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Athletic training clinical education is the most integral component in the transition into practice. However, barriers within clinical education exist, which may affect athletic training students' professional preparedness. Simulation technology, within other healthcare professionals' education, has shown promising benefits. However, research regarding simulation technology in athletic training is limited, with current practices relatively unknown. This study assessed the prevalence of simulation technology and explored factors that influence its use in athletic training clinical education. Athletic training program directors or clinical coordinators (n=54) completed an online survey via Qualtrics. The survey examined current simulation technology practices in clinical education. Additionally, participants rated the influence of barriers, challenges, and facilitators on its use. Survey responses indicated that 31 of 54 programs were using some form of simulation technology, with an additional 11 programs stating they were considering using it in the future. Within these programs, high-fidelity simulation (n=22) was the predominant type used. In addition, most of these programs noted improvements in professional competencies (e.g., decision-making, skill development) and clinical experiences (i.e., engaged time, incident variety), 84% and 77%, respectively. Of the 54 programs, 36 rated "high financial cost" as a very influential barrier. "Limited staffing and availability" were also found to be big challenges. On the other hand, 26 of 54 programs rated "additional healthcare programs" very influential, the most among facilitators. The results indicate that simulation technology is currently used within athletic training clinical education, but barriers still influence its use. Future research should continue examining simulation technology's benefits and exploring specific implementation strategies to improve use.

THE PREVALENCE OF SIMULATION TECHNOLOGY IN ATHLETIC TRAINING

CLINICAL EDUCATION

by

Steven M. Kong

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Approved by

Dr. Pamela Kocher Brown
Committee Chair

DEDICATION

I dedicate this dissertation to my family and friends for all their support through this process. A special thanks to my wife, Laura, whose constant encouragement and love have allowed me to not only pursue my dreams but also achieve them.

APPROVAL PAGE

This dissertation written by Steven M. Kong has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Chair	Dr. Pamela Kocher Brown
Committee Members	Dr. Diane Gill
	Dr. Aaron Terranova

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CHAPTER I: PROJECT OVERVIEW

Certified Athletic Trainers (ATs) are recognized as allied healthcare professionals who are put in a position to provide optimal care and promote positive patient outcomes through their professional training education. These athletic training programs aim to prepare students through didactic and clinical education using a competency-based approach (NATA, 2011). However, clinical education has continually been the most integral component in preparing athletic training students and the transition into practice (Bowman et al., 2017; Dodge et al., 2015). In athletic training clinical education, clinical experience allows athletic training students to gain clinical competency by facilitating independent practice, exposure to incidences, patient encounters, and experiencing the daily task of ATs. These real-life clinical experiences enable students to integrate into the profession fully. However, notable clinical education barriers exist that hinder the transition into practice, such as level of involvement and academic and clinical incongruence (Thrasher et al., 2018). In addition, newly credentialed ATs have difficulty with their clinical decision-making, confidence, and communication skills (Carr & Volberging, 2012).

Simulation technology can supplement clinical education and improve clinical development by increasing incident exposures and experiences that foster clinical competency, decision-making, confidence, and communication (Palmer et al., 2014; Doherty-Restrepo & Tivener, 2014). In addition, when examining the education of other healthcare professions, simulation technology has been used to supplement clinical education with promising effects, such as improved clinical competency and decision making (Yuan et al., 2012; Zhu et al., 2014). Considering these benefits, use within athletic training could assist in optimizing student learning and better prepare ATs for the transition into the profession. However, barriers exist that may hinder implementation and need to be explored.

Background Literature

The evolution of athletic training education has led to newly certified practitioners being more academically and theoretically inclined than ever. Evident by the Commission on the Accreditation of Athletic Training Education's (CAATE) emphasis on the development of accreditation standards and athletic training education competencies to improve the foundational knowledge base and emphasize evidence-based practice (CAATE, 2019). Accordingly, the athletic training profession decided to move the entry-level professional degree to the master's level. The move to a professional master's degree expects to improve the longevity of athletic training by improving retention and career placement rates, 88.7%, and 88.5%, respectively; and has shown higher first-time pass rates of the BOC exam (Bowman et al., 2017, Ostrowski and Marshall, 2015). In addition, research has suggested that a didactic education for a focus on the profession and, thus, an ability to refine clinical competencies (Cavallario & Van Lunen, 2015).

Although didactic education has expanded, clinical experiences continue to provide educational opportunities in diverse and immersive settings. These opportunities facilitate students to practice autonomously, gain exposure to injury/medical incidences, and experience all aspects of the profession (Bowman et al., 2017; Elder et al., 2017). Bowman et al. (2017) found that amongst faculty, 62% believed that clinical experience was the primary strategy in preparing students to transition into practice, and 56% of new graduates agreed. Clinical experience is a component of one's clinical education, which is the most crucial facilitator in the transition to clinical practice (Bowman et al., 2017; Dodge et al., 2015). For this study, clinical education will refer to the acquisition, practice, and evaluation of clinical proficiencies by way of clinical experiences, as well as laboratory settings.

Barriers within Clinical Education

Clinical education also provides opportunities for athletic training students to practice autonomously with quality mentorship on actual clients/patients. These real-life applications allow students to connect content competencies with clinical experience, which aids with the full integration into the profession (McKeon et al., 2017). However, barriers within clinical education exist that may affect athletic training students' professional preparation (Thrasher et al., 2018). These barriers include limited autonomous practice, lack of active opportunities, clinical incongruence, clinical inconsistencies, and culture of clinical education. Although five are listed, this study will focus on these three: lack of active opportunities, clinical incongruence, and clinical inconsistencies.

Athletic training students were found to have minimally engaged active learning time, nearly 60% of the time, during their clinical education (Nottingham et al., 2017; Bowman & Dodge, 2013). When active learning and quality mentorship were present in clinical education, critical thinking and clinical reasoning skills were better developed (Walker, 2008; Kicklighter et al., 2018). Additional research found that quality clinical experiences and clinical experience variety improved perception of professional preparedness and influenced confidence amongst athletic training students (Mazerolle & Benes, 2014; Carr & Volberding, 2012). However, students' individual experiences vary based on clinical placement with different types of incidents, levels of autonomy, and mentorship within their clinical setting (Smith et al., 2011). Therefore, there may be potential for clinical inconsistencies regarding active learning time and incident frequency and variety during their clinical education. An additional barrier is clinical incongruence, the gap between what students learn in courses and labs and what they experience during clinical education (Thrasher et al., 2018). Given the flexible learning design of clinical education, a lack of situational exposures and improper timing with athletic training students' progression with their didactic learning may lead to this incongruence. (Thrasher et al. 2018).

The aforementioned clinical education barriers (active learning time, incident variety/frequency, and clinical incongruence) may affect professional preparedness. In addition, Palmer et al. (2014) noted that there might already be limited time for clinical education and thus insufficient time to prepare new ATs to enter the profession. This limited autonomous experience may hinder one's ability to move from novice to expert with professional competencies and interpersonal communication (Greisler & Lazenby, 2009; Kicklighter et al., 2018; Carr & Volberding, 2012).

Deficiencies among Newly Certified ATCs

Athletic training students are deemed clinically proficient through the passage of the Board of Certification (BOC) exam following a competency-based education program, which includes the demonstration of clinical integration proficiencies (CIP) while experiencing a variety of clinical settings. However, as mentioned previously, not all clinical experiences are considered "quality". In addition, studies have referenced anecdotal evidence that deficiencies amongst newly certified ATs are present (Mazerolle et al., 2015; Carr & Volberding, 2012; Gardin & Mensch, 2014). Employers and employees viewed similar "thematic" deficiencies amongst newly certified ATs, including interpersonal communication, decision-making skills/independence, and confidence (Carr & Volberding, 2012; Massie et al., 2009). Research has also shown that although the passage of the BOC examination demonstrates competency, factors beyond competency were needed to enable knowledge and transfer of core skills, including critical reasoning, problem-solving, and oral communication (Raab et al., 2011; Carr &

Volberding, 2012). These attributes assist in developing clinical expertise and are advanced through applying skills and knowledge through extensive autonomous experience.

