001).

Educators and administrators strive to keep their curriculum current with the most up to date software integrations and the technology used in healthcare, specifically in medical imaging. This evolution in the technology leads to innovative ideas for cost effectiveness and new program opportunities within their institutions (Olmstead, 2010). Institutions must find better ways to allocate funds with the changes seen in funding for higher education. Tuition has been on a steady incline since 2005, averaging around 3.4% per year (Trends, 2015). This rise in tuition is primarily caused by the decrease in governmental funding (Mitchell, Leachman, & Masterson, 2016). According to Mitchell et al. (2012), government funding is down $10 billion dollars compared to funding prior to the 2007 recession. Administrations of higher education institutions were forced to evaluate processes and determine what would be more financially sound for their establishment. This tuition increase is compounded by both a decrease in state funding and a constant need to update instructional material, improve campus resources, and

ensure upgraded clinical materials for healthcare programs. Institutions must remain appealing to the potential student (Mitchell et al., 2016). Faculty must be advanced in their thinking concerning classroom structure and didactic instruction and have familiarity with ground-breaking ideas to support the changing technology and the resources needed for online learning. Educators must be able to blend didactic and clinical material to help support the evolving learning styles of the student population and the need of healthcare (Kettner, Moroney, & Martin, 2013).

Brabson Survey Research Group as cited by Allen (2013) found that most faculty and administrators believed that online education is a critical component to the long-term goals of education at their institutions. This ten-year study found that in 2002 less than half of the respondents believed that online education was critical to their personal and institutional success; by 2013 that number had risen to nearly seventy percent (Allen, 2013). It is important for educators to understand the progression of distance education in their career field and the student's engagement process because distance education is only going to propagate (Dixson, 2010).

Strategic Planning and Faculty Retention

According to the U.S. Department of Education's National Forum on Education Statistics (Lewis, Alexander, & Farris, 1997), distance education is becoming part of the planning agenda of colleges and universities, even though there is some resistance from established educators. Allen (2013) found that two-thirds of academic leaders expressed the need for more discipline in the online classroom on both the institution side and the student side of instructions. Institutions often implement classes without realizing the amount of work the instructor must allocate to developing and delivering didactic material (Allen, 2013). The increased comfort level of the

faculty and students with online learning has begun to eliminate reservations of the administration concerning effectiveness of the curriculum but there are still apprehensions. As students and faculty become more accustomed to online platforms for distance learning, some of the anxiety will be reduced (Allen, 2013). Along with duplicated best practices, accreditation standards will ensure quality education among similar programs from varying institutions (U.S. Journal, 2014).

Often the amount of work and effort that goes into the creation of a distance education course can be daunting and more than what faculty anticipates. Therefore, administrators must also consider the cost of faculty training, turnover, and its impact on learning outcomes. Turnover is inevitable, especially among part-time and adjunct faculty (Pferdehirt, Smith, & Al-Ashakr, 2005). The cost of turnover includes factors such as course adaptation and redesign, faculty training, and increased staff support during training times (Pferdehirt et al., 2005). Those at institutions must have a systematic approach for training new faculty and retaining quality faculty with the skills needed to teach distance learning/online classes and be able to quickly and effectively deploy these tactics when needed (Pferdehirt et al., 2005).

Higher education faculties are aging and new younger educators are difficult to come by; mostly because of a lack of interest in becoming an educator (Hessler & Ritchie, 2006). Clark (2005) found that in 1987 25% of full-time instructional staff were less than 40 years old, an equal number was 55 years or older, and the remaining 50% fell between the ages of 40 and 54. By the early 2000s he found a considerable decrease in the faculty under the age of 40, with the total only 18% of the faculty. Hessler and Ritchie (2006) referred to the upcoming, younger educator as Generation X educators and they considered themselves as a minority in higher

education. Generation X educators, those that are under 35, were found to have different methodologies but wanted to meet the same objectives as the more experienced faculty.

Hessler and Ritchie (2006) mentioned ten factors that may encourage recruitment and retention of Generation X educators. These factors included guidance from the more experienced staff, socialization among the diversified groups within the institution, and flexibility between the institution and faculty. Institutions must allow for mistakes but take the opportunity for corrective action and learning experiences for personal growth and in turn offer rewards for exceptional service. Taking these factors into account may help higher education institutions to "grow their own" educator and customize their teaching style to adapt to the already established student population (Hessler & Ritchie, 2006).

Disadvantages of Distance Education

Distance education and online learning are still viewed with skepticism by some faculty (Kolowich, 2012). Surprisingly, Kolowich's (2012) found that almost half of the 4,500 faculty surveyed admitted that the progression of online education excited them more than worried them. The remaining half of the surveyed group was skeptical. This skepticism stemmed from the unknown and lack of education concerning implementation of distance education courses and how that might impact faculty job security (Kolowich, 2012). Participants in this same study said they believed students learn less in an online setting than in a classroom setting but they believed this will shift as best practices and technologies advance (Kolowich, 2012). However, Maki and Maki (2007) concluded that often students in online courses perform more work than students in a traditional classroom setting. They continued by implying that student's self-driven attitude and exposure to more material leads to a more productive outcome (Maki & Maki, 2007). The implicit core need of higher education is to grow student's knowledge but a more

tangible mission is research, teaching, and service (O'Banion, Wilson, & League, 2011). One criticism of online education is that it fulfills the need for one niche of the student population but it may not fulfill the core needs of higher education (Allen, 2013).

Another chief concern was the lack of interaction with the students (McVey, 2014). These concerns were addressed by the institutions involved in McVey's (2014) study by using workshops and conferences. Some institutions required faculty to become a student in an established online course to learn the structure of distance learning. Most importantly, in order for educators to overcome their resistance to distance learning, deep self-reflection must occur after attending workshops and such activities so these individuals can transform their way of thinking and adapt to the new pedagogy (McVey, 2014).

Advantages of Distance Education

The U.S. Journal of Academics (2014) listed advantages of distance education. These include ease of access to accredited degrees, flexibility, and self-paced learning. These advantages allow the non-traditional student to obtain a respected education. Concerns by some educators are that interpersonal communication skills will suffer with the integration of more distance learning/online course material. Institutions are including communication courses and mandatory group activities to address possible interpersonal deficiencies (Casey, 2004).

Distance education may not all together replace traditional on-campus education, but its flexibility makes it an attractive alternative for students who seek higher education. Students' perspectives concerning distance education is vital to the success of any program (Casey, 2004). Prospective students' input can provide understanding of what is being sought after when looking for an institution to meet their education goals and this allows institution to better anticipate the needs of incoming classes (Carlsen et al., 2016). Findings from a survey

conducted by the Impact of Distance Education on Adult Learning (IDEAL) Project (Carlsen et al., 2016) offered insight into the social and academic needs of adult students and provided strengths and weaknesses within distance education. Online learning contributes to customer satisfaction through factors such as efficiency, ease of access, and increased opportunities (Casey, 2004).

