2019

Simulation as a Remediation Tool for Clinically At-Risk Associate Degree Nursing Students

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Walden University
June 2019

Abstract

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by

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MSN, Arkansas Tech University 2010

BSN, Arkansas Tech University 2008

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Walden University

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Abstract

Evidence-based remediation options are limited for nursing students who fail their clinical competency evaluations. Scholarly literature provides a paucity of studies related to the use of simulation-based technology to remediate nursing students. The research question focused on the difference in the initial competency demonstration evaluation scores of associate degree nursing students compared to the reevaluation scores after remediation with simulation-based technology. Benner's novice to expert and Kolb's experiential learning theories were used to explain how nurses acquire and develop skills. The researcher used a quantitative one-group pretest posttest design to examine archival data from 149 nursing students from a South-Central United States community college who failed their initial competency evaluation and were remediated with simulation-based technology. A Wilcoxon signed-rank test was used to compare the precompetency scores to the afterremediation scores and was found to have a statistically significant improvement in students' scores following simulation remediation. A confirmatory factor analysis was conducted showing the competency evaluation questions were measuring the construct they were designed to measure. This study supports prior research findings by substantiating the positive benefits of simulation adding to the limited body of research related to simulation used for remediation. This study can make a positive impact on the nursing profession and the community by contributing to the body of knowledge for those who seek additional methods for students to achieve clinical success. Future studies are needed to validate these findings, which indicate that remediation with simulation-based technology can assist with student retention and promote student success.

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Dedication

I wish to dedicate this dissertation to my children and grandchildren. You have provided a constant motivation to do my best and never to give up. May you see each obstacle in life as an opportunity for personal growth. I also wish to dedicate this dissertation to LB, because without your friendship and consistent support throughout the years, I am not sure I would have survived with my sanity intact. Finally, I would like to thank my friend and coworker, Allison, for providing a safe place to vent frustrations, talk research, and offer calming advice during stressful times.

Acknowledgments

I want to say a heartfelt thanks to my chairperson Dr. Carla Lane for her constant support and sense of humor that got me through several mini-crises. Dr. Lane has provided professional guidance and personal support through each step of this journey. Her confidence in my abilities sustained me through many frustrating moments. With a simple phone call, she boosted my morale and pointed me in the right direction. Just as some nurses put all their heart into their patients, Dr. Lane puts her heart into coaching her students towards success. I am so fortunate to have had you as my chairperson. I would also like to extend my gratitude to Dr. Colleen Paeplow for agreeing to assist me midway through my study. You "gently nudged" me out of my comfort zone and made me a better researcher. Your encouragement and kind words inspired me to push a little harder, and for that, I am truly thankful. I would also like to thank my URR Jennifer Lapin for the time spent reviewing my study.

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Chapter 1: Introduction to the Study

Nursing students must possess the knowledge and skills necessary to provide safe, effective nursing care in the clinical setting, which could include any facility that offers healthcare services for patients. Flott and Linden (2016) and Lee, Jang, and Park (2016) stated that patient safety has been recognized globally as a critical concern, and it is imperative that nursing programs produce safe and competent nursing graduates. Many times, although passing academically, nursing students struggle when performing in the clinical environment.

There are fundamental skills necessary for every nurse to master; assessment, critical thinking/clinical reasoning, communication, and patient safety awareness skills are among those vital skills that nursing students must learn to provide competent patient care. Steven, Magnusson, Smith, and Pearson (2014) stated that the importance of patient safety is a global concern, and Silverston (2014) suggested that proper patient assessments and clear communication can improve patient safety. Further, Ashley and Stamp (2014) declared that healthcare professionals must have clinical judgment skills to work in healthcare. Simulation offers a way for students to transfer didactic knowledge to clinical skills and can improve students' decision making, clinical judgment, and critical thinking skills (Lynn & Twigg, 2011).

Although nursing instructors work hard at assisting those students who struggle in the clinical setting with these basic competencies, a lack of time and the responsibility of helping multiple students with learning opportunities make it difficult to focus on the students who continue to struggle clinically. Chunta (2016) and Killam, Luhanga, and

Bakker (2011) reported that clinical nursing faculty frequently find it difficult to cope and feel frustration when supervising students who continue to perform poorly in the hospital clinical environment. Simulation and the use of simulation-based technology have proven to be an effective method to provide students with a safe place to hone clinical skills. High fidelity simulation improves patient safety and can assist students in acquiring knowledge that can then be transferred to the healthcare setting (Richardson & Claman, 2014). Additionally, simulation offers a way for nursing students to obtain clinical experience outside of the clinical setting (Jeffries, 2015). Although simulation has shown to be a suitable replacement for a variety of experiences in the clinical setting, there is a lack of literature related to simulation as a remediation option for those students experiencing problems in the clinical environment. Custer (2016) noted a lack of research in the use of remediation in higher education, and Camp and Legge (2018) stated that there is little available evidenced-based research related to nursing clinical remediation practices.

This quasi-experimental quantitative study adds to the existing limited body of knowledge by examining if simulation, using simulation-based technology, can effectively be used as a remediation option for those students who fail to meet clinical objectives. This study can make a positive impact on the nursing profession, as well as the community-at-large, by adding to the body of knowledge seeking additional methods for students to achieve clinical success.

Chapter 1 contains a summary of the background literature related to simulation as an option for remediating nursing students who struggle to meet clinical objectives. I

also describe the problem and identify a gap in practice supported by current and historical literature. I identify a need for further study to find an evidence-based remediation option other than the clinical setting. The benefits of simulation are described, as well as the most current and common uses for simulation. The purpose of the research study is explained, and literature supporting the need for further study in this area is provided. I discuss the research question and hypotheses, followed by the theoretical framework that guides the study. The justification for the chosen design is addressed, including supporting literature. I define the independent and dependent variables, as well as terms that may be ambiguous or vary among disciplines. Any assumptions made during the study are identified, and I provide an explanation. The scope, delimitations, and limitations of the study are acknowledged. Finally, the significance of the study to the program, community, and program discipline are explained.

Background

According to the World Health Organization (WHO; 2009), a clinical or healthcare setting is an inpatient or outpatient hospital setting, a primary care center, or an ambulatory, day, or long-term care center where healthcare services are provided for people. Simulation has been used as a learning pedagogy since the 18th century and has continued to evolve since that time. In 2015, the National Council of State Boards of Nursing found in a study with 666 nursing students that clinical experiences in the healthcare environment could effectively use simulation experiences up to 50% of the time with no significant difference in licensure pass rates (National Council of State

Boards of Nursing, 2015). Simulation has been shown to be an efficient way to teach nursing students patient safety practices (Tella, Liukka, Jamookeeah, Smith, & Partanen, 2014). There is an abundance of research related to the benefits of simulation to improve clinical confidence, clinical reasoning, communication, and patient safety, as well as other skills required to be a safe, competent nurse. Basak, Unver, Moss, Watts, and Gaioso (2016) reported that high-fidelity simulation has resulted in higher student satisfaction and self-confidence, and Khalaila (2014) discovered that simulation reduced anxiety and increased self-confidence and caring. Simulation has been shown to increase knowledge, as described by Konieczny (2016). Mariani, Cantrell, Meakim, and Jenkinson (2015) concluded that nursing students were more comfortable with patient safety issues after participating in simulation.

Literature related to simulation and its use as remediation option is sparse. Simulation as a useful teaching tool has been established, but its usefulness for remediation needs to be determined (Leach, 2014). There is a lack of research related to clinical remediation practices in healthcare education (Camp & Legge, 2018; Custer, 2016; Williamson, Moreira, Quattromani, & Smith, 2017). In this study, I examined if simulation can be an effective remediation option for students who perform poorly in the clinical setting and fail to meet clinical objectives.

Problem Statement

The problem is that there is a lack of evidence-based remediation options for students who fail their clinical competency evaluations. Simulation-based technology has been proven to be an effective clinical alternative to the healthcare setting, but there is a

lack of research supporting simulation for remedial purposes. The National Council of the State Boards of Nursing simulation study reported that up to 50% of clinical time could be substituted with simulation without affecting student outcomes (as cited in Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014). Students often struggle in the clinical setting with such skills as critical thinking and clinical reasoning while faculty lack evidenced-based resources for clinical remediation (Camp & Legge, 2018; Custer, 2016). Nursing faculty in the clinical setting often do not have the time to focus on students who need extra guidance; therefore, early remediation may not be implemented (Custer, 2016). Phuma-Ngaiyaye and Chipeta (2017), and Rafiee, Moattari, Nikbakht, Kojuri, and Mousavinasab (2014) noted that nursing faculty have a high workload and lack the time and resources to spend adequately preparing students to gain clinical competence.

As noted by the National Council of the State Boards of Nursing (2015), simulation and the use of simulation-based technology have been found to be an effective clinical education modality, but there is a lack of research supporting its use as a tool for remediating students who are at-risk for poor clinical outcomes. Supporting the National Council's claim, Park and Yu (2018) asserted that simulation-based education is an effective way to teach students within the dynamic setting of nursing education, yet Custer (2016) and Evans and Harder (2013) noted that evidence-based research in remediation with simulation is lacking. Further, Skrable and Fitzsimons (2014) noted a gap in the literature related to the use of simulation in associate degree nursing programs. This study adds to the body of limited research available for an evidenced-based method

of remediation for those nursing students who fail to meet clinical outcomes and struggle in the clinical environment.

Purpose of the Study

The purpose of this quantitative quasi-experimental one-group pretest-posttest was to examine whether there is a significant difference in the clinical competency demonstration scores of nursing students at the college who have failed the initial clinical competency evaluation and were reevaluated following the completion of the remediation session with simulation-based technology. This study adds to the limited body of knowledge for ways to remediate nursing students who struggle with passing clinical competency evaluations. The dependent variable was the clinical competency demonstration evaluation scores. The independent variable examined was remediation with simulation-based technology. In this study, I examined if there was a significant difference in the pretest scores compared to postremediation with simulation-based technology scores (dependent variables) when the independent variable (the intervention) simulation-based remediation was instituted.

Research Question and Hypotheses

The convenience sample used to answer the research question in this study consisted of previously unanalyzed archival data of 149 associate degree nursing students from a community college located in the South-Central United States. The nursing students in the study participated in a nursing faculty administered clinical competency assessment(s) using the nursing program's Clinical Competency Evaluation Form.

Research Question (RQ): What is the difference in the initial competency demonstration evaluation scores of associate degree nursing students compared to the reevaluation scores after remediation with simulation-based technology?

H_0: There is no statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology. H_0: $\mu_{pre} = \mu_{post}$

H_a: There is a statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology. H_a: $\mu_{pre} \neq \mu_{post}$

Theoretical Foundation

Benner's novice to expert theory was used along with Kolb's experiential learning theory as the theoretical underpinning of this study. Benner's (1982) novice to expert theory, adapted from the Dreyfus model of skill acquisition as described by Benner (2005), was used to explain how nurses acquire and develop skills that support progression from one level of competency to the next (as cited in Davis & Maisano, 2016). Kolb's (1984) experiential learning theory was used to explain how individualized simulation-based remediation can be used to transform a student's knowledge through a four-phased learning cycle. This cycle consists of a concrete experience (simulation remediation), reflective observation, abstract conceptualization, and active experimentation (Poore, Cullen, & Schaar, 2014). A detailed explanation of the theories and how they will provide a foundation for this study can be found in Chapter 2.