Clinical expertise combines one's individual experience, education, and clinical skills that develop over time into "expert-like" tendencies. An individual with expert tendencies can highly organize and interconnect knowledge structures (Gardin & Mensch, 2014). Gardin and Mensch (2014) found a difference between novice ATs and expert ATs in how they represent accrued knowledge, with novices demonstrating less complex search-and retrieval systems. On the other hand, more experienced ATs demonstrated higher levels of clinical reasoning (Gardin & Mensch, 2014). Greisler and Lazenby (2009) found similar differences between novices using hypothetical-deductive reasoning and experts using case-pattern recognition, with those utilizing case-pattern recognition able to organize and process information more efficiently. These findings coincide with other studies, which found that newly credentialed ATs had difficulties making decisions independently and feeling confident during the transition to practice (Walker et al., 2019; Thrasher et al., 2015). However, Walker et al. (2019) found that decision-making and confidence improved with practice and experience and could be facilitated through professional preparation within their clinical education or with additional clinical experience. One avenue for newly certified ATs to gain additional experience has been through graduate assistantships; however, graduate assistantship positions may be eliminated with the degree transition. The loss of this avenue will put a greater emphasis on clinical education in the development of athletic training students and a potential need to seek ways to supplement clinical education to assist in developing clinical expertise, such as simulation technology.

Simulation Technology

As a supplement to clinical education, simulated/standardized patients or scenarios may be used to evaluate student proficiency (NATA, 2011). Simulations have been used across many healthcare professions to conduct training, evaluations, and research (Doherty-Restrepo & Tivener, 2014). Using simulations and standardized patients provided opportunities to practice cognitive and psychomotor skills while demonstrating proficiency in clinical skills before patient implementation (Elder et al., 2017). In addition, simulations mitigate barriers to real-time evaluations and encounters (Armstrong et al., 2018; Palmer et al., 2014). However, they offer little to allow for an immersive experience that one may encounter in the field (Doherty-Restrepo & Tivener, 2014; Palmer et al., 2014).

With the development of technology, simulations have become more realistic. They can provide immersion of students in realistic scenarios that mimic real-life environments while creating enough fidelity to dissolve students' disbelief in the simulation (Doherty-Restrepo & Tivener, 2014). Simulation technologies, such as high-fidelity simulations and augmented/virtual reality (AR/VR), are now being used in the professional education of other healthcare professions with promising benefits. High-fidelity manikin simulations provide many of the same benefits as standardized patients while eliminating the time and monetary costs associated with training mock patients and increasing the realism of scenarios (Palmer et al., 2014). Research has found that high-fidelity simulation improved students' knowledge and skills, clinical competency, confidence, and decision-making skills (Doherty-Restrepo & Tivener, 2014; Yuan et al., 2012; Miller et al., 2018). In addition, augmented/virtual reality (AR/VR) has demonstrated similar improvements in skill development and efficacy (Moro et al., 2017). It provides rich contextual learning in a more authentic learning experience that can also adjust to individual learning styles and experiences (Zhu et al., 2014). Augmented reality superimposes digital models into the real world, while virtual reality allows users to be fully immersed in a synthetic environment that mimics properties of the real-world (Moro et al., 2017). Part of the reason these simulation technologies have been effective is their ability to repeatedly provide students with a realistic environment where skill training can occur, with mistakes, and without harm to the patient (Doherty-Restrepo & Tivener, 2014; Zhu et al., 2014).

In athletic training education, the use of technology outside of managing information was limited (Moffit & Lindbeck, 2018). However, technology is being used within clinical education, as seen in Nottingham et al. (2017), Miller et al.(2018), and Palmer et al. (2014), with increased active learning time, enhanced confidence, and improved decision-making skills. Additional research regarding the use of technology, notably simulation technology in athletic training clinical education, is few and far between, with studies involving AR/VR in athletic training nearly non-existent. Palmer et al. (2014) noted potential barriers to the implementation of "high-tech" devices, including lack of space, financial resources, and technical support (Palmer et al., 2014). Technical support includes mechanical troubleshooting but also faculty/staff training and ability. The limited research coupled with implementation barriers demonstrates the need to examine further the prevalence of simulation technology in athletic training clinical education and what factors contribute to its use or lack thereof.

Purpose

Based on the background literature, simulation technology may be underused in athletic training clinical education, especially given the benefits that have been shown within other healthcare professionals' education programs. In addition, understanding simulation technology in athletic training programs may provide an opportunity to enhance students' learning and professional development. Therefore, the purpose of this study was to assess current simulation technology practices and explore factors that influence its use in athletic training clinical education using the following specific aims:

- ***Specific Aim #1: Determine the prevalence of simulation technology use in AT clinical education***
- ***Specific Aim #2: Explore barriers and challenges to its use.***
- ***Specific Aim #3: Explore facilitators for their use.***

Methods

Following IRB approval through the University of North Carolina at Greensboro, accredited athletic training programs were recruited via the email of their respective program director. These programs and program directors were gathered from the CAATE website using the search directory, with program directors' emails obtained through each program's website. The recruitment email (Appendix A) described the purpose of the study, criteria for selection, level of involvement, a review of the informed consent, and a link containing the Simulation Technology Survey (Appendix B). Program directors were instructed to forward the recruitment email to the program's clinical coordinator if they felt the clinical coordinator was better suited to participate in the study. The survey was open for eight weeks, April 2021 to June 2021, with follow-up reminder emails sent biweekly. All responses were collected electronically and analyzed via SPSS using descriptive statistics (frequency and means).

Participants

A total of 300 recruitment emails were sent to CAATE accredited professional athletic training programs, with 62 responses. However, eight (8) of the 62 surveys were incomplete and excluded, and the total number of participants was 54. The response rate of 18% was within the

15%-60% response rate of similar studies involving program directors. The 54 responses comprised a broad spectrum (size, location, and housing) of athletic training programs across the country. In addition, there were 35 professional master's programs and 19 bachelor-level programs, only 13 of which stated that they would be transitioning to professional master's programs. Surveys were completed by 48 program directors and six clinical education coordinators, varying in age and experience. For additional demographic data on participating athletic training programs and survey participants, see Appendix C (additional results tables).

Simulation Technology Survey

The simulation technology survey was conducted online using Qualtrics (Appendix C). After providing informed consent, the first section gathered demographic data on participating athletic training programs and participants, in addition to respondents' familiarity and perceptions of simulation technology. The following section provided an operational definition of simulation technology and clinical education, and gathered data regarding current simulation technology practices in the clinical education setting. These questions were developed explicitly for this study and examined types of simulation technology, what it was used for, and how it was used. In addition, questions looked to determine if programs observed improvements in students' professional competency and clinical experiences as seen in other healthcare professionals' education. The following two sections obtained data regarding the barriers and challenges, and then on facilitators on simulation technology implementation. Previous studies noted most of the 15 barriers/challenges. At the same time, some were added either by the expert review panel or through conversation with program directors based on their personal experiences. In addition, the eight facilitators were noted in previous studies or suggested additions by members of the expert review panel. In both sections, responses used a 4-point Likert scale, with one being "not influential" and four being "very influential. The final section provided questions regarding the effects of COVID-19 on their current clinical education and simulation technology practices, as well as any final thoughts on simulation technology. An expert review panel, consisting of a variety of experts (>5 years) within the field of athletic training and athletic training education, provided an overall review of the survey to assure that questions were appropriate and relevant. The overall review included removing irrelevant demographic questions, reordering questions, providing additional options for lists (tech portability, limited staff, and preconceived perceptions), and overall impression of the survey.

Results

The results on the prevalence of simulation technology and practices from those athletic training programs that use it are presented first. Then the results from all athletic training programs on barriers, challenges, and facilitators are presented. The results regarding the effects of COVID-19 are presented in the final portion.