Students participating in the IDEAL survey and other surveys credited their level of success and satisfaction to the support structure surrounding them. This support structure was comprised of family, instructors or support staff at the institutions, and fellow classmates. Faculty at institutions providing distance education must understand the importance of a strong support structure surrounding the student (Carlsen et al., 2016). The survey (2016) also showed the greatest attention attributed to the cognitive-oriented support from teachers, tutors, and fellow classmates.

Dixson (2010) studied online student engagement and stated that the success of online students is based upon their cooperation and collaborative learning and they must be engaged in the learning process for a full comprehension of the material. Distance education offers students access to advanced technology and the convenience of flexible classes but without student engagement, maximum potential can be difficult to achieve (Sun & Ruda, 2011). During the study (Sun & Ruda, 2011), it was also discovered that engagement was directly related to interest of the subject matter and self-motivation.

Students' Profile

The IDEAL survey (Carlsen et al., 2016) provided a student profile for a typical distance education student population. Based on the 1,770 valid surveys completed it was found that the majority of the students were women who were furthering their education amid their parental and

familial duties (Carlsen et al., 2016). Although women comprise 56% of college students, the participant group cannot be considered homogeneous (Casey, 2004). Casey (2004) also found that more women than men participate in online courses and this was attributed to males struggling with self-motivation when it came to the completion of the course material. It was also found that these students were completing work responsibilities while completing their class duties. The majority of these students began their education but took a leave to fulfil other obligations. Another distinct group found in the IDEAL survey were retired individuals wishing to stay active or to fulfil some goal they had set for themselves (Carlsen et al., 2016).

Barriers that seemed to be common among all students participating in the survey were time constraints as a result of outside responsibilities and technology limitations (Carlsen et al., 2016). The drive behind the student's motivation was highly diverse. Job advancements, career opportunities, joy of learning, and monetary gain were some of the impetuses revealed in the survey. Overall the survey results showed an overwhelming level of satisfaction with their distance learning experience (Carlsen et al., 2016).

Summary

A review of research is provided in this chapter to highlight the different styles of pedagogy and the importance of the material being relayed. It is important to realize all factors when considering higher education needs and subspecialties available. Healthcare fields of study, particularly those with clinical aspects, must have an integrated blend of didactic material and clinical experience to ensure full comprehension of the material (Moore et al., 2018). In multiple studies it has been substantiated that online or distance learning is successful in multiple different fields of study.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

Introduction

Qualitative studies are means for discovering and comprehending the connotation that individuals associate with societal or human problems (Creswell, 2009). This chapter describes the design and methods used to collect and compare responses of interviews conducted with program directors of online diagnostic medical sonography programs. An overview of the procedures used to conduct the study, including population and data collection methods are discussed in this chapter. The purpose of this study was to examine the perceptions of diagnostic medical sonography online program directors concerning traditional classroom education versus online education within diagnostic medical sonography. The data collected from three programs were analyzed and attention was paid to themes that emerged.

Typically, a qualitative approach is warranted when the research question is exploratory in nature (Creswell, 2009). This leads to data collection questions typically beginning with a *why or what*, so researchers can gain a better understanding of the topic and its variables (Cottrell & McKenzie, 2011). In this study, program directors' perceptions regarding online education in diagnostic medical sonography were explored by using a mixed data collection process. The researcher investigated participants' perception of online education program design, outcomes, and the affect varying levels of faculty qualifications has on the program.

Research Design

This study was based in the constructivist paradigm and whiles fundamentally a cross-sectional design, publicly available quantitative data and qualitative data from interviews was used to identify characteristics, differences, and commonalities between three online diagnostic

medical sonography programs (Creswell, 2008). I used interviews to gather program directors' points of view concerning program structure and overall success of the programs. Additional quantitative data was included to enhance the qualitative data (Creswell, 2008).

Research Question

The research question directing the study was:

What are the program directors' perception of face-to-face versus online program delivery in a clinically based subject?

Population

There are only four diagnostic medical sonography programs in the United States that offers an online or hybrid program. Only three of the four programs chose to participate in the study. The population for this study was chosen from a list provided by The Commission on Accreditation of Allied Health Education Programs (CAAHEP) website.

Informed Consent Consideration

Qualitative researchers must be aware of ethical dilemmas that may arise during data collection and analysis. Institutional Review Boards (IRB) were developed to ensure there is informed consent on behalf of the participant, that participants understand they can withdraw at any point and not face penalties, assess risk and benefits of the study to assure reciprocity, and most importantly to ensure the investigator is qualified to perform the study (Glesne, 2011). Prior to the interview, willingness to participate was confirmed and an informed consent document was completed by the participants.

Data Collection Procedure

The researcher conducted an interview with each program director at a time convenient for each person. These interviews were conducted via phone conversation and were recorded for

reference. Each participant was asked the same questions and some of their responses elicited follow up questions. A copy of the questions that were asked of the program directors may be found in Appendix B.

Data Analysis Procedure

Notes were taken by the researcher during the interview process and the interviews were transcribed. Using a constant comparative method, the researcher explored the responses to each interview question and looked for themes that emerged from that data. The interview themes were then integrated with data collected from the institutions website that included program structure, program acceptance criteria, and ARDMS board examination outcomes. ARDMS examination outcomes of the programs will be evaluated to compare the overall success of the programs. The researcher categorized data based on the common questions used during the interview. This allowed for flexibility during the extraction and analysis of the results.

Summary

This chapter included the methodology for the study as well as a brief explanation of the IRB process and informed consent considerations. The data collection and analysis were explained, and the theme comparison was described.

CHAPTER 4

RESULTS

Data Overview

For confidentiality, the participants were assigned a pseudonym. Andy, Brian, and Charlie will be the directors' names throughout the remainder of the study. Andy and Brian's programs awarded professional certificates upon successful completion of the program and Charlie's awarded an Associate of Science degree. Program length ranged from 12 months to 30 months with total credits required ranging from 40 to 72. The student enrollment at the three institutions ranged from 2,000 to over 7,300, with ultrasound cohorts ranging from 8 to 22 students annually. All the participants had 20 plus years of experience within allied health education with more than 10 additional years of experience within the clinical setting of diagnostic medical sonography. All participants began their education careers as adjunct faculty and progressed into the roles that they currently hold. None of the participants anticipated that they would be educators; they began their career with the intent of working in the clinical setting.

Participants were chosen from a list of accredited programs published on the Commission on Accreditation of Allied Health Education Programs (CAAHEP) website. Contact information was provided on the website and I made the initial contact via email. I included a description of the study and explained that the interview would be audio recorded for accuracy purposes, but no identifying information would be used in the study. I also attached a written consent form for the program directors to review, sign, and return via email along with a time and date convenient for them to participate in the interview.