Nature of the Study

I used a quantitative design because according to Leavy (2017), a quantitative research design allows the researcher to explain relationships, associations, and correlations between variables. A quantitative method was the best approach to address the research question in this study where I examined if remediation with simulation-based technology results in a statistically significant difference in initial competency evaluation scores and post remediation scores of students who failed their first competency. I used a quantitative quasi-experimental one-group pretest posttest design to examine if there was a significant difference in the clinical competency demonstration pretest and posttest scores (the posttest dependent variable) following the completion of the remediation session with simulation-based technology (the posttest independent variable). The source of data consisted of a convenience sample of archived initial and post remediation competency scores collected from 149 associate degree nursing (ADN) students from the years 2012 to 2017.

A single-group convenience pre- and post-intervention sample was used, therefore excluding the use of an experimental design. A quasi-experimental design takes advantage of a naturally occurring situation or event and is most often selected when an experimental design is not feasible (Bordens, 2017; Leavy, 2017). A control group was not an option for this population of nursing students because remediation with simulation-based technology was the only intervention offered to the nursing students. Additionally, failing to use the remediation strategy with all students was not considered an option due to the critical nature of providing safe patient care. Therefore, a single-

group convenience sample using archival data was selected for this study because a quasi-experimental design was the best fit to answer the research question.

Definitions

Clinical reasoning: Having the necessary skills and ability to collect and respond appropriately to data as the situation evolves. (The INASCL Board of Directors, 2011).

Critical thinking: Taking the information collected using all of ones senses and through carefully analysis and synthesis develop a plan of action (Papathanasiou, Kleisiaris, Fradelos, Kakou, & Kourkouta, 2014).

Fidelity (high, medium, low): A ranking of the manikins ability to simulate reality to increase the participant sense of realism. (The INASCL Board of Directors, 2011).

Patient assessment: Systematically collecting patient data (physical, psychosocial, spiritual, financial) that is needed to provide appropriate patients care (Medical Dictionary, 2009).

Patient safety: Providing quality patient care while committing no patient harm (The INASCL Board of Directors, 2011).

Remediation: Implementing an intervention that is intended to affect a positive change in student performance (Evans & Harder, 2013).

Simulation: A teaching pedagogy used to simulate real patient scenarios to assist students in progressing from a novice student nurse with the expectation of reaching expert status (The INASCL Board of Directors, 2011).

Simulation-based technology: Technology that that can be used to improve a student's performance during simulation sessions (Montgomery, 2016).

Task trainers: Models of the human body that assist students in acquiring the skills needed to provide patient care such as intraveneous arms or hips for intramuscular injections (Society for Simulation in Healthcare (2016)

Assumptions

Hoy and Adams (2016) stated that assumptions are statements that are taken as fact or accepted as the truth. In this study, I assumed that all students took the remediation plan seriously and completed the remediation plan to the best of their ability. I or a designated faculty member discussed with each student before beginning the remediation session. The requirements, such as hours, activities, and timeframes were reviewed, and a student signature of understanding was obtained. An additional assumption is that simulation-based technology is considered by the college's nursing faculty to be an effective method to remediate failed clinical competencies. Because subsequent years remediation with simulation-based technology has had a positive outcome, that is, more than 90% of the students successfully passed competency after going through the remediation plan one time, the remediation plan with simulation-based technology was thought to be a valuable remediation option (A. Divine, personal communication, January 23, 2018). The assumption was made that the remediation scores accurately measured the skills and knowledge gained from the remediation plan. Although data have not been formally collected on this method, reports of remediation pass rates are communicated to the course coordinator for grading purposes, indicating that more than 90% of the students pass their competencies after participating in the initial remediation plan and reevaluation. An additional assumption was made that all

remediation faculty used the competency evaluation sheet questions to guide student evaluation during the initial evaluation and subsequent reevaluation after remediation. It is a requirement of the nursing program that nursing faculty use the agreed upon discipline-specific competency evaluation sheets to strengthen consistency among evaluators.

Scope and Delimitations

In this study, I examined the initial and postremediation competency demonstration evaluation scores to determine whether remediation with simulation-based technology can improve nursing students' competency scores, therefore offering a potential additional means to remediate nursing students who struggle with the clinical components of nursing. The scope of the study included 2012 to 2017 first and second semester ADN students who failed an initial competency evaluation and were required to remediate with simulation-based technology and who then were subsequently reevaluated using the same competency evaluation form. Students who failed to follow the prescribed remediation plan and did not meet remediation deadlines (three students) were deemed automatic third attempts and were excluded from this study. Additionally, those who failed to show up for the prescribed remediation plan and eventually dropped from the program were therefore excluded from this study because no second attempt was made. This posttest results are limited to the studied population, and, therefore, are not generalizable to the broader population. Although the results are not generalizable, they do warrant additional studies in this rarely researched remediation option for nursing students who struggle with clinical competency.

Limitations

Slack and Draugalis (2001) proclaimed that having knowledge of any potential threat to internal validity and how those threats affect the study enables better analysis of the results. Unknown external factors during the 2 weeks of initial and postremediation evaluation could have influenced the student's performance during the postremediation simulation evaluation. Because unknown factors are beyond my control, when describing the posttest results, these limitations were acknowledged.

Having a different pre- and post-faculty evaluator could have affected student scoring in the areas of anxiety and individual expectations. Faculty meet before each competency to discuss specific criteria and set guidelines to promote consistency among faculty evaluators and lessen evaluation differences. Additionally, to facilitate optimal student performance, a different faculty evaluator was selected for initial and postevaluations. Because the lab coordinator is responsible for reevaluations, it is not always possible to achieve this goal. The lab coordinator is aware of the need to refrain from bias during evaluations to minimize the same evaluator effect. Therefore, the competency tool (see Appendix A) was strictly followed to minimize faculty bias in student scoring.

A primary limitation of this study was the lack of random selection to create experimental and control groups for comparison. Rather, I examined the effectiveness of the remediation via pre-post test scores from a single group. The lack of randomized selection and a control group can affect the internal validity of the study. Slack and Draugalis (2001) proclaimed that selection threat is a major concern and poses a threat to

internal validity when a lack of randomization of groups occurs. This study was also limited by the student's exposure to the initial competency evaluation, which could have impacted the reevaluation score. Once going through the evaluation, students may become more familiar and comfortable with the evaluation process, therefore affecting the reevaluation score.

Significance

This study is significant because remediation with simulation has the potential to increase the clinical competence of nursing students who struggle in the clinical setting, therefore, creating safer, more competent nurses providing patient care. This study may be significant at the local level by providing further research on additional ways to remediate nursing students who struggle clinically. Additional remediation strategies can offer a way to decrease the time that clinical instructors spend working with clinically at-risk nursing students. The study can benefit the local college and community because simulation-based remediation may assist the college's nursing graduates in becoming a more skilled, knowledgeable, and easily marketable workforce available for employment at the local hospitals and clinics. More skilled nursing graduates can assist in alleviating the national nursing shortage. Jung, Lee, Kang, and Kim (2017) reported that negative effects on healthcare continue to occur due to national and international nursing shortages. This study is significant in that it adds to the limited research available related to the use of simulation-based technology to remediate students who are at risk for failing to meet clinical competency expectations. Ultimately, this study can positively impact social change in the nursing profession because if shown to be effective, it can suggest an

additional means to remediate nursing students, which could result in a higher number of competent nursing students graduating from the college's nursing program. More nursing students who complete the nursing programs and pass their licensure exam result in a larger number of nurses available to care for patients in hospitals, rural clinics, and underserved areas.

Summary

Nursing students must possess the knowledge and skills necessary to safely take care of patients in the clinical setting, yet some struggle with the transitioning and applying academic knowledge to patient care situations. Faculty find it difficult to provide the necessary one-on-one attention to those students who struggle with the clinical component of nursing. Although research supports simulation to teach the necessary clinical skills, literature supporting the use of remediation with simulation-based technology to increase the success of those students who fail basic clinical competencies remains scarce. The purpose of this quantitative study was to examine whether there is a significant difference in the clinical competency demonstration scores of nursing students who have failed the initial competency evaluation and were reevaluated after completion of remediation with simulation-based technology. The theories used to guide this study were Benner's novice to expert theory (1982) and Kolb's experiential learning theory (1984). These theories were used to explain how nurses acquire and develop skills that support progression from one level of competency to the next and how individualized simulation-based remediation can be used to transform a student's knowledge through Kolb's four-phased learning cycle. Definitions were

provided to clarify the terminology used when utilizing technology in nursing education. The assumptions of the study were outlined, as well as identifying the scope and delimitations unique to this study. The limitations of the study such as unknown factors, lack of a control group, students' previous exposure to evaluation, and evaluator differences were declared, and the mitigating factors were disclosed. The significance of the study to the students, the college, the profession, and discipline, as well as the community-at-large, was identified. The next chapter contains a comprehensive literature review, including the history of simulation and provides evidence to support the need for this study.

Chapter 2: Literature Review

The problem is that there is a lack of evidence supporting the best practices for the use of simulation-based technology for remediation in ADN programs. Therefore, the purpose of this quantitative quasi-experimental one-group pretest-posttest study was to examine if there is a significant difference in the initial and postremediation Competency Demonstration Evaluation Form (CDEF) scores of nursing students at the college who have failed the initial clinical competency evaluation following the completion of the remediation session with simulation-based technology.

Literature searches have revealed that empirical data from research studies in nursing remediation are scarce. Simulation has been identified as a useful teaching tool, but its value for remediation needs to be determined (Leach, 2014). Hughes, Mitchell, and Johnston (2016) have determined that competent nurses are critical to maintaining patient safety. Bean (2015), Camp and Legge (2018), Custer (2016), and Williamson et al. (2017) concluded that there is a general lack of research related to academic and clinical remediation practices in healthcare education. The current nursing workforce is aging and continues to retire, leaving a void in healthcare. Nursing programs are looking for ways to increase student success and produce safe nursing graduates to fill those voids. The nursing workforce is facing challenges due to the aging and retirement of the baby boom generation (Buerhaus, Skinner, Auerbach, & Staiger, 2017).

Conversely, clinical sites are diminishing as patient safety concerns increase and competition for available slots continue to grow. Meanwhile, the old methods for students who are failing to meet clinical outcomes and pass National Council Licensure

Examination (NCLEX) licensure exams are no longer enough as nursing graduation rates continue to fall below the expected level of achievement standards set by each nursing program. Although nursing instructors have identified ADN students as at-risk for failing to meet clinical outcomes, current practices and literature reviews have failed to identify an evidence-based remediation option to help meet the needs of students who struggle to meet clinical outcomes. Cascoe, Stanley, Stennett, and Allen (2017) stated that early recognition and remediation could increase the likelihood of success. Shin, Park, and Kim (2015b) and Skrable and Fitzsimons (2014) suggested that simulation is a teaching strategy that can be used to provide students with a realistic, safe environment to practice and offered simulation as a teaching tool to fill the gap between nursing education and practice.

Multidiscipline databases, as well as nursing databases, were used to complete a comprehensive review of the literature ranging from years 2014 to 2018 to determine what is known about remediation in healthcare, as well as to identify a gap in knowledge. Benner's novice to expert (1982) and Kolb's experiential learning theory (1984) provided the theoretical framework for this research study and were used to explain how students gain knowledge and apply that knowledge using simulation-based technology in nursing education.

During the course of this review, the literature was used to identify the key characteristics of successful and unsuccessful students and to create a foundation for the study by discussing what is known about the history of simulation technology and nursing education. In the review, I explored the current uses of simulation technology,

discovered what effects the use of simulation-based technology has on a nursing student's ability to perform competently in the clinical environment (patient assessments, communication, use of appropriate clinical judgment, and promoting patient safety), and determined what is currently known about using simulation-based technology for remediation.