Prevalence of Simulation Technology

Before viewing this study's definition of simulation technology, participants were asked about their level of familiarity with it and their perceptions of simulation technology. Regarding familiarity: 12 were "very familiar", 23 were "moderately familiar", 18 were "somewhat familiar", and only one was "not familiar at all". Their perceptions of simulation technology responses can be found in Table 1, where all but one of the 54 participants either agreed or strongly agreed with four of the five listed perceptions.

Table 1. Preconceived Perceptions

"Simulation Technology can…"	Strong D (1)	Disagree (2)	Agree (3)	Strong A (4)	Mean	SD
Be an Effective Tool	0	1	21	32	3.57	.536
Provide Sig Benefits	0	1	21	32	3.57	.536
Overcome Clinical Barriers	0	1	25	28	3.50	.541
Improve Prof Preparedness	0	1	29	24	3.43	.536
Provide Sig Realism	0	8	26	20	3.22	.691

Based on the operational definition of simulation technology and clinical education provided in the survey, 28 programs use a form of simulation technology, while 22 stated "no", and four were "unsure". Of the four "unsure" programs, three listed types of simulation technology consistent with the operational definition, thus added to "Yes" programs (n=31), resulting in roughly 57.5% of programs in this study using it. The 22 "No" programs were asked about future considerations of simulation technology, and 11 stated they would consider it. The rationales provided by the 11 programs that stated they would not consider its use are seen in Table 2. These programs skipped to the barriers and challenges section of the survey.

Table 2. Rationale for nonuse in the future.

Program Closure	Cost	Prefer Clinical Experience	Where the program is housed
6	6	3	2

Current Practices in Athletic Training

Only "Yes" programs (n=31) answered questions that examined their current practices of simulation technology. Table 3 contains the results on types of simulation technology and the top three responses regarding the capacities used and for what the content area used. Notably, "High-fidelity simulation" was the predominant type used, with 16 of 31 programs stating they use it. A complete frequency table for capacity and content area can be found in Appendix C.

Table 3. Current Practices

Types		Capacities		Content Areas	
High-Fidelity Sim	22	Assessment	27	Clinical Exam and Dx	27
Augmented Reality	8	Educational Learning	26	Acute Care	24
Virtual Reality	3	Student Experience	23	Psychosocial Strategies	15

"Yes" programs' responses to simulation technology influences on professional competencies and clinical experiences can be seen in Table 4 and Table 5. Nearly all programs in this study mainly found moderate to great improvement in most professional competency areas, with 16 of 31 participants noting great improvement in students' "confidence".

Table 4. Improvements in Professional Competencies seen in "Yes" Programs

Aspects of SD	None (1)	Minimal (2)	Moderate (3)	Greatly (4)	Mean	SD
Confidence	0	2	12	16	3.47	.629
Skill Development	0	1	17	12	3.37	.556
Decision Making	0	2	17	11	3.30	.596
Clinical Efficiency	0	2	17	11	3.30	.596
Clinical Competency	0	3	15	12	3.30	.651
Knowledge Base	0	4	23	3	2.97	.490
Prof Collaboration	3	7	15	5	2.73	.868

This study also found that all listed aspects of clinical experience improved either moderately or greatly amongst a clear majority, about 77%, of the 31 “yes” programs.

Table 5. Improvements in Students' Clinical Experiences seen with "Yes" Programs.

Inconsistencies	None (1)	Minimal (2)	Moderate (3)	Greatly (4)	Mean	SD
Engaged Time	0	5	16	8	3.10	.673
Incident Variety	0	6	14	9	3.10	.724
Incident Frequency	1	4	15	9	3.10	.772
Matched Didactic/Clinical	1	4	17	7	3.03	.731

Barriers and Challenges

All programs (n=52) rated the influence of barriers and challenges. The results of barriers and challenges are shown in Table 6 below. The results indicate that "high financial cost" was the greatest barrier to implementing "high tech" simulation technology. Of the 52 programs, 36 rated it very influential, much more than any other barrier or challenge, and only two stated it was not influential. "Limited staffing", "availability", and "lack of space" were also big challenges. On the other end, "preconceived perceptions", "student engagement", and "lack of significant benefits" were found to be not much of a barrier.

Table 6. Influence of Barriers and Challenges

Barrier/Challenge	Not (1)	Somewhat (2)	Moderate (3)	Very (4)	Mean	SD
High Financial Cost	2	7	7	36	3.48	.874
Limited Staffing	9	10	19	14	2.73	1.050
Staff Availability	12	7	17	16	2.71	1.143
Lack of Space	8	15	14	15	2.69	1.058
Tech Portability	7	17	15	12	2.63	.999
Tech Functionality	9	17	15	11	2.54	1.019
Tech Access	10	18	13	11	2.48	1.038
Lack of Institutional Support	13	20	9	10	2.31	1.058
Lack of Options	11	22	12	7	2.29	.957
Staff Motivation	15	16	15	6	2.23	1.002

Lack of Tech Support	18	16	12	6	2.12	1.022
Preconceived Perceptions	21	16	11	4	1.96	.969
Student Engagement	19	21	10	2	1.90	.846
Fear of Tech	25	15	9	3	1.81	.930
Lack of Sig Benefits	27	20	3	2	1.62	.771

Facilitators

All programs (n=52) rated the influence of facilitators, and the results are shown in Table 7. The greatest facilitator was “additional healthcare programs”, with 26 of 52 programs rating it very influential. “Individualized learning”, “institutional support”, and “improved didactic and clinical connection” were also seen to be influential facilitators. On the other hand, “students’ technical prowess” and “technology grants” were not found to be much of a facilitator.

Table 7. Influence of Facilitators.

Facilitator	Not (1)	Somewhat (2)	Moderate (3)	Very (4)	Mean	SD
Additional Health Prof	5	6	15	26	3.20	1.000
Didactic/Clinical Connection	2	9	25	16	3.06	.802
Institute Support/Initiatives	5	10	16	21	3.02	1.000
Individualization of Learning	1	22	21	8	2.69	.755
Variety of Tech	6	17	18	11	2.65	.947
Improved Tech Access	8	20	14	10	2.50	.980
Students Tech Prowess	15	15	16	6	2.25	1.007
Tech Grants	17	14	11	9	2.24	1.106

Effects of COVID-19 and Final Thoughts

Finally, all participants (n=51) answered questions about COVID-19 effects on clinical education practices and simulation technology. As shown in Table 8, the results indicate that clinical experience, selected by 42 programs, was the area of clinical education most affected by COVID-19. The results regarding factors during the pandemic that contributed to simulation technology use, or nonuse, can be seen in Table 9. "Other" factors named by participants included: "closing of the program", "lack of interest", and "limit time". Regarding the use of technology because of the pandemic, 19 programs began using it, while 11 programs stated they increased use because of COVID-19. Of the 51 participants, 41 stated that they believe simulation technology will continue to supplement AT clinical education in a "post-pandemic" reality. Finally, common final thoughts regarding simulation technology included: "It is a valuable tool", "It can supplement clinical experience", "High cost makes it difficult", and "More support is needed".

Table 8. Areas of Clinical Education Affected by COVID-19.

Clinical Experience	Skill Acquisition	Professional Preparation	Clinical Efficiency	Effective Comm	Foundational Knowledge	None
42	29	19	19	9	6	4

Table 9. Factors Affecting Simulation Technology Use During COVID-19.

Campus or Clinical Access	Availability	COVID-19 Restrictions	Budgetary	Technology Access	Alternative Practices	Student Engagement	Other
23	18	17	16	12	9	7	7

Discussion

This study aimed to assess the prevalence of simulation technology and explore factors that influence its use in athletic training clinical education. This study found that 31 of 54 programs were using simulation technology, and another 11 were considering implementation in the future. The results indicate that simulation is being used in athletic training, and utilization within these programs may continue to increase, especially given the 11 programs that stated they increased use because of the COVID-19 pandemic. In addition, these "yes" programs noted improved decision-making and clinical efficiency, consistent with findings of other studies across varying healthcare professions (Doherty-Restrepo & Tivener, 2014; Yuan et al., 2012;

Miller et al., 2018). These findings suggest that simulation technology can supplement clinical education to assist in the transition to practice in athletic training by diminishing deficiencies of newly credentialed ATs noted by Walker et al. (2019) and Thrasher et al. (2015). However, there are still barriers that influence implementation.