Prior to beginning the interview, I reminded the program directors that I was recording our phone interview and no identifying information would be included in the study. I also asked

for the sake of confidentiality of students and institutions, that no names be included during the interview. At the conclusion of each interview I asked for clarification on certain topics. I then sent a digital copy to TEMI.com transcription service and had it transcribed. After transcription was completed, I reviewed each interview and looked for themes throughout the responses.

This results section describes the program director's background in Allied Health and their journey into education as well as their views concerning online education vs. traditional education. Included in this chapter will also be information concerning outcomes as a result of their online pedagogy implementation.

Program Directors' Background

The directors who participated in this study obtained their educator experience in a similar pattern. They all began their careers in a clinical setting and were offered adjunct positions which progressed into their current program director positions. All the participants began their teaching career by instructing an ultrasound physics course. Andy explained, "I showed up at my first (clinical) job and they told me I would be co-teaching a physics class." Andy and Charlie were volunteered by administrators at their institution to begin teaching physics based on the need within their community and their post-graduation status from their ultrasound programs. Charlie laughed while stating, "I was the most recent person to pass their physics board. I was their guinea pig." Charlie then began providing ultrasound physics refresher courses to the residents at his hospital. He continued, "I had not intended specifically to become an educator but because I have a problem saying no, that is how I got into it (the education field)." Brian described his growing passion for education, "At some point in there I started getting interested in the education side of things because I always liked having students."

All the directors had a traditional style education during their ultrasound training. There was more integration of online classes as they began taking advanced training and courses to prepare for their career in education. "I started working on a masters (degree) in online style education," Brian states while describing his education background. This personal experience in online education helped them understand the online classroom and some best practices that would help make their programs successful. It helped some of the directors identify areas for improvement when providing online education. Brian commented, "I learned flawed areas within my own education experience and that helped me realize student and instructor expectations do not always match and must be outlined so that everyone is on the same page." Andy provided the example, "I saw what it was like whenever an instructor didn't respond, it was extremely frustrating." He makes it a point to let students know what to expect in reference to response times to either emails or text messages.

Each participant had been a part of their faculty in some form for 10 or more years. This longevity of service has allowed them to see growth within online education. The programs began as a TV correspondence course or traditional course and they now all function as an asynchronous classroom. "The program started back in 1999 as a telecast course through different colleges," Andy describes. One director made specific reference to the advances seen in technology and connectivity to the internet. He continued, "I am based in a rural area and when I began the program, I had a dial up system that functioned at about 50 kilobits per second download speed and now I function with a system that has 100 Megabytes per second." Internet connectivity was not optimal or available for streaming of video content. Each participant made mention of advancements in software and communication tools to make the online classroom more accessible for students. Different classroom platforms, such as

Blackboard, and various video conferencing capabilities (Skype and FaceTime) were mentioned during the interview process. Brian and Charlie mentioned specific simulation software that allows the students to get their hands on an ultrasound probe and get an in-depth anatomy experience from the perspective of a sonographer. Brian also noted that "during class time you can ask questions and get an immediate response. We use products now like Zoom and Skype that allow this capability via the internet," to help bridge the distance between online students and their instructors. He continued with explaining the lab portion of his program, "we use simulation software called Simtics." This program allows the students an opportunity to experience a sonography exam from a simulation point of view since a lab is not feasible for students who do not live near the campus. Charlie explained the reasoning for the online transition as, "we found that our students were further and further away from us. So we then began creating options for them."

All the directors' experiences as educators have been a mix of traditional style classroom and online or distance pedagogy. "I have taught one face to face class," Brian explains, but his college education was through a traditional, on campus program. The program he directs has been online almost since its inception, so there was not much opportunity for a traditional classroom setting. Andy described his progression as, "old school face to face and then telecast turned into online." This progression allowed him periods of trial and error to refine his program. Charlie took pride in the fact that, "all of my staff have degrees in distance education. He continued by saying, "our program has been online since it began." All of this experience led these directors down a path to create thriving diagnostic medical sonography programs.

Program Structure

A comparison of program structure is important to understand the online learning environment versus the traditional classroom. This structure comparison will demonstrate how these directors incorporate didactic material with the clinical aspect of the programs. Andy explained that he "took his traditional program and just rolled it into his online classroom." All the programs had courses such as college math, human anatomy and physiology, and medical terminology that students must complete prior to applying to the ultrasound programs. Students with allied health degrees were eligible based on their previous experience. Brian explains why his program requires this: "since we are online and we cannot teach patient care skills, we require that they have that (patient care experience) coming into the program." In addition to the above prerequisites, Brian's program required that applicants complete a college general physics course and Charlie's program required a health occupation course. Programs would have limited availability for each cohort, and it was a first come first serve acceptance as long as prerequisites were met. An additional prerequisite required by all the programs is clinical observation hours that must be completed by the student in a sonography department of their choosing. This time not only allows the student to see what the sonography work environment is like, but it also gives the clinic site an opportunity to meet a potential student who could be placed in their department for training and possible future employment. Charlie added to this, "for traditional, local based students, clinic sites are established and the work environment is known. But if we have a student interested in the program and they live out of state, the student needs to contact a local facility (close to them) in which they feel safe and would like to complete their clinical requirements." Then once observations are complete and there is a potential for the student to be in the program, the director or clinical coordinator will contact the clinic site and verify that it is

adequate for the students' clinical internship. Brian's process is, "we have a form that they (clinic site) fills out and it asks about types of exams and credentials of the staff." If the site of the student's choosing does not have adequate volumes or a variety of exams or if they choose not to have the student join them, it is the student's responsibility to find a site that meets all program requirements. Brian mentioned, "most students come to us with a site that is wanting to train them. They have either worked for the facility or have connections within the clinic."

The program directors and their faculty (clinical coordinators or adjunct faculty) then look at the student's application packet and grant admittance into the program based on grade point average and geographical location to determine the best fit for the program and participating clinic sites. One program in particular is a first come, first serve program. Andy describes his view on open enrollment, "I favor open enrollment. It allows all walks of life to experience the sonography profession, if they desire." As long as prerequisites are met and application is complete, then the student is admitted into the program, based on spots available. Granted there must be a clinic site willing to have the student. "It is the student's responsibility to secure a clinic site," Andy explains.

Brian and Charlie's programs have a traditional admittance process and a non-traditional process. Traditional admission is as described above, prerequisites and screening process, and the non-traditional process is based on the student having a clinic site, based out of state, which is willing to sponsor them for the program. These students are placed in a non-traditional admittance status and are not competing for a local clinical site; hence, their GPA and other prerequisites are not a factor to their admittance into the program. Charlie added about clinic sites sponsoring students, "these clinic sites participate mostly because they have a need and they want to take the student and make them their own." In that situation, the sponsoring clinic site is

required to sign a waiver stating they know that this student has not met traditional prerequisites and they are willing to take responsibility for that students' success or failure. The other applicants are placed in the traditional admittance pool and they are scored based on their grade point average. This score will determine their geographical placement for their clinic rotation. Not all students who apply traditionally will be accepted because there is limited availability of clinic sites. Andy commented, "the first come, first serve allowed for everyone to have the opportunity to learn ultrasound, whereas the traditional programs had a more stringent policy for program admittance in regard to medical experience." He liked the fact that the field was available for any who are interested.