Literature Search Strategy

The databases of CINAHL, EBSCO, MEDLINE, ProQuest, Sage, Google Scholar, and Science Direct were searched for peer-reviewed articles containing empirical studies related to the historical and current uses of simulation-based technology and the use of simulation for clinical remedial purposes. The articles were published between 2014 and 2018, but there are few research articles specifically related to simulation remediation research. Therefore, literature dated before 2014 provides foundational research specifically related to simulation used as a remediation tool for nursing students. The search terms employed to inform the literature review included *simulation, history of simulation technology, human patient simulators, remediation, simulation-based technology, nursing remediation, remediation in nursing education, critical thinking, communication, clinical judgment,* and *patient safety*.

Theoretical Foundation

For this study, Benner's and Kolb's theoretical frameworks were used for describing how prelicensure nursing students acquire and develop skills and knowledge through repetition, experience, and reflection. Benner's (1982) novice to expert theory, adapted from the Dreyfus model of skill acquisition as described by Benner (2005), was

used to explain how nurses acquire and develop skills that support progression from one level of competency to the next. Kolb's experiential learning theory (1984) was used to explain how individualized simulation-based remediation can be used to transform a student's knowledge through a four-phased learning cycle. This cycle consists of a concrete experience (simulation remediation), reflective observation, abstract conceptualization, and active experimentation (Poore et al., 2014).

Using simulation-based remediation, nursing students can build upon those skills and knowledge obtained through experiences and repetition and acquire the competency necessary to progress to the next stage of skill acquisition. The novice to expert model consists of five stages of skill acquisition: (a) novice, (b) advanced beginner, (c) competent, (d) proficient, and (e) expert (Benner, 1982). Typically, an ADN student will progress through at least the first two stages before program completion. Students whose skill level could be classified as marginally acceptable would be considered an advanced beginner (Benner, 1982). Therefore, this stage is consistent with the skill mastery of the college's nursing graduates.

Kolb's experiential learning theory is described as a process through which experiences and reflection allow the creation of new knowledge (Poore et al., 2014). Kolb's experiential learning theory consists of a four-phase learning cycle that can be used for simulation-based remediation. This theory may show how nursing students begin with a concrete phase of the experience, which consists of the remedial simulation, then enters the reflective phase where the student reflects on the simulation experience to establish meaning. Subsequently, the nursing student enters the abstract conceptualization

phase where the experience are processed and where the student searches for the significance of the experience, finally arriving at the active experimental phase, which allows the student to take the knowledge that has been gained and apply it to the clinical setting.

Combining the Benner's novice to expert theory (1982) and Kolb's experiential theory (1984) may show how a nursing student progresses through various stages to gain skill competence. Benner's and Kolb's theories may also be used to demonstrate how the student uses those experiences and with reflection makes meaning out of the experiences. The two theories used in combination may explain knowledge and skill acquisition and how those skills can be applied in an authentic setting, such as the clinical environment.

Benner's Stages and Nursing Students

Although Benner's novice to expert model published in 1982 consists of five stages and all of Benner's stages are briefly described, in this study, I focused on the *novice* and *advanced beginner* stages because those stages are consistent with the expected level of achievement for an ADN student advancing from a first-year to a second-year student. First-year nursing students are considered novices but transition to the advanced beginner's stage by graduation (Fero, Witsberger, Wesmiller, Zullo, & Hoffman, 2009; Sparacino, 2015). Figure 1 illustrates the stages of the Benner model and how nursing students fit into the model, starting at the novice stage and progressing to advanced beginner upon graduation and up to 6 months and beyond after employment begins.

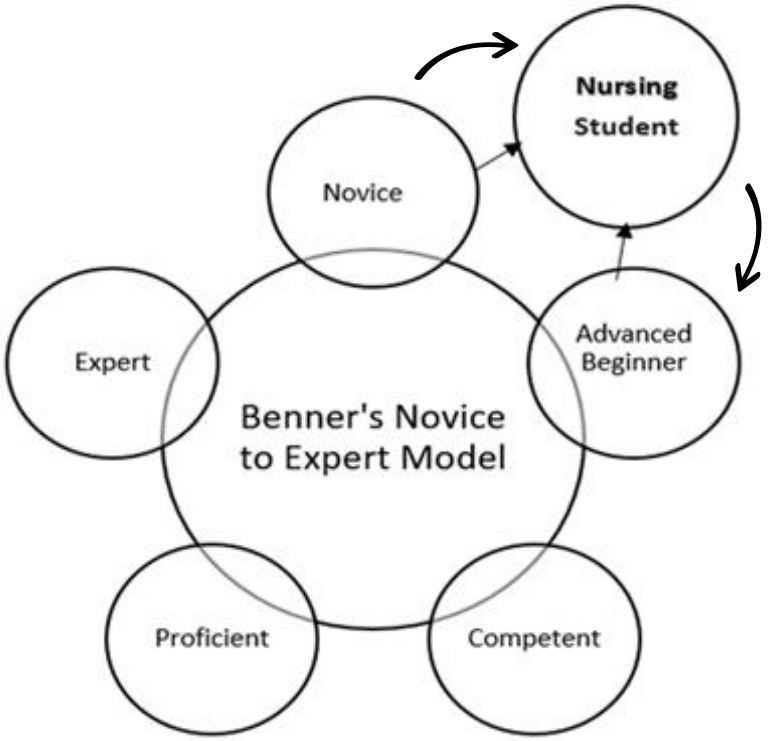

Figure 1. Representation of the five stages of Benner's model with desired stages acquired while a nursing student

A nursing student is in the novice stage in the first year of their education to become a nurse. As a novice, the nursing student has limited to no experience with the situations and problems that arise in the clinical setting. Benner's theory is considered one of the most important theories in nursing and is used to explain the five stages nurses go through to gain clinical knowledge and skills (Oshvandi et al., 2016). Typically, nursing students remain in the novice stage while continuing to learn during their second year of undergraduate nursing education. Therefore, nursing students must have rules and guidelines as well as instructor support to guide them while encouraging more independent patient care decisions to further progression towards Benner's second stage

of advanced beginner. Davis and Maisano (2016) suggested that as novice nurses learn new knowledge, this knowledge will then support progression from one stage to the next.

The novice then transitions to an advanced beginner, which is usually toward the end of the second year in the final semester and can persist up to 6 months after graduation. Davis and Maisano (2016) described the advanced beginner as a nurse or nursing student who has experienced a sufficient number of patient events and can respond appropriately with the assistance and support of rules and guidelines.

The competent stage is associated with a practicing nurse who has worked 2 to 3 years in the nursing field and creates a connection between nursing actions and their effects on the patient. This stage did not apply to this study. Subsequently, the nurse transitions to the proficient stage, exhibiting skills and competencies that include the ability to adapt to changing patient situations and to see the whole picture and respond according to rapidly changing conditions. Sitzman and Eichelberger (2017) described this stage as when nurses have 3 to 4 years of clinical experience and recognize critical signs and symptoms while applying the appropriate intervention. Finally, in the expert stage are nurses who have more than 5 years' experience and no longer require guidelines to make clinical decisions, responding instantly and appropriately to changing patient events. Guidelines are only required when confronted with situations outside the nurse's area of expertise.

Schecter and Ryan (2017) conducted a quasi-experimental pilot study for nursing students using Benner's Novice to Expert model as the frame. Eight nursing students over three semesters were assigned preceptors and enrolled in three clinical adult health

courses locate at a community hospital to observe their development from a novice nurse by measuring gains in competence and confidence work. A Competence/Confidence Self-Assessment Scale (CCSS) was used to measure the student competence and confidence. The results indicated that using Benner's model, through repetition of experiences, the student's perception of their competence and confidence increased indicating that the increase in self-confidence may assist students in progressing to the advanced beginner stage of development (Schecter & Ryan, 2017).

Paragas (2016) utilized Benner's Novice to Expert model in her study, Development of Evidenced-Based Scenario with High Fidelity Simulation to Improve Nursing Care of Chest Pain Patients, to demonstrate how simulation can assist nursing students to progress from the novice to the advanced beginner stage. Progression can be achieved by providing a practice environment with real patient scenarios that allow the student to perform skills and practice critical thinking without fear of patient harm. Paragas (2016) stated that Benner's model provided an opportunity to make mistakes and through repetitive practice achieve growth without compromising patient safety. Humphreys (2013) and Shepherd (2017) suggested that simulation is a learner-centered activity and that using Benner's novice to expert model as a framework for teaching with simulation offers a useful philosophical underpinning when determining what type simulation would benefit a particular student. Kelly, Hopwood, Rooney, and Boud (2016) concluded that Benner's theory, when applied to simulation, can explain how students advanced from novice to advanced beginner as they participate in, then reflect upon the simulation experience.

The relevance of Benner's novice to expert model to this study is related to the way the theory demonstrates how simulation-based technology can be used as a remediation tool to assist a novice nursing student, who fails to meet clinical objectives, to acquire the knowledge and skills, through practice and repetition, advance to Benner's next stage of development. Stage advancement is attained through practice, experiences, and reflection that enables the nursing student to continue the transformation from a novice to an advanced beginner and return to the clinical setting better prepared to meet clinical objectives.

This study may add to the existing literature supporting the use of Benner's novice to expert theory. The framework was used to explain how remediation with simulation-based technology can assist the nursing student, through focused experiences and repetition, to progress from one stage of competency to the next. By designing simulation remediation scenarios based on Benner's framework and using simulation-based technology, the students who experience difficulty in specific areas, as well as those who experience difficulty in multiple areas, can practice and reflect on the experience before attempting the skill again. This experience can be created safely in a simulated environment without fear of harm to patients or embarrassment to the student.

Kolb's Experiential Learning Theory (ELT)

Kolb's experiential learning theory was used to complement Benner's framework and further explain how nursing students build upon experiences to create new knowledge. Kolb's theory can be used as a way to guide learning with simulation-based technology because thoughts are not rigid and can change with experiences while

offering a process by which knowledge acquisition is attained (Kolb, 1984; Poore et al., 2014). Kolb's theory consists of four phases, the concrete experience, reflective observation, abstract conceptualization, and active experimentation. According to Poore et al. (2014), students must experience each of the four phases to achieve optimal learning. Nursing students began the concrete phase which is the simulation scenario while participating in the simulation and during the debriefing session which follows each simulation. Next, students enter the reflective observation phase where they review actions and consequences. Subsequently, the nursing students will enter the abstract conceptualization phase where they reflect upon their thoughts and actions and form new ideas that could improve clinical outcomes. Finally, students enter the active experimentation phase where they apply the knowledge they gained to subsequent simulation and clinical situations.

Norman (2018) used Kolb's theory of experiential learning to looked at the different learning outcomes while watching participants in a pre-recorded video simulation experience to determine if there was a difference in student learning outcomes when one group was given an observation guide, and the other group was not. Simulation was noted to be the concrete experience, and reflective observation was used when the observers with and without guides watched and reflected upon the simulation, as well as the student's performance while watching the pre-recorded simulation experience. Abstract observation ensued when the observers critically reflected on the pre-recorded simulation experience to evaluate the student performance in the role of a nurse. Active experimentation occurred during the debriefing session when both those students with

and without guides learned from observing the interaction and decisions made during the pre-recorded videoed simulation. The researchers used Kolb's theory to explain how learning occurs with the final results indicating non-significant differences between those who had guides, and those who did not. Similarly, Weber and Farrell (2016) utilized Kolb's experiential learning theory to describe how through the concrete experience (simulation), reflective observation (debriefing session), abstract conceptualization (reflects and processes simulation experience), and active experimentation (students apply new knowledge to subsequent learning opportunities) students gained, understood, and applied new knowledge to future clinical situations.

Utilizing Benner's novice to expert model in conjunction with Kolb's experientiallearning theory may provide a way to describe and understand how a novice nurse attains skill advancement. By combining the two theories nursing faculty may achieve a better understanding of how those students, who may struggle with the clinical competencies, can gain knowledge through practice, repetition, self-reflection, and deliberate practice, then subsequently, apply those skills to attain stage advancement. The research question of, what is the difference in the competency demonstration evaluation scores of ADN students when initial scores are compared to the scores after remediation with simulation-based technology, builds upon these existing theories. The research question does this by describing how nursing students, through a simulation remediation session, may achieve stage advancement which can result in greater skill acquisition and knowledge attainment.