Two influential barriers found in this study, "high financial cost" and "lack of space", were consistent with noted barriers by Palmer et al. (2014). "High financial cost" was the predominant barrier. Given the budget constraints that may affect athletic training programs and universities, the high financial cost of simulation technology may be daunting, not to mention the limited physical space to accommodate certain types of technology. It would be assumed that one way to overcome these barriers is with "technology grants", but this was one of the lesser influential facilitators. "Additional healthcare education programs", on the other hand, was highly rated in this study.

The presence of other healthcare professions programs within the same university, nursing (42) being the most common, could offer several potential benefits and help overcome barriers and challenges faced by athletic training programs. First, sharing access to technology with multiple programs could ease the burden of these high-cost devices, especially given that high financial cost was the greatest barrier to implementation. A second benefit could help overcome the lack of space by allowing the technology to be housed in a shared space. Finally, a third potential benefit is increased collaboration among healthcare educational programs. Collaboration between programs could foster communication skills and knowledge sharing, ultimately enhancing patient care once students enter the profession.

However, it should be noted that the presence of other healthcare professional programs is not a guarantee that technology could or would be shared. It may depend on the willingness of programs to share or whether the athletic training program is housed in the same school/department as these other healthcare programs, as noted by two participants. In addition, simulation technology use within other healthcare professions tends to focus more on general medical and acute care emergency scenarios. While this is relevant to athletic training, additional scenarios and simulation technology must cater to content areas specific to athletic training students to prepare them better.

Additional big challenges noted in this study were "limited staff" and "staff availability". More than 67% of programs in this study only employ 2-4 faculty members, including part-time faculty. Considering faculty and staff's responsibilities, it is no surprise that these barriers/challenges were influential. The availability to staff could limit the ability for technology training, simulation lesson planning, and incorporation of new technology, limiting the use of simulation technology. Individual programs may be unable to address these barriers and rely on factors such as institutional support and initiatives that promote technology use. In this study, "Institutional support" was a highly influential facilitator. The improvements observed with "yes" programs and other documented benefits of simulation technology could provide a rationale for providing additional space and, more importantly, additional funding. Therefore, the support of one's institution could go a long way in increasing the use of simulation technology.

As previously noted, one of the main barriers to clinical education is the potential disconnect between didactic knowledge and real-world application, given its flexible nature. However, more than 80% of "yes" programs saw moderate to great improvements to matched didactic and clinical education with simulation technology use. This ability to match didactic and clinical education could allow for more appropriate application of skills into the clinical experience to enhance knowledge transfer and clinical proficiency. It may explain why all but two programs rated it at least somewhat influential in implementation. It has also been noted that simulation technology provides a repeatable and safe environment to practice skills they may experience in the field. This increase in incident exposure, practice, and experience could allow newly credentialed ATs to develop more expert-like tendencies. It coincides with findings from this study that saw improvements in professional competency areas, specifically skill development and decision-making. These competencies are related to an AT's ability to improve patient outcomes.

A limitation to this study was the low number of respondents, which in part may have been attributed to the increased responsibilities and time commitments of staff due to the COVID-19 pandemic at the time of the survey. The lower response rate limits the generalizability of findings regarding the current climate of simulation technology used in clinical education; however, it guides programs on the value of simulation technology. In addition, findings may assist programs in identifying barriers and ways to facilitate its implementation. It is essential to consider that each program is unique and faces its own barriers and challenges in implementing simulation technology.

The results demonstrate that simulation technology is currently being used to supplement athletic training clinical education, benefiting students' clinical development. Benefits include increased skill development, decision-making, and clinical competency. In addition, programs in this study noted improved engaged time, incident frequency, and matched didactic/clinical learning, all barriers to clinical education. These findings illustrate how the benefits of simulation technology are improving aspects of professional competency and clinical experience and assisting ATs in the transition to the profession. If the goal is that more expert-like practitioners enter the field, then using effective educational tools to prepare them better should be explored, especially given the findings. These tools, such as simulation technology, will not only optimize patient care but also continue to propel the profession, and its clinical education practices, into the future. Additionally, this study noted influential barriers to implementation, with a high financial cost, staffing, and lack of space being more challenging than others. These barriers vary depending on the program, but they can be overcome, demonstrated by programs currently using simulation technology. On the other hand, programs identified primary facilitators, such as additional healthcare programs, didactic/clinical connections, and institutional support. Not every program may have equal access to these facilitators, but they may provide a platform to address their individual needs to increase use across the programs. Simulation technology is an effective educational tool to help athletic training students, and future research should continue to examine these benefits with an eye toward the specific skill set of ATs. The need to cater specifically to ATs may require future development of simulation technologies to accommodate the diverse content areas in the profession. Additionally, the views and experiences of newly certified ATs with simulation technology should be examined, and specific implementation strategies for programs to use as a roadmap to increase use.

CHAPTER II: DISSEMINATION

Initial dissemination was a summary report (Appendix D) that was distributed in June of 2022, via email, to participants that voluntarily provided their information. The purpose of the report was to provide participants with a brief recap of the study while highlighting notable findings and how they could potentially be useful. It is presented as a series of slides to display results in an organized manner to best relate findings to practical implications/recommendations. It also allows the reader to focus on particular topics/findings within this study that may otherwise get lost in a formal report. Additionally, the slide format could be easily shared or presented to institutions, departments, programs, and colleagues to increase support and foster discussion. Participants in the study, program directors or clinical coordinators, were selected to receive the report because they are in the optimal position to elicit change within the AT curriculum (didactic and clinical) and incorporate simulation technology to enhance student learning and preparation. In addition, the email and report encouraged them to share with colleagues and other athletic training programs.

Summary Report

The report is presented in slide format to quickly organize information in a way that is the most useful for participants. The first two slides include the title slide and a transition slide. The transition slide includes how the summary report is presented, first with "take-home messages", then with the full summary report. Additionally, the transition slide reminds them of why they are receiving this summary report and thank you message for their participation in this study. The following three slides are "take-home messages" and scripted below. These slides are presented at the beginning of the summary report for readers to obtain the most pertinent information on how these findings may apply to their programs. The next two slides display the purpose, aims, and methods, briefly reviewing why and how this study was completed. The script for the following eight slides is also presented below. Finally, the last two slides include a "what's next" slide to recruit programs to examine specific implementation strategies and obtain video demonstrations, followed by a thank you slide with contact information for additional questions or comments.

Slide 3 – Take Home – An Innovative Tool

This slide presents findings from this study and how they may show that simulation technology can be an innovative tool. First, the slide lists the prevalence of use within this study, and what types of simulation technology are used to demonstrate that there are options and resources for those interested. Next, the slide notes how simulation technology has helped programs adapt to the issues surrounding the COVID-19 pandemic, with 19 programs beginning and another 11 programs increasing their use. Finally, there is a statement on how simulation technology may allow programs to be innovative for the future by expanding practices that are more catered to athletic training.

Slide 4 – Take Home – A Supplement to Clinical Education

Slide 4 provides a rationale for why simulation technology can be a supplement to clinical education. The slide states the benefits observed from programs in this study that use simulation technology and how they may diminish barriers to clinical education and assist with professional preparations. These benefits are listed in this take-home slide to reinforce the potential benefits to program directors/clinical coordinators on how simulation technology supplements clinical education to improve student development.