Once admitted into the program, students are required to complete didactic and clinic portions of the program. The didactic portion of the program is designed so the students comprehend the material they will need to have while in the clinical setting and to prepare them for their board examinations. This material must be blended with the clinical experience to prepare a well-rounded sonographer. Brian and Charlie both made the statement that accrediting agencies were concerned with the online structure for a clinically based profession. Accrediting officials biggest concern was if the student was getting an adequate clinical education with the online learning. "The students still have clinicals. They still learn how to scan in a hospital," was Brian's response to the officials when they had these concerns. Once the site visitors for these agencies were shown how the didactic material and the clinic experience were integrated, they realized that the students were receiving a comprehensive educational experience within the allied health field.

Faculty

The directors were asked about qualities they look for when selecting faculty to teach in their programs. A unanimous response was a person who is flexible and has interpersonal communications skills. "Choose the right people," Charlie exclaimed. He continued by saying, "If you have self-motivated people who have been cursed with the idea that they want to do good in this world, you will pick the right person every time." Brian adds to this philosophy: "if you find someone who has ever said, 'that's good enough', they're not the right person."

The range of processes seen in the clinic sites and the diversity of the staff within those departments ensures there will be a broad spectrum of situations and personalities that faculty will encounter. All the participating programs that these directors are associated with have clinical affiliations and students across the country, and some into Canada. These students are based in different time zones and the students often juggle work with school, leaving a limited window for schoolwork. Often this means the student is emailing or even texting questions from a time zone different from that of the faculty. Charlie stated, "that it is a personal sacrifice that they, (faculty), choose to make. They often respond to their students to the detriment of their spouse, children, and family." Andy and Brian both made similar comments stating that their family time was sacrificed to help their students. While on vacation or time off they chose to respond to emails or texts messages that the students would send.

The geographical distance seen within the programs' clinical sites requires interaction with multiple healthcare cultures and individuals. Andy commented, "interaction with these affiliates is crucial to the success of the student and the health of the relationship with the clinic site." The faculty interacting with these sites must be open minded to the methods of the clinical site and know how to appropriately communicate the expectations of the program. In addition,

they must be aware of the dynamics, which encompasses work environment and personalities they may encounter, within the ultrasound department to which the student is assigned. Charlie provides the example, "Each department has their own personality to it." Building these relationships is complex and challenging at times. Charlie continues by explaining that faculty must foster these relationships so that a trust can be created with preceptors in the clinic site. All clinically based programs must trust that their preceptor is being truthful and fair concerning the education of the student.

Another attribute that was mentioned is familiarity with technology. Brian stated, "you (faculty) have to be tech savvy. All the sonography faculty have done either higher education courses in online education or we have full degrees in online education." Faculty who are immersed in online education must constantly assess their technology to make certain it is efficient. Brian and Charlie made mention of technical support staff used specifically for their online portion of their programs. "We have an instructional designer on campus that we can utilize," Brian explains about online course development. All the faculty of these programs work closely with a technology specialist to ensure that the technology platforms that are integrated into the virtual classroom are working optimally for the online setting. There was also a comment made that faculty cannot be timid when trying new technology. Charlie jokingly said, "We have crashed our network here on campus so many times by trying new things." This was affecting the entire campus network, so "they've (technical support) walled us off to a specific port (in the network) so that we do not affect the entire campus."

Technology is one factor that faculty must contend with, but a more complex factor is the students in which they are mentoring and training. Each student learns at a different pace and understands topics on varying levels. And due to the asynchronous nature of the program,

students are encountering material at different times. Faculty must be patient and understand that they may receive the same questions from multiple students at different stages of their learning. Charlie reiterates this by saying staff, "are trying to meet their student where they are, when they are there and not get frustrated." Brian's program has addressed this issue by asking the students to post questions on a discussion board. There is a faculty member assigned to answer questions on this discussion board. The students are then asked to read the discussion board, and this allows students to see different perspectives of topics and understand the material more deeply. "This also allows the students to seen what their classmates are struggling with," Charlie explains. "I find this an encouragement for the student; they see that they are not the only one not understanding something."

All the directors alluded to the fact that communication is a key to program success and student satisfaction. Faculty must understand that students are not in front of them every day. It is important to communicate regularly and promptly when a student reaches out. Andy responded to this topic by stating, "I provide my cell phone number and multiple contacts to my students. I respond, most of the time, within the hour." In a traditional classroom a student could raise their hand and ask a question with an immediate response. Online education does not allow this amenity.

Mission minded faculty was another attribute that these directors look for in their faculty. Mission statements among these programs are similar. They all want to produce reputable entry level sonographers to contribute to the need within their community. Charlie mentions, "Unfortunately there are philosophical disagreements, from site to site, on the parameters of what an entry level sonographer should be." He continued by saying that each healthcare facility may have a different focus area. Some sites may be heavily focused in general

sonography and others in vascular sonography. Each site will have a different opinion as to what they think an entry level sonographer should know how to do. Comparing the three programs, they each had a similar view on entry level. When asked how they keep their faculty focused on the mission statement, they all responded that education is their job. "You don't have to tell them what the mission is because their mission is to take care of their students and to make sure they learn," was Charlie's response concerning program mission. If education is the primary emphasis, then it is not difficult to stay focused on the mission. Charlie and Brian both made mention of regular course review, student feedback, and advisory meetings to help keep the program on the forefront of ultrasound education and keep their faculty mission minded.

Strengths and Weaknesses of Online Education

When comparing online education to traditional, the directors were asked some strengths and weaknesses to online education. Again, flexibility was a unanimous response when referencing strengths. But their responses about flexibility varied. Andy stated, "the availability is widespread, and anyone interested can begin an education in ultrasound, as long as prerequisites are met and they have access to a computer and the internet." Andy and Charlie did mention that online education is not for everyone. But these online programs have the capability to reach areas that do not have formalized programs and allow for people in the most rural areas to receive a quality education. "If you pushpin where the programs are located on a map, you can see that they are not dispersed well," Andy stated.

Brian's view concerning flexibility is, "It allows for the diverse clinic sites to customize their student's education to cater to the community's need in which they are located. They are essentially creating a future employee." For example, Institution X may do general, vascular, and obstetrical sonography exams. Institution Y may only need an experienced technologist in

general exams. Brian explains: “There is a clinic that has an EKG tech that is just awesome, and they want to help move that employee up the career ladder.” This facility has recognized that the employee wants to further their education, and they are an exemplary employee. There is a need within the department of the facility for an imaging tech. They sponsor that student and take responsibility for their clinical experience. This customizes the student’s learning specific to that clinic’s needs. And although this customization is optimal for the site, it limits the student’s marketability in the imaging field.