Literature Review Related to Key Concepts and Variables

Because recognizing the characteristics of nursing students who are clinically success and those who struggle in clinical are critical to early recognition of the need for remediation, the literature review began by exploring the available research on the characteristics of successful students, as well as those who exhibit signs for potential failure. Additionally, relevant literature on simulation technology in nursing education was explored to provide a historical view of how simulation technology has evolved in nursing education. Literature related to simulation's common and less common current uses in nursing education are reviewed, as well as current literature on simulation's effect on assessment ability, communication, clinical judgment/clinical reasoning, and patient safety practices were examined. The available literature on simulation and its use as a clinical remediation intervention or tool was examined to identify gaps in the literature related to simulation as an instructional tool.

Clinical Success and Failure Characteristics

Various factors and characteristics can contribute to a nursing student's success or failure in the clinical setting. Recognition and understanding of those factors will assist nursing instructors in identifying at-risk students and provide an intervention that can potentially avert clinical failure and dismissal from the nursing program. While common practices among instructors include spending more time in the clinical setting with those students who are at-risk for failure to meet clinical outcomes, this method has not always been successful and can cause the student to experience greater anxiety and become burdensome to the instructor who has several students competing for attention. Early

identification of successful and failing clinical behaviors can be the answer to increase student's successful completion of the nursing program and allow faculty to implement effective remediation practices.

Students who are successful in the clinical arena have specific characteristics that can be readily identified through observation and ideally tracked through documentation to provide an appropriate intervention. DeBrew and Lewallen (2014) and Lewallen and DeBrew (2012), stated that students who are recognized as clinically successful arrived at the clinical site with a positive attitude and embraced new learning opportunities. They actively sought to bond with fellow students and clinical site staff, engaged in clear communication with the instructor, peers, and clinical personnel while displaying the ability to think critically. The students were prepared for clinical encounters and demonstrated skill progression, accepted constructive feedback and adapted to the changing clinical setting. Several studies (Lewallen and DeBrew, 2012; Duffy, 2013; DeBrew and Lewallen, 2014) described students who were unsuccessful as demonstrating behaviors such as failing to adapt to the clinical environment, arrival at the clinical site unprepared to take care of their patient and non-receptive to feedback, display difficulty communicating with patients, instructors, peers and clinical staff, and displaying an unenthusiastic attitude toward nursing.

Consequently, students who perform poorly or unsafely in the clinical environment compromise patient safety. Furthermore, those nursing students are often a concern for nursing instructors resulting in instructors who struggle with how to address poor performance in a timely and safe manner. Prompt recognition of unsatisfactory

clinical behaviors and early interventions are necessary to promote student success. For this purpose, Chunta (2016) recommended early identification upon recognition of unsuccessful behaviors and prompt remediation.

History of Simulation Technology and Nursing Education

Simulated patient care models have been in use since ancient times beginning with clay and stone human models in the 18th century (Jones, Passos-Neto, & Braghiroli, 2015; Palaganas, Epps, & Raemer, 2014). As technology evolved and allowed the incorporation of mechanical function to be placed inside what was once static human-like models, simulations usefulness only increased and expanded. In the 1960s, Asmund Laerdal, a plastic toymaker by trade, designed a patient simulator, which he named Resusci-Anne (see Figure 2) to be used to train people in cardiopulmonary resuscitation (Jones et al., 2015).

Figure 2. From Resusci® Anne Basic and SkillGuide™ [Photograph]. https://www.laerdal.com/us/docid/1022079/ Resusci-Anne-Basic-and SkillGuide. By Laerdal. (2018). Reprinted with permission.

Today's simulation equipment includes mannequins that can respond to verbal commands, cry tears, breath, and exhibit other realistic human characteristics. Figure 3 provides a review of the evolution and use of simulators in healthcare as described (Palaganas et al., 2014).

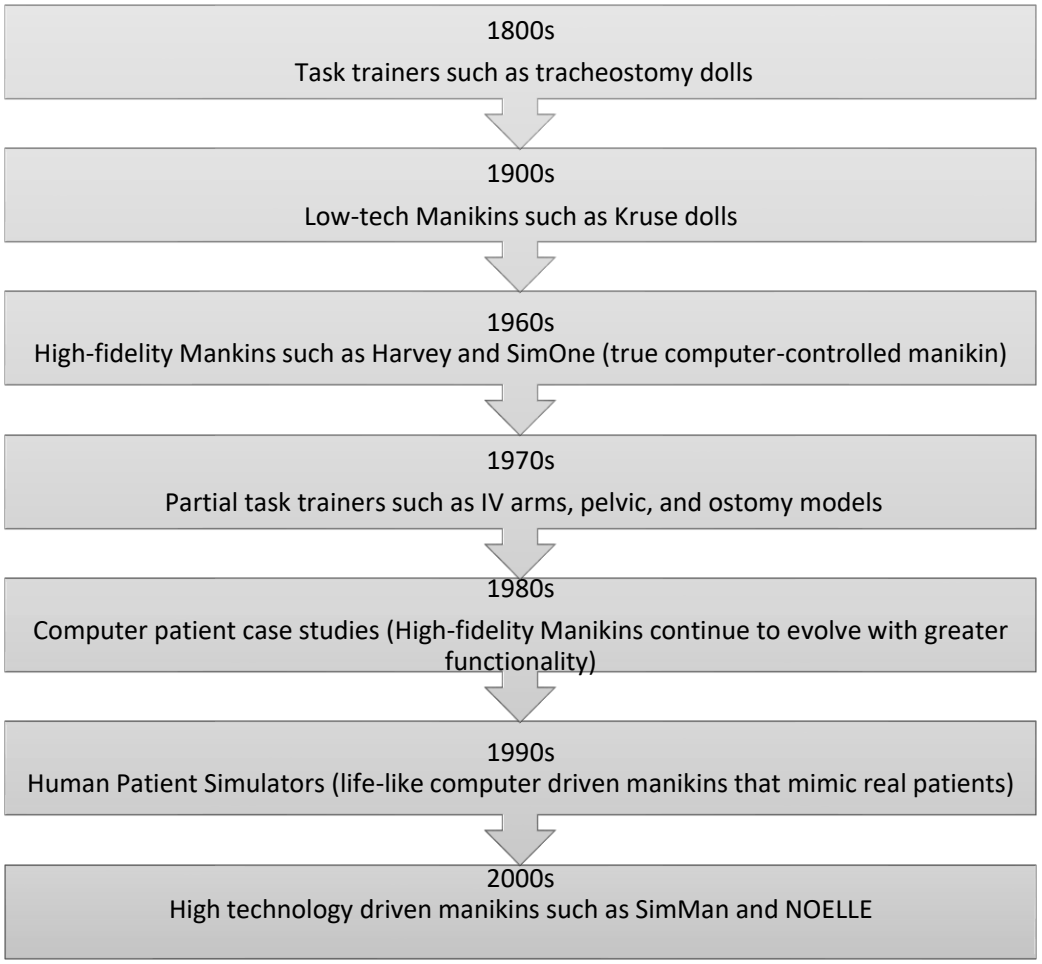

Figure 3. Evolution of simulators in healthcare.

Simulation and the use of simulation technology in nursing education has undergone significant growth over the last several years. This growth is partly due to the increasing concerns related to patient safety and the inability of nursing programs to

provide enough clinical sites for students to gain hands-on practice with patients. Tella et al. (2014) suggested that simulation was an efficient way to teach nursing students patient safety practices. Additional growth in the use of simulation can be attributed to its use by nurse educators. This increase may be related to the positive results reported in the study by the National Council of the State Boards of Nursing (2015) which concluded that nursing instructors can use high-fidelity simulation to simulate real patient encounters and substitute up to half of the traditional clinical hours with simulation with similar student outcome (Hayden et al., 2014). According to Lambert and Watkins (2013) and Naik and Brien (2013), 21st-century simulation technology has experienced a significant rise in acceptance and has advanced so that it provides a more realistic practice environment to improve patient safety. Although the use of simulation-based learning in nursing education has been well-documented and its usefulness as a clinical substitute has been positively validated, little evidence exists to determine if simulation would be beneficial when used as a remediation tool for clinically at-risk nursing students.

Simulation Current Uses

Simulation's popularity continues to expand as evidence of its effectiveness grows among published research. Additionally, the need for more student-patient experiences outside the hospital environment is becoming apparent as student's approach graduation with minimal skills and the knowledge necessary for coping with multiple patients with high acuity levels. Studies related to current simulation-based technology used in nursing education was examined, and the most common literature related to current uses of simulation in nursing programs, as well as less conventional roles for

simulation, was described to better understand the benefits of using simulation in nursing education. Further, literature was examined to determine how other researchers have used simulation to strengthen the clinical skills of those students who are experiencing problems in the clinical setting. Although the available literature is sparse to support simulation specifically as a remediation tool, current literature was examined to determine if those benefits could be applied to use simulation-based technology for remediation purposes.

Uses for simulation are numerous and depend upon what objectives faculty wish to set for nursing students. Simulation used in areas such as teaching critical thinking/clinical reasoning, self-confidence, or decrease anxiety has grown rapidly, but adoption of simulation in other areas has been slower. Some programs, due to regulatory restrictions or faculty reluctance, have been slow to embrace simulation as a substitute clinical site. Other areas such as teaching cultural competence have only seen an increase in attention in the last few years and one area, simulation as a remediation option has only minimal research available. Conversely, literature related to the simulation in nursing when used to develop psychomotor skills, assessment skills, communication skills, patient safety practices, critical thinking, clinical judgment, clinical reasoning are more readily available.

Student satisfaction and self-confidence. For example, a quasi-experimental study conducted by Basak et al. (2016) reported that nursing programs had a greater than 40% use of high-fidelity mannequins in simulation training of novice nursing students. The researchers examined how using low and high-fidelity mannequins during

simulations differ in assisting students in acquiring skills while measuring student satisfaction and confidence with each type. Sixty-Six Bachelor of Science (BSN) nursing students from first and fourth semester participated in the study. The students were further subdivided, and each group participated in a ten-minute session of both a high-fidelity and a low fidelity simulation. Each session was debriefed for twenty minutes then students completed two Likert-type questionnaires, a 13-item Students' Satisfaction, and Self-confidence scale and a Simulation Design Scale which is a 20-item tool consisting of a 1-5 rating scale with (1) indicating *Strongly Disagree* and (5) indicating *Strongly Agree*. Basak et al. (2016) concluded that results were statistically significant with $p<0.05$ Scores were higher for the high-fidelity groups at 4.67 compared to the low-fidelity group at 3.62. The simulation design scale scores were 4.15 for the low-fidelity mannequin group compared to 4.73 for the high-fidelity mannequin group. Overall results indicated student's perception was high-fidelity simulation resulted in greater student satisfaction and self-confidence when compared to low-fidelity mannequins.