Slide 5 – Take Home – A Way to Overcome Barriers

Slide 5 starts by noting the two biggest implementation barriers noted by the programs in this study. It then states that they may be overcome with the assistance of the following facilitators, additional healthcare programs, and institutional support. Additional healthcare programs may provide an avenue to share the cost burden and lack of storage space. Another benefit of this facilitator is increased collaboration with medical professionals to help provide comprehensive patient care. The other facilitator listed is institutional support, which could assist in funding and support to address the barrier of limited staffing and availability. Additionally, it lists potential ways to drum up institutional support, including benefits to students/programs and collaboration within an institution. Finally, there is a note that each program needs and

Slide 8 – Prevalence

This slide includes the results regarding participants' familiarity level with simulation technology and their preconceived perceptions, with 53 of 54 being at least somewhat familiar with it and that they agreed with the positive perceptions of its use. In addition, the prevalence findings (specific aim #1) are included, with 31of 54 programs using simulation technology and 11 more considering future use. These findings were included in the report to demonstrate that simulation technology is currently being used. Additionally, with the COVID-19 pandemic, athletic training programs have had to find ways to adapt. Part of that has been the inclusion of simulation technology as 19 programs began using it, while 11 programs stated they increased its use. These figures further demonstrate the growth of simulation technology in athletic training clinical education.

Slide 9 – Simulation Technology Addressing Clinical Education Barriers

This slide discusses the implications of simulation technology and clinical education barriers. The noted clinical education barriers and ways simulation technology address them to improve clinical education experiences are listed. The first one listed is intra-program clinical incongruence. Since one of the main issues with clinical education is the potential disconnect between didactic knowledge and real-world application, the ability of simulation technology to apply skills more appropriately timed could allow for enhanced knowledge transfer. This ability coincides with findings from this study that participants rated this matched didactic/clinical learning as an influential facilitator. In addition, the ability to individualize learning through simulation technology could serve as an advantage to improve on areas of weakness with each athletic training student. Another clinical education barrier addressed on the slide is the limited incident variety and frequency. Simulation technology provides an opportunity to experience a variety of realistic, repeatable scenarios. This ability would increase incident variety and frequency and assist students in getting a complete clinical education experience, given the flexible nature of clinical education.

Slide 10 – Current Practices

Slide 10 provides the most common findings of "yes" programs regarding the current practices of simulation technology. The most common type used by programs was high-fidelity simulation, with assessment and clinical exam/acute care the most common capacity and content for which it was used. Additionally, results regarding observed improvements to professional competencies and clinical experiences were included, with 77% and 97% of programs, respectively. These results indicate that although high-fidelity simulation is the most common, programs use AR/VR. It also shows that the most common capacity and content area used align with the typical general medical scenarios used in other healthcare professions. However, the findings suggest a potential for growth among current practices to accommodate athletic trainers' entire scope of practice. This growth includes expanding types of simulation technology and content areas more specific to the profession, which could further student development. Additionally, the improvements witnessed by programs in the study suggest the benefits of simulation technology are assisting in mitigating clinical education barriers and better preparing students for the profession.

Slide 11 – Simulation Technology Addressing Deficiencies in Newly Certified ATs

Slide 11 discusses the implication of simulation technology in addressing the noted deficiencies in newly certified ATs. The slide lists more tangible components, such as skill development and decision-making, but mentions how confidence may be improved through repeated practice in a safe environment. Regarding skill development and decision-making, simulation technology provides opportunities for other experiences through increased incident frequency and variety. This added practice fosters the development of more expert-like tendencies that can aid in the transition to practice. Findings from this study coincide with benefits to skill development, decision-making, and clinical efficiency, as seen with other healthcare professions. Regarding improved confidence, simulation technology provides a safe environment to learn from mistakes and build confidence.

Slide 12 – Barriers and Facilitators

This slide list the findings of influential barriers/challenges and facilitators. Only the more influential barriers and facilitators were included in the report because they are likely to be most common among other programs. However, it is noted in the report that each program may encounter barriers and challenges based on the circumstances of its program. In addition, the facilitators listed may not apply to each program.

Slide 13 – Implications on Implementation Barriers

Slide 13 provides space to discuss connections between noted barriers and facilitators to improve implementation. The first barrier addressed is the high financial cost of simulation technology, which was the greatest barrier found in this study. Various reasons (e.g., program funding) beyond the actual dollar amount of the technology may contribute to this burden. However, influential facilitators in this study could provide an opportunity to offset the cost. The first is the presence of additional healthcare programs on campus to share the burden of cost and space. In some instances, these programs on campus may already have the technology, so athletic training programs could develop a relationship with them to foster collaboration with simulation technology use. Another avenue to reduce costs is through technology grants or partnerships. While technology grants were not considered a big facilitator in this study, any means of obtaining additional funding should be explored. Along these lines, working with technology companies could lower costs while helping improve the development of said technology. In some instances, the previous facilitators may not be options for programs. They may have to wait until prices decrease as technology becomes cheaper and more readily available.

Slide 14 – Implications on Implementation Barriers (continued)

Slide 14 has the other big barriers discussed: limited staffing and availability. Since the constraints of each institution may limit this barrier, facilitators may not be as readily available. However, some facilitators may be used to help mitigate these challenges. The first way listed to help with limited staffing or availability is institutional support, one of the top facilitators. Programs may accomplish this by demonstrating the value of simulation technology with improved student achievement, program innovation, and institutional collaboration. Another facilitator not listed in the study was networking with other athletic training programs. By doing so, programs could share scenarios, aid lesson planning for simulation technology, and help troubleshoot technology issues. Each of these could reduce simulation technology's strain on staff availability.

Slide 15 – Review and Final Thoughts

A summary of implications or "take-home" message is included in this slide. First, it highlights the findings of this study that promote simulation technology use in athletic training clinical education, starting with the perceived benefits to student developments observed by "yes" programs. Next is a recap of how simulation technology limits clinical inconsistencies. Following that is a brief statement on how facilitators are to help overcome barriers. The slide concludes with my final thought on how simulation technology can help better prepare students to enter the profession and provide optical patient care and thus should be used in athletic training clinical education practices.

CHAPTER III: ACTION PLAN

The findings from this study provided information regarding the prevalence and practice of simulation technology use within athletic training clinical education, as well as explored barriers, challenges, and facilitators that influence implementation. These results can be used to shape athletic training education, specifically looking to improve its use. The following action steps will be used.

Short Term Plan

As mentioned in Chapter II, the first step was to disseminate the findings to participants in the study who voluntarily provided their contact information and encouraged participants to share with colleagues. In addition, the primary investigator will contact connections at institutions with athletic training programs to disseminate findings and the summary report if not included in the initial dissemination. The next step will be for the primary investigator to work with the University of North Carolina Greensboro athletic training program and the nine active programs within California. The plan in working with these programs will be to establish an athletic training educational technology community that encourages learning about the technology and fosters discussion that grows simulation technology use. In addition, working with these programs will help identify and address specific barriers and facilitators that promote simulation technology implementation. It may also include simulation technology training and troubleshooting specific technical issues with simulation technology use (e.g., software, scenarios, etc.). Finally, the specific implementation strategies and troubleshooting examples obtained through this step will provide other schools interested in using simulation technology more of an implementation guide.

The next step would be to gather videos of simulation technology from programs currently using it. Programs associated with the AT educational technology community, and other programs with which the primary investigator has connections, will be asked if video of simulation technology in use could also be obtained. In addition, programs receiving the summary report will be asked if they would be interested in participating in these video recordings. Video demonstrations will provide programs with a visual appreciation of how simulation technology is used and how it assists students with the transition to practice. In addition, participants could potentially be asked to share their experiences and reactions to using simulation technology. These video demonstrations will also be a part of future presentations to local/ regional programs and national and regional symposiums.