All the participants in this study discouraged students from working during these rigorous programs but the flexibility for the student to work their didactic material around their work and clinic schedule makes online education appealing. Charlie’s view of flexibility is that, “it allows the student to learn the material when they are best prepared to learn.” Again, every student learns differently, some have optimal learning times in the morning and some at night. In an asynchronous environment, students can choose when they watch the recorded lecture and even how many times they watch it. “It is as if the student can attend class each time they have a question,” Charlie explains. Students can access specific topics utilizing the resources that are provided by the online classroom. This flexibility allows for the student to reach their optimal learning potential. All of the participating directors made multiple references to the fact that students can access material any time and as often as they like. Not only recorded lectures but questions posted on discussion boards by fellow classmates. The directors also mentioned personal tutoring sessions. Often, they would see a common trend or question in these discussion boards so they would create a date and time to do a live webcast covering that particular topic. This would provide further clarification on difficult topics for the students.

There were also instances where one-on-one Skype or Facetime tutoring sessions were provided for individual students' concerns.

Another advantage mentioned was cost effectiveness. Andy discussed the financial strain on a student by saying, "Individuals from areas that do not have established programs may have to commute to receive an education in ultrasound." The portable nature of online education helps reduce commute times, and thereby the financial stress a student may experience. Two of the programs implemented online education specifically for students who had commute times in excess of two hours one way. They began to see all students benefit from recorded lectures and that is when their fully online programs began. Overall tuition varied between the sites, but the online programs meet students in their community and help support the local healthcare establishments.

Students must be comfortable with asking questions within a classroom. Andy and Brian stated that students are more apt to ask questions in an online setting. "When you're in the classroom, they (students) may have a fear of asking the dumb question. In online learning, you don't have that," Andy explains. They even went as far to say they are bombarded with questions. They said students fear the criticism they may receive if they ask a question, or too many questions, during a class. The anonymity of online learning and discussion boards allows for the student to be comfortable asking any question, no matter how "dumb" they think it might be. The multi-faceted discussion board allows for students to see different points of view on similar topics as well.

Some weaknesses that were mentioned pertained specifically to students' motivation and management of clinic sites. Charlie commented, "They have to be motivated internally to learn this material; which means they have to dedicate the time to sit down to learn." He continues by

saying, “And that’s kind of different for what I see for my students who come to the classroom. They (students) want to be sat down and (be) spoon-fed in the classroom.” Online students do not have an instructor in front of them “entertaining” them or motivating them. Andy suggests to his students, “you must set aside a time and date that you are going to watch the lecture and complete your work.” For example, Monday at three o’clock is the time the student has set aside. If something unforeseen happens or the student is not well at that time, they do not miss material that is covered during that lecture like they would if they were in a traditional classroom and fell ill. If the student misses class in a traditional setting they must rely on notes from a classmate, but with an asynchronous classroom the student can receive the same information as their fellow classmates firsthand. But that personal drive, discipline, and organization must come from the student. In an online setting there is not an instructor that you meet with once or twice a week to remind you of deadlines for assignments.

Another challenge seen is technology functionality. There is the old saying technology is great if it is working. Andy discussed the fact that his program is based in a rural area. Ten years ago technology and internet connectivity was not what it is today. This poor connection presented problems with streaming videos and intermittent internet connection. These obstacles corrected themselves with the progression of technology. He continues by saying, “Current internet connection is limitless and allows for the virtual classroom to be better, in my opinion, than a traditional classroom.” All of the directors revealed the importance of optimal online learning platforms to conduct class time. Unfortunately, the superior technology that is currently available was not available when these programs initially began. So, they have all seen ease in classroom content production and implementation in an online setting. The challenges they

experienced when starting the program are no longer an issue because of the software and programs available for the online classroom.

Technology integration is crucial to the online classroom. The use of technology has made the face to face classroom obsolete in some accredited programs. This lack of face to face can bring into question the integrity of the student. Accrediting agencies want to ensure that programs still have measures in place to ensure students display academic integrity. Brian's program requires their students to take their examinations while in a locked down proctoring browser. "The program we use videos the student while they are taking the exam, and it flags if the student looks down." Brian or his faculty can then review the video to see if the student is being dishonest. Andy verifies his students' compliance by building questions into their lectures and the student must respond to those questions in an email. "There are more points built into the lecture than what there are in taking the exams." This holds the student accountable for watching the lectures. All the program directors use online testing software, but ultimately they rely on the student to be truthful about their education.

Clinic Challenges

A clinic environment can be challenging. Some students have never been in a healthcare culture. Prior to the student entering the clinic site, there must be clear boundaries and rules that everyone is aware of and agree upon. With each clinic site there must be a contract covering topics such as discipline, expectations, and liability. Each program has its own contract that has been reviewed by the educational institution's lawyers. The clinic facility must also seek their legal counsel for review of the contract. This can often be a tedious process due to the varying opinions of the legal counsel. Brian explained, "We have contracts drawn up by our lawyers here at the college. The clinic site lawyers often have affiliation contracts of their own. We just

have to make sure that both parties are agreeable." So the contractual aspect of clinical affiliation can prove difficult with the distance between the sites and the fact that clinical affiliations are not always within consecutive years. Charlie commented, "It is easier when we have standing relationships with clinic sites and they agree to have students in consecutive years."

Ultrasound programs must have didactic material coupled with a hands-on clinical internship. The students' clinic schedule will be dictated by the clinic site to which they are assigned, and didactic work must be integrated to the clinic schedule or other obligations. The geographical location of each student in these online programs varies greatly and this inherently presents challenges. In a traditional on campus program, clinical coordinators visit their clinic sites and students on a regular basis. This allows for the faculty to see first-hand how the student is doing in their clinic and provides a feedback time for the preceptor. Geographical location limits this in an online setting. Other avenues of communication are crucial for everyone to know the progress of the student and more importantly if they are struggling with any clinical concepts. It is vital for all parties that are involved to understand the dynamics within the sonography department that they are dealing with and the importance of regular communication. As Charlie mentioned earlier each department had its own personality. He explains that "clinical coordinators must be able to identify personality conflicts versus true issues when they are presented with less than acceptable (progress) reports." Charlie's program also has a unique communication platform that the preceptor, student, and clinical coordinator all comment on weekly. The preceptor places comments on the board relating to students' performance and maybe goals that they have asked the student to set for themselves. There is also an area that

allows for private communication between the student and faculty or the faculty and preceptor. This type of open communication ensures that everyone is on track.