Simulation and student anxiety, self-confidence and caring ability. Khalaila (2014) carried out a descriptive quantitative study which evaluated the effectiveness of simulation in reducing anxiety, increasing self-confidence, promoting caring ability, and measuring simulation satisfaction, as well as the predictors and mediators for caring efficacy among nursing students. This research study consisted of sixty-one second-year nursing students during their first clinical experience. The author hypothesized that anxiety would decrease, and self-confidence and caring ability would increase between the students pre-clinical and pre-simulation experience and post-clinical with simulation

experience. Khalaila (2014) used a pretest-posttest design. The pre-test/post-test consisted of an adaptation of the 20-item State-Trait Anxiety Inventory that measured students emotional state (apprehension, tension, responses of the autonomic nervous system which produces flight/fight response) when exposed to changing situations. Caring ability was measured using the 30-item Caring Ability Inventory including 13 items which were reverse scored. Final study results indicated a negative correlation between anxiety and caring efficacy, a positive correlation between caring efficacy and caring ability, and a positive correlation between self-confidence and caring efficacy, and lastly, satisfaction with learning with simulation was positively correlated with caring efficacy. ANOVA test results revealed that anxiety decreased, self-confidence increased, and caring ability increased from pre-simulation-pre-clinical to post-simulation-post clinical. Study conclusions indicated that nursing students experienced reduced anxiety levels, increased self-confidence, and caring efficacy with simulation.

Simulation and student medication knowledge and patient safety. In a comparison study to determine the effect of simulation on knowledge of medication administration, Konieczny (2016) observed 126 randomly assigned nursing students. Sixty-five were assigned to a low fidelity group, and sixty-one were assigned to a high-fidelity group, then subsequently participate in the same three medication administration simulation scenarios which involve the care of a patient with an endocrine, cardiac and respiratory diagnosis. A pre-assessment/post-assessment was administered to both the low-fidelity groups and the high-fidelity groups with the post-assessment taking place after the simulation intervention and a debriefing session. Results indicated that the low-

fidelity and high-fidelity group pretest score were 5 out of 10. The low fidelity posttest score was 7.02 out of 10 while the high-fidelity group posttest scores were 8.15 out of 10 indicating that the use of high-fidelity simulation produced the greatest increase in medication administration knowledge. Konieczny (2016) claimed that the study indicated that high-fidelity simulation produces increased knowledge which could result in greater patient safety and increase student exposure to situations where vital knowledge regarding patient conditions are needed.

Simulation as a teaching tool. Davis, Kimble, and Gunby (2014) suggested that high-fidelity human patient simulators are innovative tools for teaching nursing students. The researchers conducted a mixed-methods convergent parallel study investigated teacher factors, student factors, and educational practices as outcome predictors of undergraduate nursing faculty use of High-Fidelity Human Patient Simulators (HFHPS). The researchers recruited 139 undergraduate registered nurses (RN) nursing faculty teaching in the United States who had access to working high-fidelity human patient simulators and who have taught in the clinical environment during the last 12 months. The data collection method was an approximately 30-minute Web-based survey including a demographic data form, the *Clinical Site-Scale*, a four-item 5-point Likert scale, *Student Readiness for Simulation Learning Scale* with a scale of 1-10 with a score of 10 signifying a more positive faculty perception of simulation participation readiness. The survey also included the *Comfort Level Scale*, the *Modified Teacher's Sense of Efficacy* 12-item Scale measuring HFHPS faculty teaching self-efficacy using a 9-point Likert scale, and the *Modified Teacher Confidence Scale* a 32-item instrument using a 6-point

Likert Scale. Higher scores equate greater confidence, and the scores for this scale can range from 32-192. Results indicated 90% of faculty used simulation as a teaching method and 68% reported that simulation was used as a clinical substitute with 79% reporting <= 10% of simulation substituted for clinical hours. Further analysis revealed that although many faculty used simulation, a low percentage use it for substituting for traditional clinical hours. It was also noted that simulations, as indicated by hours in simulation, were not accurately recorded and this resulted in inaccurate reporting.

Results supported that nursing faculty's beliefs about HFHPS were strongly associated with HFHPS use. The faculty using HFHPSA as a substitute for clinical hours had a lower self-efficacy, which led the researchers to speculate that this could be the result of some faculty's misunderstanding the complexity of simulation, examples would be the technical components, the time needed to implement simulation, and challenges associated with large classes. Conversely, there were also fears among some faculty that if a student could make a mistake in simulation, they would make the mistakes in the clinical setting as well. Conclusions were that simulation may change how nursing education is delivered creating opportunities for students to experiences and use critical thinking skills to better care for the more challenging patients encountered in today's healthcare setting.

Simulation and patient safety. The researchers, Mariani, et al. (2015) described using a nonexperimental pretest-posttest design and developed, and video recorded two simulation scenarios for a participant pool of 175 senior level undergraduate nursing to exploring the student's perception and comfort level concerning patient safety practices.

Before participating in simulation, the nursing students completed the *Healthcare Professionals Patient Safety Assessment* (HPPSA) which measures the student's perceptions of comfort level with patient safe care practices. The HPPSA is a three-part survey containing in the first part an 18 statement Likert-type scale related to errors and patient safety in healthcare. The second part consists of five questions where students rated their comfort level with disclosing or reporting an error. Part three consisted of six questions with a *yes* or *no* response expected.

Ninety-three percent of the participants were women, eighty-six percent were white, with fifty-nine percent classified as traditional students. The student's ages ranged from 21-49. Part One demonstrated no statistically significant differences in pre- and posttest scores. Part Two post-test scores increased from 16.96 to 17.69 indicating students would feel more comfortable in completing an incident report, finding an error during case analysis, supporting and advising a peer on reporting an error, and disclosing an error to faculty and staff after the simulation scenario. Part Three demonstrated that 50% or greater of the students had no experience in dealing with errors. The researchers concluded that students perceived high-fidelity simulation as more satisfying and resulted in increased self-confidence when compared to low-fidelity simulation. The researchers concluded that clinical simulation was shown to be an evidenced-based teaching tool that stimulates safe-practice principals among nursing students allowing them to demonstrate competency in clinical judgment, consequences of actions, and the evaluation of the effectiveness of their interventions. Nursing students who participated in a quality and safe practice simulation scenario had overall results that showed student's comfort with

safety-related patient issues were increased after taking part in the simulation scenario revealing that simulation contributed to the students learning about quality and safety standards and expectations.

Simulation and cultural competence. Simulation with high-fidelity mannequins that have the capabilities to respond physiologically to teach basic nursing skills can also be used to teach cultural competence in nursing (Roberts, Warda, Garbutt, & Curry, 2014). Teaching a nursing student how to be culturally competent requires that the nursing student is exposed to patients that come from different backgrounds than the student, and those opportunities do not always happen in the hospital setting. Roberts et al. (2014) and Ozkara (2015) suggested that changing healthcare demographics due to the increasing minority population has compelled educators to begin preparing for the increase of culturally diverse patients that healthcare practitioners will begin seeing in the clinical setting. Just as culture affects how a person approaches life it also affects a person's healthcare beliefs and a person's cultural beliefs affect how they view illness and wellness, and how and when they will seek medical care. With the rise in the minority population, healthcare in the United States will see a culturally diverse population coming into the United States healthcare systems. Therefore, understanding, recognizing, and preparing for this shift in population will allow healthcare workers to better care for their patients and therefore affect patient health goals and outcomes. Towards this end, cultural competency integration into nursing programs has become a requirement. Roberts et al. (2014) stated that although several programs describe how simulation can be effective in teaching cultural competency, specific outcome data are lacking.

Use of simulation to teach cultural competence has been suggested to inject realism when teaching culturally competent care. Integration of simulation into the nursing curriculum has been increasing due to the positive results. The literature shows that simulation can decrease medication errors, increase patient safety, be used as an additional clinical site, and for providing specific clinical experiences for students. Roberts et al. (2014) declare that the studies they examined indicated that simulation appears to be a useful tool to teach cultural competence in nursing students but stress that more research is needed to determine which methods are most effective. The researchers suggested that high-fidelity simulation shows great promise for assisting students in providing culturally competent care to patients who find themselves in the healthcare setting. Ozkara (2015) conducted a literature review and found that a Population Reference Bureau report completed in 2010 revealed that the United States has more foreign-born residents than any other country. Because of this diversity, many healthcare beliefs could present a challenge to today's healthcare workers, especially nurses. Issues such as wellness and illness beliefs, mistrust in westernized medicine, language barriers, as well as different cultural practices have presented instructors with the task of preparing students to take care of culturally diverse patients that are being seen in a variety of healthcare setting. Simulation was looked at as a potential tool to develop those cultural competence skills in nursing students. The literature review revealed that high-fidelity simulation increased cultural awareness, provided opportunities to integrate cultural awareness and cultural sensitivity in nursing education in a safe environment. Although the literature is available regarding the United States changing population mix, research

related to teaching cultural diversity in healthcare using simulation remains limited. Therefore, Ozkara (2015) agreed with Roberts et al. (2014) that more research is needed to determine the effectiveness of simulation in teaching cultural competence.

The overall conclusion reached by the researchers was that simulation offers an opportunity for students to encounter a variety of patients and begin to develop the skills to practice therapeutic communication regardless of the situation they may face in the healthcare environment. Although culturally competency related simulations have not been the subject of many studies, the positive benefits warrant further investigation.

Simulations effect on assessment, communication, clinical judgment, and patient safety. Foronda, Liu, and Bauman (2013) conducted an integrative review using the databases of CINAHL AND PubMed from the years 2007 to 2012 to evaluate research findings related to simulation in undergraduate nursing education. During this search and evaluation, the authors found that students found satisfaction (16 studies) when participating in simulation and felt that simulation allowed them to gain confidence/self-efficacy (26 studies). Additionally, students found simulation to decrease anxiety (11 studies) while increasing skills/knowledge acquisition (29 studies). The skills and knowledge category consisted skills such as psychomotor skills, social skills, reasoning, predicting, problem-solving, teamwork, assessment skills, decision-making skills, medication administration, prioritization, cognitive knowledge, critical thinking, collaboration, communication, and clinical learning, high-stakes testing. Synthesis of the literature concluded that simulation was beneficial for teaching student's knowledge and skills, improve confidence. The students were found to be satisfied with their simulation

experience, although some students voiced anxiety when participating in a simulation activity. Students also found value in interdisciplinary simulations; specifically, it helped teach students to communicate with other healthcare disciplines. This article supports simulation as an education tool to teach or reinforce students' knowledge and skill acquisition related patient care skill such as assessments, decision-making, communication, problem-solving, and various other skills noted in the paragraph above.

Khalaila (2014) noted that many times student felt anxiety when anticipating their first time in a clinical setting and purposed using simulation scenarios to introduce the student to the clinical experience to reduce anxiety. Although anxiety is a natural reaction to experiencing something new and unknown, anxiety related to simulation has also been noted in various research studies (Gantt, 2013; Kaddoura, Vandyke, Smallwood, & Gonzalez, 2016; Neilsen & Harder, 2013). Despite this claim, simulation can also be used to acclimate the student to the patient care environment and give them an opportunity to practice cognitive and psychomotor skills before performing them on a real patient.

Simulation and anxiety. In this study, Khalaila (2014) reported adding the Quality and Safety Education for Nursing competencies into simulation scenarios allowing the nursing student to be exposed to the knowledge, skills, and attitudes before the clinical experience. Simulation is a tool that allows the students to experience situations and react to them in a safe environment where they do not have to be concerned with doing patient harm. Learning by simulation allows immediate feedback, and a difficult situation can be repeated so that the student can work toward performing

the correct response or action. Simulation is also known to decrease anxiety among novice nursing students and increase self-confidence and clinical competency. The results of this study concluded that simulation reduced anxiety, improved self-confidence, caring ability, and caring efficacy. This research provides further evidence of simulation effectiveness as a tool to affect nursing students in a positive way such as decreased anxiety, improved self-confidence, and increased caring behaviors.

Simulation and self-confidence, student satisfaction. Cummings and Connelly (2016) conducted a study related to undergraduate nursing student's satisfaction, confidence and educational practice levels relating to the simulation activities that the nursing faculty incorporated in the nursing curriculum. The simulations consisted of scenarios that incorporated current academic content and were allotted eight hours of simulation lab time which was a substitute for clinical observation time. The junior year students participated in four adult health simulation activities in groups of three or four and the senior students participated in three simulation scenarios, one with pediatrics, one with obstetrics, and one for professional nursing integration. The junior scenarios were patients with conditions commonly seen in the medical, surgical setting, diabetes, chest pain, asthma attack, requiring the student to use prioritization, critical thinking, and communication skills as some simulations required one nurse while others included team nursing.