The following step will explore opportunities to present on the topic of simulation technology. First, the primary investigator will seek to present to programs that received the summary report. Presenting to these programs could assist them with simulation technology use and make a direct impact on supplementing their educational practices. In addition, the primary investigator will investigate national and regional professional symposiums (NATA, FWATA, etc.). Symposiums provide a platform where athletic training professionals, including program directors, clinical coordinators, and athletic training students, unite to foster discussion, network, and propel the profession forward. Presenting at these symposiums could allow for greater awareness of simulation technology for all athletic training education stakeholders, which may allow them to advocate for ways to supplement their education practices. The presentation will provide findings from this study and include "take-home" messages on how these findings can be used moving forward to improve implementation, similar to the summary report. It will also include work completed with local programs on addressing specific barriers and challenges, video demonstrations, and testimonials. The increased exposure, and discussion, could increase sharing of ideas to promote implementation and further the development of simulation technology in athletic training.

Long Term Plan

The long-term plan will include two fronts. The first front is the continuation of research in this topic area. The first step in this plan is to submit this study to peer-reviewed journals within the fields of athletic training and educational technology. Specific journals include the *Athletic Training Education Journal*, *British Journal of Educational Technology*, and the *Journal of Sports Medicine and Allied Health Sciences*. Publication within these professional peer-reviewed education journals will allow the target audience to view results and implement findings in their clinical education practices. The next step on the research front is to continue to examine simulation technology and clinical education within athletic training. The research will examine the effectiveness of implementation strategies and the views/experiences of athletic training students with simulation technology on their transition into practice. Specifically looking at professional competency areas such as confidence, clinical reasoning, communication, and autonomous experience. In doing so, these results could provide specific examples of how to overcome barriers while offering further evidence of the effectiveness of simulation technology use and therefore improve prevalence across AT education.

Finally, the other front would be to explore the development of simulation technology more specific to athletic training, such as content areas outside general medical or emergency care. The ideal goal is to enable complete "feel" realistic scenarios to develop better and prepare athletic training students. An example would be a knee evaluation with appropriate laxity for special tests. Having specifically designed simulation technology for athletic training would make it more applicable to the needs of athletic training students. This task would be accomplished by working with individuals within the athletic training profession (established in the short-term plan as the AT educational technology community), other allied healthcare professions, and the technology industry. The first step would be collaborating with colleagues with similar interests in promoting and developing simulation technology for athletic training. Then, utilizing our unique resources, we would determine specific need areas while working with other allied healthcare professions to examine how they use simulation technology and how that may be adapted to athletic training. The final step would be to reach out to various technology companies with expertise in simulation technology to assist in the development/repurposing of simulation technology for athletic training education.

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APPENDIX A: RECRUITMENT EMAIL

RE: Participation in Dissertation Study

Dear AT Program Director,

My name is Steven Kong, and I have been an athletic trainer for over 10 years. I am completing my dissertation through the University of North Carolina at Greensboro online EdD in Kinesiology program.

I am looking for athletic training Program Directors or Clinical Education Coordinators to participate in my research study. Your email was identified because you were listed on the CAATE's website as the program director of a professional AT program. If you prefer that your Clinical Education Coordinator is better suited to participate, I would greatly appreciate you forwarding this email to them.

The purpose of my study is to assess the prevalence of simulation technology use as part of, or supplement to, AT clinical education to determine if a discrepancy exists; as well as explore common factors that may influence implementation. Participation in this study will involve the completion of an online survey that will take roughly 15 minutes to complete. All responses will be anonymous, but at the end of the survey, you can enter your AT program into a drawing to win a $25 dollar donation (4 winners).

I'd like to thank you in advance for your help in completing my dissertation. Your time is greatly appreciated. Here is the link to the research survey: ATSimulationTechnologySurvey

For more information about this study, please contact me, the principal investigator, by email at smkong@uncg.edu or my chair Dr. Pamela Kocher Brown, by email at plkocher@uncg.edu.

Thank you,

Steven Kong
Principal Investigator
UNC Greensboro, Dept of Kinesiology
smkong@uncg.edu

Study Title: The Prevalence of Simulation Technology in Athletic Training Clinical Development

APPENDIX B: SIMULATION TECHNOLOGY SURVEY

Start of Block: Introduction
End of Block: Introduction

-
Start of Block: Demographics

Q2.1 This section will ask questions in reference to your institution, your program, and yourself. Please answer the questions to the best of your ability.

Q2.2 The following questions are in reference to your institution:
- Q2.3 What NATA District is your school associated with?
- Q2.4 How are your school sports classified?
- Q2.5 What additional healthcare professional degrees are offered through your school? (select all that apply)

Q2.6 The following questions are in regards to your Athletic Training Program
- Q2.7 In what department/school is your AT program housed?
- Q2.8 What is the current status of your program?
- Q2.9 What is the degree type of your entry-level AT program?
    - Skip To: Q2.12 If = Master's
        - Display 2.11 If = No
- Q2.10 Do you plan on transitioning to a Professional Master's Program?
- Q2.11 If no, could you please state why?
- Q2.12 How many faculty members (Full and Part-Time) does your AT program employ?
- Q2.13 How many students are enrolled in your AT program?
- Q2.14 On average, what is your CI to student ratio?

Q2.15 The following questions are in regard to you as the participant.
- Q2.16 What is your title within the Athletic Training Program?
- Q2.17 What is your age?
- Q2.18 How many years have you been in your current position?
- Q21.9 How familiar are you with Simulation Technology?
    - 4 - Very Familiar
    - 3 - Moderately Familiar
    - 2 - Somewhat Familiar
    - 1 - Not Familiar at All
- Q2.20 Based on your perceptions of simulation technology, please rate how much you agree with the following statements (1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree):
    - "Simulation Technology can…"
        - _1 …be an effective tool
        - _2 …provide significant benefits
        - _3 …provide significant realism

_4 …help overcome clinical education barriers
_5 …improve student's professional preparedness

End of Block: Demographics

Start of Block: Simulation Technology Use

Q3.1 This section will focus on the use of Simulation Technology within clinical education.

- When answering these questions, please consider the following definitions:
  - **Clinical Education** - For the purposes of this study, "clinical education" will refer to the acquisition, practice, and evaluation of clinical competencies by way of clinical experiences and laboratory settings.
  - **Simulation Technology** - For the purposes of this study, "Simulation Technology" will refer to technology that simulates real environments while creating enough fidelity to dissolve students' disbelief in the simulation. Examples include High-Fidelity Simulation and Augmented/Virtual Reality (AR/VR).

Q3.2 Given the previous definitions, does your AT program utilize Simulation Technology as part of your Clinical Education?
- Yes, No, Unsure
  - Skip to Q3.10 If = No

Q3.3 Which types of simulation technology are used? (Select all that apply)
- High-Fidelity Simulation, Augmented Reality, Virtual Reality, Other

Q3.4 In what capacity is simulation technology primarily used in your educational practices? (select all that apply)
- Educational Learning, Student Experience, Feedback, Collaboration, Assessment, Other

Q3.5 What AT Education content areas does your program **<u>currently use</u>** Simulation Technology for within Clinical Education? (select all that apply)
- Evidence-Based Practice, Prevention and Health Promotion, Clinical Examination and Diagnosis, Acute Care of Injury and Illness, Therapeutic Interventions, Psycho-social Strategies and Referral, Healthcare Administration, Professional Development and Responsibility

Q3.6 **<u>In the future,</u>** are there any additional areas in that you may want to incorporate simulation technology within your clinical education practices.
- Evidence-Based Practice, Prevention and Health Promotion, Clinical Examination and Diagnosis, Acute Care of Injury and Illness, Therapeutic Interventions, Psycho-social Strategies and Referral, Healthcare

Administration, Professional Development and
Responsibility

Q3.7 **Student Development** - Based on your program's experience, please rate (1=None, 2=Minimal Improvement, 3=Moderate Improvement, 4=Great Improvement) how simulation technology has improved each of the following aspects of student development:

_1 Knowledge Base
_2 Skill Development
_3 Clinical Efficacy
_4 Clinical Competency
_5 Confidence
_6 Decisions-Making Skills
_7 Professional Collaboration
_8 Other

Q3.8 **Clinicals** - Based on your program's experience, please rate (1=None, 2=Minimal Improvement, 3=Moderate Improvement, 4=Great Improvement) how the following inconsistencies have been improved with the utilization of simulation technology:

_1 Matched Didactic Learning and Clinical Experience
_2 Engaged Time
_3 Incident Frequency
_4 Incident Variety
_5 Other

Q3.9 Any additional thoughts on the benefits (witnessed or perceived) of simulation technology within AT clinical education

- Skip To: End of Block If Q3.9 Is Displayed.