"It becomes complicated to manage these students at so many different clinical sites with so many different internal departmental dynamics," Charlie said. He continues by explaining that often this struggle is not noticed by the student or the clinic site and he attributes this to his outstanding clinical coordinators. Brian and Charlie mentioned that they send questionnaires to new prospective clinic sites that include questions such as productivity, types of exams, and credentials held by individuals within the department. This information will allow the director and clinical coordinator to assess if there is enough supervision and exposure to examinations to meet the goal of the program and standards of the accrediting agencies. "I have to put a lot of trust in the clinical area," Andy states. There must be trust between the clinic preceptor at the facility and the clinical coordinator at the educational institution. "That is the biggest area that I have to be guarded in." The students' clinical experience lies solely within the preceptor's hands.

Another obstacle mentioned is the lack of interaction between the faculty and student prior to entering the clinic site. Some clinics are accepting of students with no hands-on experience prior to entering their facilities; others are not so understanding of this lack of interaction. Charlie's program addresses this struggle by having mandatory lab competencies where students must come to campus, or in rare occasions go to their clinic site, and complete a list of competencies that pertain to scanning and technique. This lab time allows the student to get their hands on an ultrasound probe and complete certain skill sets that are expected upon entering the clinical sites. Brian requires his students to use scanning simulation software that can be accessed from their home and complete modules to prepare them for their clinical

experience. Both of these methods help to address the concern of interactions the students could possibly encounter and clinic preparedness. "How much of it (unpreparedness) was from me not adequately preparing both of them (student and clinic) for what they are about to encounter," Charlie candidly explains. He also has hours of recorded "pep talks" from previous students on what to expect going into clinic. These resources help the student to connect to the clinical environment prior to entering the facility.

Another question raised by the accrediting agencies is how do the directors address issues within the clinic site? "Most of the time my clinical preceptor can identify and rectify the problem, but sometimes we will skype so that I can see the issue and hopefully help," Andy describes his course of action with a clinical issue. Equality among students is a must. If a program has local clinic sites, they are required to provide the same avenue of communication with the clinic sites that are further away. Charlie provides a great example:

> "Let's say my clinic site calls that is two miles down the road. A student is having trouble with obtaining a certain view of the anatomy. Then that same day a clinic site two hundred miles away calls with a similar issue. The agencies say that I must communicate via Skype or Facetime with both so that equality is seen."

Brian does explain "there are certain circumstances that we must travel to the clinic site. Administration understands and budgets for unforeseen issues." This is especially the case with sites that are further away. Rule of thumb: "what you can do for one, you must be able to do for all," Charlie sums it up.

The directors said they encourage students to apply at their local programs, if there is one available. One reason for this is clinic availability. It is difficult to obtain a clinic site that has an established program in the area. These clinic sites have relationships with the existing programs

and it would be in poor taste for them to enter into a contract with another facility. The students' goal is to obtain an education in ultrasound and often they have sticker shock when they see the cost of tuition. They do not always understand the logistics behind clinic site procurement and the process as a whole. The majority of students are concerned with the financial impact that their education will have on their finances. Charlie said when he talks to prospective students and asks them why they did not choose their local program and their reply is, "yours is cheaper", he always explains the difficult path that the student is going to encounter when securing a clinic site. He stresses the importance of a strong clinical site relationship and how difficult it will be for a "new" program to come into an area where an already established program is.

Outcomes

The three directors who participated in this study have seen success regarding clinical performance, didactic performance, ARDMS board examinations pass rates, and job placement with the implementation of online education. These criteria are constantly monitored not only by the accrediting agencies but by the educational institutions themselves. "If my curriculum were not preparing my students, it would show very quickly in our exam scores," Brian explains. For accreditation programs must meet benchmarks that ensure the program is adequately preparing students to become diagnostic sonographers. The undisputed response from the program directors concerning outcomes was that all the aforementioned criteria have stayed consistent or improved with the implementation of the online pedagogy. Charlie explains his reasoning: "I don't think it is because of distance education (students are succeeding). I think it is because they have access to all of this guidance and material twenty-four, seven." He continues with confidence, "our students' outcomes are better, job placements are better, and retention rate is

higher." All of these improvements are one hundred percent attributed to the access that students have to material and the better preparation they are allowed to have because of that access.

To maintain this level of standard the three participants in this study said they are constantly assessing their online classroom processes and materials to enhance the overall education experience. They all provide registry review courses prior to graduation so that the student is prepared at graduation, or even before graduation, to take the board examinations. They have regular committee meetings with their clinic sites, fellow faculty, and other allied health professionals to certify their process is meeting or exceeding healthcare standards required in the clinic. Continuing education and professional development conferences help the faculty to identify best practices within ultrasound education and implement them in their own programs. "We struggle to make certain that we are meeting the standards specific to distance education because it is the one area they (accrediting agencies) want to make certain that all students are treated the same," Charlie explained.

Student Motivation

When asked to compare the online learning to traditional class learning, the interviewees replied that each style has their good and bad. Most of all it is important that students identify their individual motivation. "Students think that I am here (in class) to entertain, at some point the motivation and drive needs to come from them," Brian stated. Andy mentioned, "online learning has evolved so much that it is more inclusive of all learning styles and is adaptable to more students." All the directors agree that online education is not for everyone and online students must be driven and organized. The student's self-assessment of their strengths and weaknesses and driving factors will help them prosper in their program of choice.

In a traditional setting, students and program directors or clinical instructors are in a classroom for these prerequisites but for the online programs this is not necessarily the case. Brian stated, "It is difficult to know these students before entering the program because they do not have classes with them." Traditional programs held interviews and students were on campus in a traditional classroom setting where faculty of the program was teaching. This traditional setting allowed faculty to get to know the student's work ethic and overall commitment to the program prior to admittance.

Communication

Throughout the interviews, communication is key was mentioned multiple times. As in a traditional classroom, timely communication with students, clinic sites, and faculty is vital so that all parties involved feel they have a voice and they are being heard. Andy specifically mentioned his experience in a class he was taking. "I was taking an online course and the instructor would not respond to specific questions concerning an assignment until after the assignments due date. This was frustrating and this frustration helped to mold the communication style that I currently use," Andy explained.

When the directors were asked about communication barriers concerning online or distance education, they all responded with, "Communication is not an issue with online education." Andy and Charlie even went as far as stating that they are easier to contact now versus years ago. The electronic age has opened many possibilities when it comes to communication. Email is the preferred method among all of the directors and their clinic sites. Video conferencing is available through certain apps or programs, but most students and clinic preceptors prefer not to be on camera. Occasionally, there may be an issue arise at an out of state clinic site. Department Deans understand the geographical complexity and must allot

funding within the budget for travel to these sites if needed. Compared to a local clinic site, this can be costly to a program budget, but it is important that the clinic site and the student understand that the director and faculty are there to support them through the education process and are available.