Similarly, the senior students were presented with a patient's conditions consistent with their area of study. Both junior and senior level students participated in a debriefing session, and both groups were required to complete a pre-quiz and a post-quiz.

Following the simulation activities, both sets of students requested to voluntarily complete a 30-item Likert scale survey containing three tools, the Student Satisfaction with Learning Scale, Self-Confidence in Learning and the Educational Practices Questionnaire. Scoring consisted of 1-5 with 5 indicating the highest score. Fifty-four students responded to the survey request, 34 junior students and 20 senior students. The mean averages for the questions were compared for the junior and senior level students resulting in eight questions that had confidence level of 95% and statistical significance at $p<.001$ with the junior students' scores ranging from 3.17 to 4.06 on the specified eight questions and the senior students scoring from 4.5 to 4.65 on those specific questions. The results from the study concluded that all students perceived greater satisfaction and self-confidence with high-fidelity simulation when compared to low-fidelity simulation the low fidelity mannequin student satisfaction score was 3.62 ± 1.01, compared to the high-fidelity mannequin group which was 4.67 ± 0.44'dir ($Z = -6.35$; $p = 0.01$). When intergroup comparisons were made, the junior and senior group scores for student satisfaction, self-confidence in learning, and simulation design using low and high fidelity mannequins was statistically significant at ($p< 0.05$). The results from the study concluded that all students perceived greater satisfaction and self-confidence with high-fidelity simulation. When comparing with high fidelity to low-fidelity simulations, senior students rated low fidelity simulation as more beneficial than did junior students.

Simulations and critical thinking, clinical reasoning/ judgment, and anxiety. Although simulation research often discussed a single simulation scenario implemented to understand the benefits and detractors of simulation better, few studies have been

conducted on the outcomes for participants of multi-scenario simulations (Kaddoura et al., 2016). The goal of Kaddoura et al.'s study was to explore how multiple simulation scenarios may benefit or create challenges for students when exposed to several simulation scenarios rather than the typical one. In an exploratory qualitative research design consisting of a convenience sample of 107 volunteer first-semester associate degree senior nursing students consisting of groups of five. The groups participated in seven 15-minute high-fidelity simulations using the Laerdal high-fidelity mannequin with subsequent 15-minute debriefing sessions. The debriefing sessions included discussions related to the student's learning experience and their perception of the learning environment. The simulation scenarios were comprised of the following patient conditions, acute coronary syndrome, asthma exacerbation, diabetes, fractures, stroke, a geriatric patient with a urinary tract infection, and a patient with delirium/dementia. During each simulation, students were given learning objectives and expected to use critical thinking, clinical judgment, as well as perform the appropriate psychomotor skills required to provide patient care.

Following the scenarios, students were presented with a survey comprised of ten open-ended questions designed to explore the student's perceptions of any benefits or challenges that were encountered during the simulation experience. Upon completion of the survey, the researchers coded the data and from the data derived themes that suggested students perceived that multi-simulation scenarios contributed positively to the development of critical thinking, clinical competence, self-confidence, theory to practice integration, and identification of knowledge deficits.

Conversely, the challenges of participating in multiple simulations identified by students were feelings of being overwhelmed, which increased anxiety. Students reported that the anxiety was contributed to the uncertainty of what to do first and pressure to perform flawlessly due to faculty observations during the simulation. An interesting anecdotal comment made by the participants was that although anxiety was present during the simulated patient care, the students' felt that it did not affect their learning outcomes. Like other studies, the results of simulation as a learning tool were reported as mostly positive. Anxiety was mentioned in this study, as well as several other literature studies as being a challenge for students participating in simulation scenarios.

Yuan, Williams, and Man (2014) recognized the importance of using good clinical judgment and decision-making skills in providing a safe patient care environment. Clinical judgment, clinical reasoning, and critical thinking are often used interchangeably in the healthcare literature. For this study, Yuan et al. (2014) defined clinical judgment as interpreting signs and symptoms and reaching a conclusion about a patient's condition. The researchers purposed that using simulation would lead nursing students to develop sound clinical judgment by encouraging the students to translate theory to practice. The ability to translate theory to practice is accomplished by systematically analyzing clinical situations through participation in simulation scenarios that required the use of critical thinking and clinical reasoning skills which allow the development of clinical judgment skills.

Yuan et al. (2014) stated that the purpose of the study was to assess the nursing students' clinical judgment during a high-fidelity simulation through observation using a

quasi-experimental design single group repeated measures design. Using purposive sampling, 120 baccalaureate students were enrolled with 113 participating in the study encompassing two years. Forty-nine students participated in year two of the program, and sixty-four students participated in year three of the program. Five simulation scenarios were used with a high-fidelity simulation mannequin to provide a realistic experience for all participants. The nursing students were advised the simulation would last from six to eight hours and be video recorded then the students were oriented to the simulation lab and mannequins before the experience. Following the simulation experience, the student participated in a debriefing session where they were asked three questions to assist them in identifying and correcting any mistakes to promote patient safety considerations. The questions were as follows:

- What were the key concepts and skills you used in this session?
- What do you need to learn more about to take care of patients in similar situations?
- What needs to be improved in the next session?

Before the debriefing session, the faculty observers used the Lasater Clinical Judgment Rubric (LCJR) to rate the student's behaviors of clinical judgment. Higher scores are equal to better clinical judgment. Following the completion of all sessions, the researchers conducted tape-recorded group discussions where students were asked to share their thoughts about the simulation experience. Transcripts were created, and students reviewed them for accuracy. All data were compiled, and the results showed that the students' clinical judgment increased from the first simulation to the last

simulation. Results of this study indicated simulation was found to assist students in developing clinical judgment skill which is a critical component in providing safe patient care. This study provided data supporting the use of simulation for teaching and enhancing student's clinical judgment skills suggesting that it could also support clinical remedial education in nursing.

Ashley and Stamp (2014) stated that clinical judgment is paramount when caring for a patient and is directly associated with creating and maintaining a culture of safety. The researchers designed a qualitative study to examine the clinical judgment and clinical reasoning skills of 104 prelicensure nursing students who participate in two 15-20-minute videoed simulation scenarios. The researchers sought to answer the following questions (1) What assessment did the nursing students make? (2) How do they interpret findings and attend to the data? (3) What interventions do they implement, and for what reason?

The study participants were sophomore and junior students who had completed academic coursework related to basic science and a health assessment class and were in the process of completing their first clinical course which was an introductory experience with adult health split between the hospital setting and the skills lab. The junior level students had participated in the same courses with the addition of a childbearing and advanced adult health course. Both simulation scenarios required the students to conduct a focused assessment, identify the problem, and provide the appropriate interventions.

Five themes were identified during coding: think like a nurse, assessment, looking for answers, communication, and magical or reflective thinking with some differences in responses being most significant in the junior students when compared to the sophomore

students. Junior students, who had more experience, preplanned what they wanted to do before entering the patient's room (think like a nurse) and were able to recognize patient cues more frequently (assessment), quicker, and more accurately. Sophomore students knew to get vital signs but looked more to the environment (looking for answers) for answers rather than the patient or the patient's chart. In most cases, junior students could extract pertinent information and act on those findings more quickly.

Issues related to communication were that both groups experienced some problems with therapeutic communication, often saying things aloud that created anxiety for their patients. The difference that stood out between the sophomore and junior nursing students was that the juniors took ownership of the mistakes while the sophomores made statements such as, "*I would not have done that with a real patient*, or *if I were a nurse I would have done things differently*, rather than acknowledging that communication was an area that needed work". Overall, students, as noted in other studies, described feeling anxiety during simulation.

The Ashley and Stamp (2014) study contributed to the body of knowledge on how students think during a simulation experience and will provide valuable information on simulation design. The study also solidified the belief that simulation helps students practice and learn to use clinical judgment in making patient care decisions, hone assessment skills, improve communication, and to use reflective thinking to enhance their ability to "think like a nurse" (p. 520). This study supports the usefulness of simulation in understanding how students respond and feel about the simulation experience further supporting the use of simulation technology in nursing education.

Simulation and communication. Communication is one of the most important areas of nursing education. Communication can be the root of many misunderstandings and potential mistakes in the healthcare setting. Anderson and Nelson (2014) suggested that the ability to communicate was a significant component of the nursing profession. The ability to effectively communicate allows the nurse to exchange critical information with other healthcare team members, establish rapport and trust with patients, provide patient education, and provide empathy and support to ill and distressed patients. With diminishing access to clinical sites, nursing programs are increasingly turning to simulation as a tool to teach nursing students the cognitive, psychological, and psychomotor skills needed to provide patient care safely and competently (Anderson & Nelson, 2014).

Communication is among the critical skills that nursing students must learn and practice to become proficient, and simulation can provide a valuable opportunity to practice and hone those skills. To provide insight into the communication patterns of nursing students in their senior year of a baccalaureate program, Anderson and Nelson (2014) conducted a qualitative study watching twenty-five video recordings of a convenience sample of seventy-one nursing students who participated in a medical-surgical scenario. Data were collected over a period of three clinical rotations, and the simulation scenarios lasted around twenty minutes; each recording group contained two to four students for a total of seventy-one students. The scenario was consistent with an advanced medical-surgical case that students might encounter in a healthcare setting. Students were provided burn-related resource materials and allowed to reflect on

potential nursing interventions. Students were expected to give pain medications, provide if appropriate, oxygen and monitor oxygenation, maintain and assess fluid status during the administration of intravenous fluid administration, and monitor for compartment syndrome.

Following the scenarios, both researchers viewed the recordings and transcripts looking for patterns of communication. A list of communication techniques was compiled, and emerging patterns were categorized into themes. The themes discovered were (a) focusing on tasks, (b) communicating-in-action, (c) being therapeutic. The researchers developed sub-categories of such as missed opportunities under the Focusing on Task theme when students failed to engage with the patient and employ therapeutic communication to encourage the patient to discuss the traumatic event. From the second theme, Communicating-in-Action, the three sub-categories evolved, relying on information, speaking in medical tongues, and offering choices. Students were often noted to regurgitate information from book knowledge rather than applying the nursing process, use medical jargon when talking to patients, or offer choices instead of stating their intention. The final theme, *Using Therapeutic Techniques*, entails students showing empathy and encouraging the patient to discuss his or her feelings.

In conclusion, the researchers noted that simulation was a good way for students to practice therapeutic communication and encouraged other instructors to consider focusing more on the students' communication practices rather than solely on psychomotor development. The researchers suggest designing simulation scenarios that are primarily focused on communication practice, allowing the student to practice and

grow in this equally important area of clinical education. The findings of this study support the use of simulation scenarios to assess the communication abilities of nursing students and provides an opportunity to practice therapeutic communication.

Beaird, Nye, and Thacker (2017) stated that communication is key to providing safe patient care. With the premise that communication can be improved by using simulation as a learning tool, these researchers conducted a study to assess the effectiveness of reviewing video recordings of student's ability to communicate using standardized patients. Ninety-four undergraduate nursing students divided into thirteen clinical groups consented to participate in a randomized prospective repeated measures design comprised of four outpatient simulations using live standardized patient actors. The researchers sought to answer the following questions: (1) Do video-assisted reflective practices influence changes in communication scores over a series of four simulations? (2) What is the correlation between student self-evaluations and standardized patient evaluations? (3) What is the dosage of simulation encounters needed to see improvement in communication scores? At the time of the study, students were enrolled in a maternal-child health course, and all students had covered therapeutic communication in their coursework.