Q3.10 In Near Future, are you considering implementing simulation technology into your clinical education practices?

- Display Q3.11 If = No
- Display Q3.12 If = Yes

Q3.11 Could you please explain why?

- Skip To: End of Block If Q3.11 Is Displayed.

Q3.12 In what capacity would your AT program like to use simulation technology primarily for your clinical educational practices? (select all that apply)

- Educational Learning, Student Experience, Feedback, Collaboration, Assessment, Other

Q3.13 What AT Education content areas are you considering implementing simulation technology? (select all that apply)

- Evidence-Based Practice, Prevention and Health Promotion, Clinical Examination and Diagnosis, Acute Care of Injury and Illness, Therapeutic Interventions, Psycho-social Strategies and Referral, Healthcare Administration, Professional Development and Responsibility

Q3.14 **<u>Expected Student Development</u>** - Please rate (1=None, 2=Minimal Improvement, 3=Moderate Improvement, 4=Great Improvement) each of the following aspects of student development based on how much improvement you would expect to see if simulation technology were implemented:

_1 Knowledge Base
_2 Skill Development
_3 Clinical Efficacy
_4 Clinical Competency
_5 Confidence
_6 Decisions-Making Skills
_7 Professional Collaboration
_8 Other

Q3.15 **<u>Expected Clinical Improvements</u>** - Please rate (1=None, 2=Minimal Improvement, 3=Moderate Improvement, 4=Great Improvement) the following areas of clinical inconsistencies based on how much simulation technology could improve each:

_1 Matched Didactic Learning and Clinical Experience
_2 Engaged Time
_3 Incident Frequency
_4 Incident Variety
_5 Other

3.16 Any additional thoughts on the perceived benefits of simulation technology within AT clinical education

End of Block: Simulation Technology Use

Start of Block: Factors Influencing Implementation

Q4.1 In this section, various factors that potentially facilitate or inhibit the utilization of simulation technology will be examined.

Q4.2 **<u>BARRIERS and CHALLENGES</u>** - Please **<u>RANK</u>** (1=Not Influential, 2=Somewhat Influential, 3= Moderately Influential, 4=Very Influential) each of the noted barrier and challenge listed on how influential they are in limiting simulation technology implementation:

_1 High Financial Cost
_2 Lack of Space
_3 Limited Staffing
_4 Lack of Institutional Support
_5 Lack of Technological Options
_6 Access to Technology
_7 Functionality of Technology
_8 Portability of Technology
_9 Preconceived Perceptions
_10 Lack of Technology Support
_11 Staff Availability
_12 Staff Motivation
_13 Fear of Technology

_14 Student Engagement
_15 Lack of Significant Benefits
_16 Other

Q4.3 **<u>FACILITATORS</u> -** Please **<u>RANK</u>** 1=Not Influential, 2=Somewhat Influential, 3= Moderately Influential, 4=Very Influential) the following facilitators on how influential they are in promoting simulation technology utilization:

_1 Additional Healthcare Profession Facilities at your institution
_2 Institutional Support
_3 Technology Grants
_4 Individualization of Student Learning
_5 Students' Technological Prowess
_6 Improved Technology Access
_7 Greater Variety of Technology
_8 Improve Connection between didactic and clinical education
_9 Other

Q4.4 Please briefly describe any strategies that your program utilizes to effectively implement simulation technology as part of your clinical education.

- Display if Q3.2 = Yes or Unsure

Q4.5 Any additional thoughts regarding factors that may facilitate or inhibit the utilization of simulation technology as part of AT clinical education

End of Block: Factors Influencing Implementation

Start of Block: COVID-19 and Conclusion

Q5.1 This final section includes questions regarding the effects of COVID-19, as well as a few follow-up questions.

Q5.2 What areas of AT clinical education have been most affected by COVID-19? (select 3)

- None, Foundational Knowledge, Clinical Efficiency, Clinical Experience, Effective Communication, Professional Preparedness, Skill Acquisition, Other

Q5.3 Because of COVID-19, has your AT program begun using (or explored the use of) simulation technology to supplement AT clinical education?

Q5.4 What types of simulation technology have you begun using (or explored the use of) because of COVID-19? (Select all that apply)

Q5.5 Has COVID-19 affected your program's utilization of simulation technology?

Q5.6 During COVID-19, what factors contributed to the Increase/Decrease/No Change of simulation technology utilization? (Select all that apply)

Q5.7 Has COVID-19 changed your and/or your program's views on the utilization of simulation technology?

- Display Q5.8 If = Yes
- Display Q5.9 If = No

Q5.8 Please briefly explain how your and/or your program's views have changed

Q5.9 Please briefly explain why your and/or your program's views have not changed

Q5.10 In a COVID-19 environment, do you believe that simulation technology can supplement AT clinical education to effectively prepare your athletic training students?

- Yes, No, Unsure

Q5.11 Once you return to an "after pandemic" reality, do you believe that simulation technology will continue to be utilized to supplement AT clinical education?

- Yes, No, Unsure

Q5.12 Any final thoughts regarding simulation technology within AT clinical education

End of Block: COVID-19 and Conclusion

APPENDIX C: ADDITIONAL RESULTS TABLES

Additional Demographic Results for Participating AT Programs

Table A. Sports Classification

NCAA Division 1	30
NCAA Division II	8
NCAA Division III	15
NAIA	1

Table B. AT Status

Active	41
Probation	5
Withdrawing	6
Seeking Accreditation	3

Table C. AT Housing

Kinesiology Dept	13
Education Dept	3
Health Science Dept	22
Exercise Science	5
Health Professions	8
Human Perform/Move	3

Table D. AT District

District 1	1
District 2	7
District 3	4
District 4	15
District 5	7
District 6	7
District 7	5
District 8	1
District 9	4
District 10	1

Table E. Students Enrolled

<10	13
10-19	15
20-29	13
30-39	9
>40	4

Table F. CI to Student Ratio

1:1	18
1:2	24
1:3	5
1:4	1
1:5	1
1:6	2
1:8	3

Table G. Faculty Members

1:1	18
1:2	24
1:3	5
1:4	1
1:5	1
1:6	2
1:8	3

Additional Demographic Results for Survey Participants

Table H. Participants Age

25-34	6
35-44	23
45-54	18
55+	7

Table I. Years in Current Position

<3 Years	14
3-6 Years	16
7-10 Years	7
>10 Years	17

Additional Results for Current Simulation Technology Practices

Table J. Capacity

Assessment	27
Educational Learning	26
Student Experience	23
Feedback	17
Collaboration	10

Table K. Current Content Areas

Clinical Exam/Diag	27
Acute Care	24
Psychosocial Strats	15
Therapeutic Inter	14
EBP	9
Prevention	7
Prof Development	7
Healthcare Admin	1

Table L. Future Content Areas*

Clinical Exam/Diag	9(8)
Acute Care	9(11)
Psychosocial Strats	13(4)
Therapeutic Inter	9(5)
EBP	6(1)
Prevention	8(0)
Prof Development	5(0)
Healthcare Admin	4(0)

* ( ) – “no” programs future consideration

Table M. Usage Types

High Fidelity	22
Augmented Reality	8
Virtual Reality	3
Other**	16

** "Other" includes standardized patients, task trainers, and lo-/mod- fidelity simulation. However, none were classified within the operation definition.