Summary

There was variation seen among the processes of the programs and their directors. The overwhelming theme was that all the directors felt as if their online pedagogy resulted in students who could reach their full educational potential. Due to advancing technology, classroom structure and communication were not a deterrent in the educational process. Overall the directors were pleased with the current process of their programs and all have been molding it into the program they have currently. Most importantly, students must be motivated and organized to tackle a strenuous online program.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The following chapter concludes this study. A summary of the research is presented, and results are discussed. These findings could easily be transferred to additional allied health fields. Recommendations for future studies end this chapter. Due to the limited availability of focused research in the allied health field, this study was based solely on the opinions of diagnostic medical sonography program directors and the literature review concentrated on online or distance education

Discussion

I began this study to find commonalities within ultrasound programs that were clinically based and to see if outcomes varied from traditional style classroom compared to an online classroom. Higher education has shifted to more online options and I wanted to know if it was possible to have an education in allied health transition from the traditional face to face to online while still producing graduates prepared to successfully pass the registry and have the skills of an entry level technologist. I believed the best way to obtain this data was to go directly to program directors of online programs already accredited by CAAHEP. I conducted interviews with three out of the four program directors of online diagnostic medical sonography programs.

In talking with the directors, it was revealed that none of them planned to teach in an educational facility. This supports the research presented in this study's literature review. During the review I found multiple sources that stated younger generations have a lack of interest in becoming an educator. This can lead to a shortage of educators in higher learning. Fortunately, these directors developed a passion for students and decided they wanted to

contribute to the field of sonography and help shape the future sonographers. "I was apprehensive at first, but finally realized I liked working with the students," Brian explains.

In searching for themes, I wanted to know what the directors thought were their biggest strengths and weaknesses, or areas for improvement, within their programs. It was also important to compare these to a face to face classroom. Much of the literature was comparative in nature and it allowed me to see others' views concerning face to face classroom and the online classroom. One advantage that parallels both the traditional and online educational environment is dedicated program directors and faculty. I found that the "key" to program success is dedication, not only from the faculty but the students as well. Students must be organized and willing to learn in a self-study type environment.

A second advantage was the asynchronous nature of the classroom. This flexible structure is appealing to the students. During the interviews, Andy mentioned, "some students have to work during the program. The recorded lectures make sure that they do not miss any content." Another attractive feature of the asynchronous program is the access the students get to the material. They can customize their learning to a time of day that they comprehend the material the best. For example, some people are more focused in the morning but others may be more productive later into the afternoon or evening.

The success of the program is gauged by the measurable outcomes such as ARDMS exam pass rates, job placement, and retention. Charlie commented, "The improved success of the program is attributed to the access the students have to the material." In talking with these directors, I believe the overall success of the program is clearly attributed to the support faculty at the educational institutions and the clinical facilities and the access the students have to the material. The structure of all the programs is similar, although the presentation of content may

vary. These programs have progressed from a traditional or hybrid program to a fully asynchronous classroom. This structure allows for the flexibility that students are searching for. Andy mentioned that "the current students are coming out of high school accustomed to technology-based classrooms." These online programs allow an easier transition for these students.

As stated above, students and faculty need support throughout these programs. Having supportive program directors, clinical coordinators, and preceptors is important for the growth of the program and the well-being of the student. When faced with challenges, staff must be able to identify and rectify the problem as quickly as possible. Brian stated, "my faculty is the counselors for our students." Being a student and juggling multiple different responsibilities is stressful and faculty must be ready to step in and provide encouragement. Brian's program had the most faculty, with only 3 on staff. Charlie and Andy's programs both only had 2 staff members at the college. "I could not do this without my clinical coordinators," Brian stated. "They address any of the issues and they answer all clinic questions. This allows me to focus on the curriculum."

The clinical preceptors must have a similar vision as the institution and be supportive throughout the training process. These preceptors are not compensated for their time and they pour into and mold these students into entry level sonographers. "These preceptors are the reason for the student's success," Andy explains when he is describing the clinical relationship. "They teach them the hands-on portion, I just teach them the book stuff." Often it is overlooked that a large part of the students' success is because of the clinic site and the experience that is had during the clinical education potion of these programs.

The clinical aspect of the sonography program is coupled with the didactic portion to ensure a well-rounded education. But how do these distance education monitor clinic education at the sites further away from their campus? The program directors and clinical coordinators have a unified relationship and address issues by collaborating with the clinical staff. "We have found avenues to handle issues without having to step foot on their campus," Charlie reminded me. Throughout this study I discovered that the faculty addressed some issues via Skype or Facetime and other issues could be addressed by a conversation or email. Andy explains that he has to have "ultimate trust in my preceptors. These guys have done this for a number of years. They know how to fix things."

I found that these programs have been in place much longer than I thought but that the ease of implementing the online classroom has increased with improving technology. The program directors had put much effort, and continue to do so, into their programs and its students. As mentioned previously, each participant gives up time with family or other obligations to attend to matters related to the program. Ultimately, the sacrifices have been proven successful. "I have seen consistency, or improvement, in job placement, board scores, and retention rates as a result of the time I have given," Charlie explains. I was surprised that all the directors felt as if online education was the natural structure of this clinically based subject matter. None of the directors stated that online education was less time consuming but their experience within online education has provided opportunity to recognize some areas for refinement within their programs.

After talking with these directors, I do believe that a clinically based program can be successful in an online classroom. The stringent requirements outlined by accrediting agencies ensures there is consistency in preparing the students for the work field. Often these

requirements seen unwarranted, but I believe they are necessary. The agencies do not state specifics of curriculum, but they allow the individual programs to customize their content to what is best for their faculty and students. I think this success is definitely due to the access students have to resources and their familiarity with the internet.

Another contributing factor to success is the students' motivation and participation. Charlie said it best when he said, "students think I am up there to entertain. They need to take responsibility for their education." The lack of interaction between instructor and student can often cause a non-motivated student to fall behind. But all the program directors were adamant that they are more accessible in the online classroom than they were in a traditional classroom. Andy explains, "in a traditional classroom, I also had to complete clinic visits. My office hours were very limited." Ultimately, the student has to be dedicated to their education, whether online or in the traditional classroom.

Another factor that I did not consider was the effects of technology and how it contributed to online education. Specifically, the lack of technology when these programs originated. The directors all made mention of the changes in technology and software during their tenure. Most changes have been beneficial. I have been exposed to technology throughout my education, so to think of a classroom without it is difficult.

All the directors mentioned that online learning is not for everyone. I believe that the student must be self-disciplined to complete the rigorous online programs. Not everyone has the motivation to stay on task and be organized to be successful. And although the online classroom is prevalent at most educational institutions, I do not think the traditional classroom will become obsolete. The content being conveyed must be well organized and structured so that information is transferred from the instructor to the student in an efficient way.