The encounter consisted of a standardized patient in which students would individually interact with the patient for twenty minutes while conducting an interview and providing patient education. An unfolding case simulation scenario was utilized that required students to interact with the simulated patient during an initial prenatal visit and a 28-week appointment with the diagnosis of gestational diabetes. The subsequent

simulation had students conducting an assessment at a six-week postpartum appointment followed by the same patient two years later experiencing a miscarriage and post-partum depression. Beaird et al. (2017) noted that grief and loss counseling was not an experience that students were often allowed to engage in due to the sensitive nature of the subject. During the simulation experience, students were expected to engage in therapeutic communication during each patient scenarios and received feedback.

The research design required videoed recording of all simulations although groups were divided into a nonvideo reflection group and a video reflection group to determine if the video viewing assisted students in developing better communication skills. Following each simulation, the standardized patient's actors provided students with feedback in a positive manner and suggested areas for improvement. After the student debriefing, the standardized patient actors completed the Macy Communication Scale, and no scores were shared with students. The video group of students was sent the videos along with the Macy Communication Scale with instructions to view the video and fill out the instrument. The nonvideo group was only sent the Macy Communications scale to complete. This process was repeated with all four simulations for each group. A demographic survey was included with the first simulation, and the last simulation contained opened-ended reflections questions for the groups to complete and submit. Results revealed that there was no statistical difference in video and nonvideo scores following the first simulation encounter, although the video group did score higher following the second, third and fourth simulation. Question two results indicated that

students were in the moderate range for judging their communication skills. Additionally, communication scores rose significantly between the first and second simulation.

The researchers concluded that communication is improved with simulation and feedback. There was no significant difference in communication performance between the video and nonvideo groups although, except for the first simulation, the video group did score higher. Results of the qualitative portion of the study were that students felt that simulation and feedback helped improve their communication capabilities. This study supports the usefulness of simulation to increase communication skills of nursing students. Although statistical meaningfulness was not established, scores and students feedback indicated that simulation was beneficial in improving students' ability to communicate with patients.

Simulation and remediation. A less studied area in healthcare is how simulation, when used as a remediation tool, effects students' clinical outcomes when they experience poor performance in the clinical setting. Although much has been written about simulation in the last ten years, how simulation is used in various programs is still very individualized, and literature on the remediation practices for poor clinical performance is limited. Camp and Legge (2018) and Custer (2018) noted that although students are often found to struggle in the clinical environment, evidenced-based options for remediation is scarce and there is a lack of rigorous studies related to the effectiveness of remediation in nursing.

Many research studies have proved the value of simulation in assisting students with improved self-confidence, lessened anxiety, improved critical thinking, improved

clinical judgment, improved communication, and an increase in patient safety. Although an abundance of information is available regarding the characteristics mentioned above, literature reviews for studies related to simulation used specifically for clinical remediation purposes are scarce with the majority being related to remediation activities to improve passage rates on the licensure exam (NCLEX). According to Custer (2018, 2016), the use of remedial activities in nursing education was primarily related to a decrease in scoring on the NCLEX licensure exam subsequently noting a lack of remediation practices incorporating simulation. Custer (2018) posited that a lack of research related to simulation remediation might be related to the variability of simulation scenarios and the differences among faculty related to satisfactory performance.

A literature review related to the use of simulation-based technology for clinical remediation revealed fewer than a dozen studies directly related to simulation and remediation for clinically at-risk students. Most of the articles were found to have been conducted in the early 2000s then again in 2013-2014. Lack of current research studies may be due in part to the uncertainty of the place simulation has in nursing education and the lack of consistency among nursing programs on when and where simulation should be included in the nursing curriculum. Camp and Legge (2018) concluded there was a lack of research related to simulation used for remedial purposes, finding only seven articles ranging from 2004-2016 related to using simulation for clinical remediation. Custer (2016) noted a lack of literature related to the use of remediation practices in nursing education and suggested there was a need to conduct further studies in this area. Walker-Cillo and Harding (2013) maintained that topics related to remedial education are

rarely found in the nursing literature. One of the early articles written by Haskvitz and Koop (2004) noted there were scant references in the literature related to the use of the human patient simulator as a remediation tool. The researchers speculated that programs were probably using them in this capacity suggesting that the traditional way that instructors have handled students "at-risk" for poor clinical outcomes may negatively impact those students' self-confidence and cause additional stress increases the number of student mistakes.

Similarly, in another early article, Bremner, Aduddell, Bennett, and VanGeest (2006) noted that simulation in nursing education provides a realistic environment for novice students to learn and hone their patient care skills. The researchers also noted that simulation could be a beneficial tool to remediate nursing students who perform poorly in the clinical setting. Bremner et al. (2006) conducted a study with 56 novice students who were enrolled in a baccalaureate nursing course; students were asked to conduct an assessment on a simulation mannequin in the same manner as they would on a real patient. Following the second assessment 41 of the 46 students completed a 2-part questionnaire, with the first part containing quantitative questions and the second part containing open-ended qualitative questions. The first part used a Likert-type scale asking the students overall perception of their simulation experience, asked their opinion whether the simulation experience should be mandatory or voluntary if having the simulation experience on the first clinical day relieved stress, and if the simulation experience made starting clinical in the hospital less stressful. Results indicated that 95% found the experience good or excellent, 68% felt that a simulation experience should be

mandatory, 61% stated it gave them more confidence in their physical assessment skills, 42% indicated that it relieved stress. In the qualitative portion of the survey, 26% commented on the realism of the simulation, but one student indicated that the mannequin was “still a dummy” (p. 172). The overall opinion of the researchers was that simulation provided a potentially useful tool for nursing education and provides novice students with practice opportunities to support skill acquisition.

Radhakrishnan, Balachandran, Venkatesaperumal, and D’Souza (2013) conducted a literature review and described how simulation had been used to mitigate the shortage of clinical sites while explaining how simulation has been used in nursing education to improve student learning. Simulation provides students with a chance to practice their skills in an environment that is life-like but safe. Radhakrishnan et al. (2013) stated that students could “think on their feet, not in their seat” when describing the benefits of simulation (p. 251).

Simulation has been used as a remediation tool for students who had difficulty in the healthcare setting by offering them repeated opportunities to attain clinical competence (Radhakrishnan et al., 2013). The researchers also noted that simulation provides a chance for students to participate in a crisis situation in a safe setting before having to experience it in the clinical setting. Simulation allows the student to practice, make mistakes, then redo the scenario after reviewing what went wrong, therefore increasing critical thinking skills while encouraging clinical decision making. Simulation scenarios can provide students with the opportunity to prioritize patient care, encouraging students to think critically and recall previous content. According to Radhakrishnan, et al.

(2013) simulation enhance student learning by requiring the students to improve psychomotor skills through repetition and changing scenarios making it necessary for the student to perform the skill while thinking through why they are doing it while conversing with the patient. These types of situations can be designed for students in simulation to mimic real-life situations that students encounter at the bedside making them ideal for multitasking and student learning.

Alternatively, Malloch (2013) suggested that when violations of the nurse practice act occur it is often a struggle to determine what type of discipline or remediation should be conducted. These problems arise in the clinical practice setting where the behavior or actions of a nurse indicate that some type of remediation should be started. Because of the need for remedial recognition and planning, an Arizona collaborative developed a Nursing Performance Module which used simulation scenarios and a novice medical-surgical simulation to allow nurses to carry out patient care without the risk of harm to a real patient. The simulation incorporated basic psychomotor skills, a conflict situation, and teaching opportunities. The Nursing Performance Module which utilized simulation was an effective way to remediate nurses who were at-risk to do patient harm. The researcher found this model to be unique and promising for practicing nurses who struggle and need to remediate promptly and to provide focal areas for remediation.

Scholtz, Monachino, Nishisaki, Nadkarni, and Lengetti (2013) conducted a before and after timed series study which included 524 nurses from inpatient/medical/surgical, and specialty units. The study intended to conduct a diagnostic simulation probe with reflection and remediation that looked at central line-associated infections (CLABSI's) of

the bloodstream. The study was instituted because of a hospital facility's concern caused by the inconsistent practices of changing and maintaining a patient's central venous lines. Concerns were to be addressed by conducting a study using simulation as a remediation intervention tool referred to as a *dress rehearsal.* The simulation was created for nurses and other frontline healthcare employees. The "dress rehearsal" was designed to determine if a simulations intervention would affect, skill and knowledge acquisition in a controlled setting, establish clinical effectiveness at the patient level, and would participate in the simulation intervention result in improved patient processes or enhanced system-wide health outcomes. The simulation intervention program consisted of a simulation trainer mannequin, developed by two clinical nurse educators, and a revised clinical and simulation checklist for scoring the participants. Each participant filled out a pre-simulation questionnaire to establish a baseline for current knowledge and self-confidence with a central venous line (CVC) dressing changes, completed the simulated CVC dressing change while the educator used the checklist to score them noting any deviations from procedure or policy and a debriefing session followed by a post-simulation questionnaire.

During the first initial six months of the study, the nurses needing remediation were provided verbal feedback with no successive simulation practice. After viewing the checklist score sheets, educators noted several key steps were missing during the CVL dressing change, and a new approach to remediation was adopted in which nurses must remediate by repeating the simulation until reaching a 100% compliance with the steps and policies were achieved. Results indicated a significant increase in knowledge, 4.1 to

4.6, and confidence, 4.1 to 4.6 with a p-value of < 0.0001 after the simulation intervention. The educators reported objective cognitive scores increased in the correct number of responses on the true-false questions, the selection of cleansing agents, the routine frequency of dressing change, the need for maximum sterile barrier, and the initial frequency of dressing change at 86% to 99%, 97% to 99%, and 59% to 87% respectively. There was also a notable increase in psychomotor skill acumen the 284/524 that initially participated in the verbal feedback before implementation of skill repetition with simulation, 108 (38%) required no prompting and 176 (62%) requiring one or greater prompts. After the simulation remediation intervention was implemented 240 nurses participated in training, 197 (82%) completed the demonstration without prompting, and 43 (18%) of the nurses required one or more prompts. The clinical performance on patients improved for those participating in the simulation remediation intervention at (76%) 2469/1882 with (9%) corrective prompting rate. The remaining 587 nurses who did not receive the simulation intervention (21%) needed corrective prompting. Overall, the hospital CLABSI rate decreased from 5.3 cases out of 1000 to 2.9 cases out of 1000 after the simulation remediation intervention was instituted constituting a significant reduction in CLABSI. The researchers concluded that simulation-based learning and remediation practices resulted in improvements in nursing knowledge, self-confidence, and psychomotor skill performance, as well as an improvement in overall patient outcomes.

Reinisch and Kwong (2014) were challenged to create a simulation program using high-fidelity mannequins to assess graduate nursing student's readiness for the nurse

practitioner clinical practicum portion of their training and to determine its effectiveness. This endeavor was undertaken due to the lack of available literature related to the use of high-fidelity simulation for graduate nurse practitioner students. The simulation program was developed so that faculty could determine if graduate nurse practitioner students going into their first clinical practicum were ready for their clinical experience. The researchers wanted to establish if any student needed remediation to increase student confidence, to identify any learning needs, and to evaluate the advanced health assessment course, as well as identify areas for improvement. Fifty-five student participants were provided a scenario using a high-fidelity mannequin and a common patient complaint while subsequently given a patient history and asked to perform a physical assessment and provide clinical documentation evaluating the simulation scenario. Eight clinical faculty observed students and scored students using a 10-point measurement tool to rate student competency. Five out of the fifty-five students required remediation and then were asked to repeat the scenario. The remediation session consisted of 20 minutes to complete the same scenario while receiving real-time feedback from faculty. Two of the five students improved with remediation and needed no further interventions.