APPENDIX D: SUMMARY REPORT

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Summary Report

STUDY:
The Prevalence of Simulation Technology in Athletic Training Clinical Education

Steven Kong, MS, ATC

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- The summary report is present in the following order:
  - "Take Home Message" (Starts at Slide 3)
  - Complete Summary Report (Starts at Slide 6)
- You are receiving this summary report, because you voluntarily provided your contact information,
  - Additionally, you are in the best position to potentially elicit change to increase the use of simulation technology.
  - Please feel free to share this report with your colleagues, institution, and other AT programs.
- Thank you again for you participation in this dissertation study, it was greatly appreciated!

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Take Home – An Innovative Tool

- This study found that about 57.5% of programs in the study are using simulation technology
  - Current Practices
    - While most programs are using High-Fidelity Simulation, other programs noted they are using Virtual and Augmented Reality. This demonstrates that there are options available for types of simulation technology that can be used, as well as resources for those interested in them.
  - COVID-19
    - Simulation technology has provided an opportunity for programs to adapt to COVID-19, with 19 programs beginning use, and another 11 increasing use because of the pandemic. This demonstrates its ability to supplement the needs of programs to continue to provide educational opportunities.
  - Innovation and Growth
    - Simulation technology can be a innovative tool to support programs and the needs of their students. There is also room for growth in how it is applied and what its designed for.

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Take Home – A supplement to Clinical Education

- Programs in the study currently using simulation technology observed improvements to the clinical experience and aspects of professional competency.
  - Diminish barriers to clinical education
    - Improved Incident Frequency and Variety, which may be limited with the flexible nature of each clinical education setting.
    - Improved Didactic and Clinical Connection, which may enhance knowledge transfer by mitigating incongruences.
  - Assist with Professional Preparation
    - Improved Skill Development and Decision Making, which may lead for more expert-like practitioners entering the profession.
    - Improved confidence, which may be occurring because simulation technology provides repeatable scenarios within a safe environment.

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Take Home – A Way to Overcome Barriers

- Programs in the study found that high financial cost and limited staffing/availability were the biggest barriers.
- However, these may be overcome using the following facilitators that were highly rated in this study:
  - Additional Healthcare Programs
    - Share Burden of Cost, which may help programs afford simulation technology
    - Sharing of space, which was noted as another influential barrier.
    - Additional Benefits, including an increase in collaboration.
  - Institutional Support
    - Promote rationale (as listed in previous slides) for increase funding that may be used to add and support staff
      - Trainings, support, partnerships
- Additional facilitators could be used based on access to them and each programs' need.

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Purpose and Aims

The purpose of this study was to assess current simulation technology practices and explore factors that influence its use in athletic training clinical education.

Specific Aim #1: *Determine prevalence of simulation technology use in AT clinical education*

Specific Aim #2: *Explore barriers and challenges to its use.*

Specific Aim #3: *Explore facilitators to its use.*

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Methods

- CAATE Professional AT Programs were recruited via email
- Program Directors/Clinical Coordinators (n=54) completed an online simulation technology survey
  - Survey was specifically developed for this study.
- All response collected electronically and analyzed via SPSS using descriptive statistics.

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Prevalence

FINDINGS

- Familiarity
  - 53 of 54 participants were at least somewhat familiar with simulation technology
- Perceptions
  - 53 of 54 participants agreed that simulation technology could be…
    - An effective tool
    - Provide significant benefits
    - Overcome clinical barriers
    - Improve professional preparedness
- Prevalence
  - 31 of 54 programs use simulation technology
  - 11 more are considering future use

IMPLICATIONS

These results indicate simulation technology is being used to supplement clinical education.

Given the level of familiarity and positive perception of simulation technology, coupled with the number of programs considering future use, programs are looking to expand its use.

This may especially be true due to the COVID-19 pandemic causing an increase in the need for simulation technology

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Simulation Technology Addressing Clinical Education Barriers

- One issue with clinical education is the disconnect between didactic knowledge and real-world application (clinical incongruence)
  - Simulation Technology allows for more timely application of clinical skills and knowledge to accompany didactic learning.
    - "Matched Didactic/Clinical Learning" was a rated an influential facilitator.
- Another barrier is limited incident variety and frequency given its flexible nature.
  - Simulation technology provides a repeatable environment to increase frequency
  - Varying simulation technology scenarios improves incident variety

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Current Practices - ("Yes" Programs)

FINDINGS

- Types
  - Hi-Fidelity Simulation most common
- Capacity
  - Assessment most common
- Content Areas
  - Clinical Exam and Acute care most common
- Observed Improvements
  - Professional Competencies
    - 77% saw at least moderate improvements
  - Clinical Experiences
    - Nearly all saw at least moderate improvements

IMPLICATIONS

These findings indicate that comparable nature (type, capacity, content, and benefits) of simulation technology to other healthcare professions.

It also demonstrates a potential for expanded utilization to cater to specific incidences in athletic training and assist in mitigating clinical education barriers.

May increase student development and improve the transition to the profession.

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Simulation Technology Addressing Deficiencies in newly certified ATs

- New ATs have noted deficiencies in skill development and decision-making
  - As mentioned previously, Simulation Technology fosters practice and experiences to assist in the developing clinical expertise.
    - Participants in this study noted improvements in skills development, decision-making, and clinical efficiently.
      - Findings correspond with benefits seen with other healthcare professions
- In addition, New ATs have lower confidence, but improves with experience that can come through simulation technology
  - Simulation technology also can provide a safe environment for skill training, with mistakes, without harm to patients.

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Barriers and Facilitators

Influential Barriers/ Challenges

- High Financial Cost
  - Greatest barrier to implementation
- Limited Staff
- Limited Availability
- Lack of Space

Influential Facilitators

- Additional Healthcare Professions
- Didactic/Clinical Connection
- Institutional Support
- Individualized Learning

The barriers listed were rated more influential than others noted in the study. However, other barriers not listed here may be more influential to certain programs based on their individual circumstances.

Additionally, these facilitators listed may not be applicable to each program, in which other facilitators noted in the study may be more influential.

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Implications – Barriers to Implementation

- High Financial Cost (and Lack of Space)
  - Ways to assist in offsetting cost:
    - Additional Healthcare Programs (Highest Rated Facilitator) may allow for the burden of cost and space to be shared, typically nursing programs who may already have the simulation technology .
      - Opportunity to collaborate with other healthcare professionals to improve communication and comprehensive patient care
    - Technology Grants (not considered a big facilitator)/ Partnerships may assist in outside funding opportunities.
      - Partnering with technology companies could help lower cost of technologies while help them further develop simulation technology for the future.
    - In some circumstances, the only option may be to wait until prices decrease as technology become cheaper and the market saturates.

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Implications – Barriers to Implementation

- Limited Staffing/Availability
  - Institutional Support (a top influential facilitator) could help mitigate challenge by increasing funding (e.g. technology training) and/or providing support for staff
    - Demonstrate value of simulation technology through improved student achievement, innovation, and collaboration.
  - Networking with other AT programs, which was not originally listed as a facilitator in the study.
    - Provides opportunity to share time responsibility by sharing scenarios, creating lesson plans, and troubleshooting technology issues.

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Final Thoughts

- Participants in this study noted improvements will skill development and decision-making, which can help students become expert-like clinicians.
- In addition, simulation technology can diminish clinical education barriers that help foster real-world experiences in a safe and repeatable environment to help the transition into the profession.
- Although there are barriers that hinder implementation, there are many different facilitators that can help over come them. The key is to match the right facilitator to fit your programs' needs.
- Simulation technology can be an invaluable tool to help better prepare student to enter the field by supplementing clinical education practices, and should continue to be developed to suit the specific needs of athletic trainers.

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What's Next

- I want to examine programs that are using simulation technology to identify specific implementation strategies used to overcome barriers.
- I am also looking to get videos of simulation technology in action from programs currently using it.
- If you are interested, please contact me at smkong@uncg.edu or kong.steven.m@gmail.com

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If you have additional Questions or Comments, please contact me at smkong@uncg.edu

Thank you again!

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