Recommendations

This study can be applied to any clinically based, allied health program. If I were to change anything about this study, I would broaden the range of my questions to include more information concerning accreditation and to ask more for suggestions on what they would do to improve their program. These programs saw a need within their community, and they came up with a solution. I would also explore more into the structure and day to day interactions with the dispersed clinical sites.

One recommendation would be to have a more uniform experience between programs. Mission statements are similar between these facilities, the lines of communication between these programs should be more open to help further the sonography community. Share common practices and network to help each program produce optimal technologists. Students interested in this field can examine the program options available and determine what program, traditional or online, works best for them.

Recommendation for Future Study

Future research could explore the applicability of online education in other clinically based allied health programs. Another perspective that could be further researched is that of students being responsible for finding their own clinical site. Additional research could be done to inquire about the perceptions of the clinical sites concerning the student obtaining their own site. Acquiring personal clinic sites takes the responsibility of placing a student at a facility away from the program officials and places that responsibility on the student. If this responsibility is placed on the student, this may be a way to determine which students are going to be driven enough to complete the rigorous program. Additional research could compare completion rates, and other indicators of success of students who were responsible for their own

clinical placements and those who were not. Based on the information gathered from the directors in this study, taking this responsibility of finding clinical sites from the faculty would alleviate a lot of issues faced within these online programs.

Further research could be conducted on radiography, respiratory therapy, dental hygiene, physical therapy assistant, occupational therapy assistant, and emergency medical technician (EMT) programs to determine if online education would be beneficial for training in their profession. These studies could help see parallel structures within the asynchronous programs. If commonalities are identified, maybe a streamline, uniform education structure can be formed. Training individuals in similar career fields that work cohesively within a facility can make the transition from education to clinic easier and help to build better team skills for ease of workflow.

Conclusion

For traditional programs that are struggling with student recruitment this study provides research on how to transition to an online didactic portion while maintaining a quality clinical component. Interdisciplinary education is becoming the new trend (West, Boshoff, & Stewart, 2016). Collaboration within healthcare makes the patients' care more efficient and cohesive. West, Boshoff, and Stewart (2016) describe what the healthcare community should strive for: "Providing a range of services integrated into a single setting and within a collaborative service framework is considered an effective service delivery model for complex and vulnerable population groups" (p. 27). The earlier collaboration occurs, i.e. during education, the easier it will be for healthcare workers to realize that multi-disciplinary departments are the future. The versatility of this study allows for multiple allied health professions to research the possibility of

making an online program that will be more streamlined and flexible for the students coming into the allied health professions.

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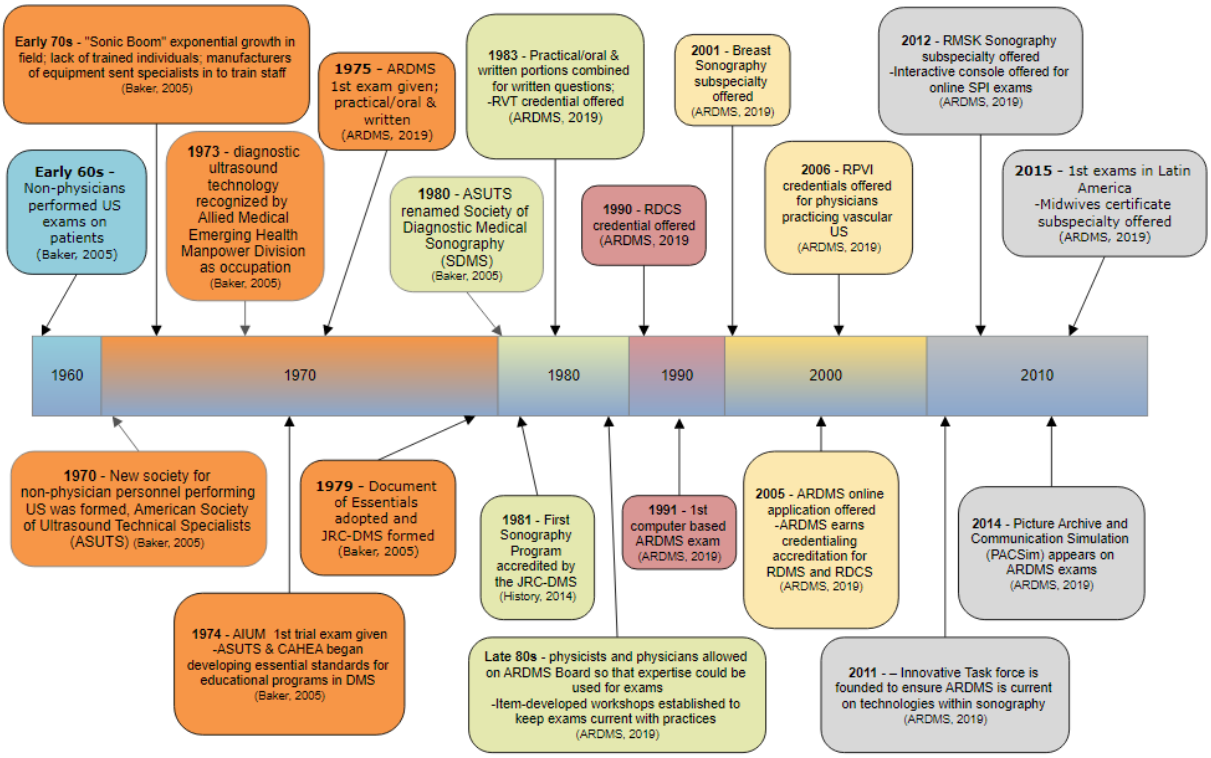
APPENDICES

Appendix A:

Ultrasound Timeline

Timeline created with information taken from multiple sources showing the progression of ultrasound in education and credentialing



Appendix B:

Approved Interview Questions

1. How did you initially become involved in education, and is your educational history primarily traditional classroom or an online setting?
2. How long have you been a part of the faculty at this institution? Was your program an original online program or traditional?
3. Describe some attributes of faculty that have proven beneficial in the online teaching.
4. Does your program mission focus on online learning and how do you keep your faculty focused on the mission?
5. What are some strengths and weaknesses of online education? How, if at all, do these outweigh traditional face-to-face education?
6. How would you compare distance/online learning to traditional, on-campus classes within Ultrasound?
7. Were there challenges in meeting standards that CAAHEP, JRC-DMS, and ARDMS have outlined when deciding on online curriculum?
8. Have you participated in traditional classroom student selection and if so how does selection for online students differ?
9. Describe the program structure (didactic classes, clinic requirements, student tentative schedule) once the students have been accepted. How does this vary from a traditional setting?
10. With geographical diversity among the online students, do you find challenges in securing comparable clinic sites for all the students?

11. Online education often presents with communication barriers, how do you stress the importance of preparation for board exams to the students?
12. Describe how you improve your program, how are best practices identified and implemented?

VITA

ASHLEY MORGAN

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