Additionally, two students presented with problems with completing the physical assessment and one of those had trouble with organization and agreed to further practice and feedback with reevaluation. Both were ultimately successful upon reevaluation. The fifty-five students were asked to provide feedback via an online survey containing three statements with a 5-point Likert scale ranging from *strongly agree* to *strongly disagree.*

The questionnaire statements were, (1) "*Simulation allowed me to demonstrate my newly acquired skills"*, (2) "*Simulation experience allowed me to feel more confident about my clinical skills"*, and (3) "*Simulation helped me identify areas for future learning" (p*. 14). Results revealed that sixty-seven percent of the students either agreed or strongly agreed with the demonstration of skills statement. Forty-one percent of students agreed or strongly agreed with the statement that simulation allowed identification of learning needs, while confidence in clinical skills resulted in forty-one percent agreed or strongly agreed and an additional twenty-four percent neither agreed nor disagreed with that statement. Reinisch and Kwong (2014) concluded that high fidelity simulation provided a chance for students to remediate those skills that were identified as needing improvement, as well as permitting students to self-identify weak areas and offered an opportunity for those students to gain competency. Moreover, simulation, when offered as a remediation solution for poor performance, allowed additional practice through repetition which increased the students' self-confidence.

Although some areas such a clinical site substitution, teaching critical thinking, self-confidence, clinical judgment, psychomotor skills, communication have seen the use of simulation blossom, very little consistency has been seen among nursing programs using simulation technology. Consequently, some areas have an abundance of literature to support simulation in nursing education while other areas such as the use of simulation for clinical remediation has scant literature available to support the use of simulation as a remediation tool for nursing students. Therefore, further studies are needed to provide evidence of simulations effectiveness for remediating clinically at-risk nursing students.

Summary and Conclusions

During ancient times simulation was used to help teach students how to provide care to the ill and infirmed (Jones, et al., 2015; Palaganas et al., 2014). Modern day uses of simulation continue to expand as more research results reveal the positive benefits that students gain when engaging in simulation scenarios. Additionally, current teaching methodologies expound upon the value that active learning environments have on students' knowledge retention. Freeman et al., (2014) and Wolff, Wagner, Pozananski, Schiller, and Santen (2015) noted active learning increases student learning of difficult material, as well as having the potential to increase student engagement in learning to care of today's complicated patient healthcare needs.

Additionally, increases in nurse retirements related to the aging nursing population have left a void in healthcare. Nursing programs are looking for ways to increase student success and produce safe nursing graduates to fill those voids. Conversely, clinical sites are diminishing as patient safety concerns increase and competition for available slots continue to grow. Meanwhile, the old methods for students who are failing to meet clinical outcomes and pass NCLEX licensure exams are no longer sufficient as nursing graduation rates continue to fall below the expected level of achievement standards set by each nursing program.

Literature results related to the use of simulation technology has shown that simulation improves student's ability to critically think, clinically reason, clinical judgment, assessment skills, self-confidence/self-efficacy, therapeutic communication, cultural competency, and patient safety. While numerous studies have been conducted on

the general effects' simulation has on students, few studies have been performed on the effects of simulation, when used as a remediation tool, on those students found to be at-risk for poor clinical outcomes.

Benner's novice to expert (1982) and Kolb's experiential learning theory (1984) was used as a framework for this study to demonstrate how simulation can be used to transition novice nurses to advanced beginners through repetition of simulated patient experiences, guided reflection debriefings. Further, describing how those experiences can transform learning through partaking in a concrete experience (simulation), reflective observation, (thinking about the simulation experience), abstract conceptualization (clinical reasoning and understanding), and active experimentation (application of new knowledge to a new experience).

This study addresses a gap in knowledge related to the use of simulation-based technology to remediate nursing students who struggle in the clinical environment. The study may expand knowledge in the discipline of educational technology by using current and future technology to enhance student success in nursing education. Results of this study adds to the body of knowledge of how the use of simulation-based technology can be used to remediate clinically at-risk nursing students and lead to positive social change by increasing student success. The study also adds additional research findings to the limited number of studies available related to the use of simulation-based technology for remediating students who struggle with clinical competency.

Chapter 3: Research Method

The purpose of this study was to examine whether there was a significant difference in the CDEF scores of nursing students at the college who failed their initial evaluation and were reevaluated following the completion of the remediation session with simulation-based technology using the same CDEF. The CDEF consists of individualized sheets for each skill that contain a list of questions that are thought to be critical to master with each skill. The questions are further categorized into patient assessment, clinical reasoning, communication skills, and patient safety to allow the faculty to visually compare initial and postremediation scores if they wish to note specific areas of gain in knowledge. The evaluation tool questions are scored pass or fail depending upon whether the students met the requirements of the question.

Research studies addressing the use of simulation-based technology as a teaching pedagogy have increased because of the rapid advances in technology and the positive reports of simulations transformational properties reported in the literature (Dean, Williams, & Balnaves, 2017; Kelly, Forber, Conlon, Roche, & Stasa, 2013; Kimhi et al., 2016; Merriman, Stayt, & Ricketts, 2014; Shin et al., 2015b; Sittner et al., 2015). Additionally, nursing education has experienced encouraging results related to the use of simulation to improve student satisfaction, build confidence, decrease anxiety, and improve critical thinking, knowledge acquisition, clinical reasoning, and clinical judgment. Harmon and Thompson (2015) and Powers (2014) suggested that simulation could increase clinical reasoning as well as provide a useful method to evaluation skills, clinical judgment, and the critical thinking skills of nursing students. Multiple studies

have noted that simulation produced positive results and has aided students in developing skills such as assessment, communication, clinical reasoning/clinical judgment, critical thinking, and decreased anxiety (Kim & Kim, 2015; Lambie, Schwend, & Scholl, 2015; Oh, Jeon, & Koh, 2015; Palmer & Ham, 2017; Shin et al., 2015b; Stroup, 2014; Weatherspoon, Phillips, & Wyatt, 2015). Further studies have noted simulation to increase the psychomotor development of novice nursing students (Anderson & Nelson, 2014; Khalaila, 2014; Radhakrishnan, et al., 2013, Scholtz et al., 2013). Some examples include assessment skills requiring hands-on patient interaction, critical thinking, and communication skills.

Although many studies have expounded on the benefits of simulation to improve students' cognitive, psychomotor, and communication skills, there is little evidence in the literature available to determine if simulation is an effective remediation tool for nursing students who have difficulties with meeting the clinical outcomes needed to perform safely in the clinical setting. Supporting this assertion, Bean (2015), Camp and Legge (2018), Custer (2016), and Williamson et al. (2017) determined that there is a lack of research to support academic and clinical remediation practices in healthcare education. Agreeing with this assertion, Breymier (2012), McCaughey and Traynor (2010), Ryall et al. (2016), and Ward-Smith (2008) suggested that simulation as a remediation tool allows students to acquire skills but acknowledged that there is a gap as well as a lack of literature supporting its use as an instrument for reinforcing clinical skill acquisition.

in the following sections, I describe the setting and demographics for the sample population in the research study and specify the population investigated as well as the

ADN program admission criteria. The research design is explained as well as a description of why this design was the most appropriate for this study. Examples of the selected research design are discussed, and a rationale is provided as to why this design was appropriate to answer the research question. Additionally, I present the variables of the study as well as the program specific descriptions of the independent and dependent variables. An explanation of why these variables are relevant and pertinent to both the nursing and technology fields is offered. A description of the procedure that the college nursing faculty use to evaluate student competency as well as the process in place to remediate those students who fail to meet the clinical competencies is presented.

Research Design and Rationale

In this study, I examined if remediation with simulation-based technology can increase the clinical outcome scores of nursing students who initially fail to demonstrate to clinical competence. The independent variable was identified as simulation remediation, and the dependent variable was the initial and postremediation CDEF scores. The research question, the null hypotheses, and the alternative hypotheses are as follows:

RQ- What is the difference in the initial competency demonstration evaluation scores of Associate Degree Nursing students compared to the reevaluation scores after remediation with simulation-based technology?

H_0- There is no statistically significant difference in the initial competency demonstration evaluation scores compared to the re-evaluation scores after remediation with simulation-based technology. H_0: $\mu pre = \mu post$

H_a: There is a statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology. H_a: $\mu pre \neq \mu post$

A quantitative approach was used because a quantitative research design allows the researcher to explain relationships and examine causation, associations, and correlations between variables (see Leavy, 2017). Although I did not attempt to examine causation, the quantitative research approach provided the best method to address the research questions I sought to examine: What is the difference in the initial competency demonstration evaluation scores of ADN students compared to the reevaluation scores after remediation with simulation-based technology? Leavy (2017) suggested that the research method chosen should be the best instrument to obtain the data needed to answer a posttest research question.

A quasi-experimental single group pretest-posttest design based on archived materials was chosen because the archival data that were used to address the research questions were composed of a convenience sample of nonrandomized nursing students. The selected population was nursing students whom nursing faculty had documented as having failed to demonstrate clinical competency using the CDEF and subsequently underwent remediation with simulation-based technology before reevaluation with the same form. According to Quasi-Experimental and Single-Case Experimental Designs (2019), this research design is consistent with single group design study approach when a study does not have a comparison group, but instead, the design measures the same

group's dependent variables with a pretest, and then after the treatment, a posttest is given for score comparison.

Quasi-experimental design studies are often used in educational research, management research, and healthcare research where researchers have easy access to the target population (Leavy, 2017). Quasi-experimental designs are selected when an experimental design is not feasible or when it is impossible to randomize groups and are commonly used in education and healthcare research. Carman, Clark, Wolf, and Moon (2015) noted that in nursing education research, a convenience sample is frequently used because of the availability of study participants who have the characteristics needed for a research study.

Lockeman et al. (2017) wanted to examine the perceptions of interprofessional education and how provider stereotypes have changed among nursing and medical students after participating in an interprofessional simulation-based experience. Similar to my study that looks at pre and postremediation scores, the researchers used a quasi-experimental pretest-posttest design with 147 senior nursing students and 163 fourth-year medical students to determine if there was a difference in the pretest-posttest scores of the students who were pretested before participating in three 2-hour simulations focusing on the interdisciplinary collaboration between the students caring for an acutely ill patient (Lockeman et al., 2017). Following the third simulation, the interdisciplinary student teams were posttested (Lockeman et al., 2017). As noted with my study, results revealed an overall increase in scores after participating in the interdisciplinary experience (Lockeman et al., 2017).

Likewise, Toubasi, Alosta, Darawad, and Demeh (2015) conducted a prospective quasi-experimental single group pretest-posttest study to discover if basic life support simulation (BLS) training would improve the skills of Jordanian nurses when performing cardiopulmonary resuscitation. The researchers used a 9-item checklist to pretest the students before the BLS simulation scenario, debriefed the students, then conducted an unscheduled posttest using the same 9-item checklist 4 weeks later (Toubasi et al., 2015). The pretest score results were $M = 4.6$, $SD = 2.9$, range = 0 to 9, and the posttest results were $M = 7.5$, $SD = 1.7$, range = 4 to 9, indicating an overall improvement in skills after the simulation training program with $p < 0.0001$ (Toubasi et al., 2015). The researchers concluded that BLS simulation training was associated with significant improvement of skills and performance (Toubasi et al., 2015).

Shin, Ma, Park, Sun Ji, and Kim (2015a) conducted a multisite quasi-experimental pretest-posttest design consisting of a convenience sample of 237 nursing students at three universities to determine if high fidelity simulation had an impact on nursing students' critical thinking skills in pediatrics. Site 1 students had one simulation experience, Site 2 had two simulation experiences, and Site 3 had three simulation experiences (Shin et al., 2015a). Data were collected using the Yoon's (2008) critical thinking disposition tool to measure critical thinking. The results revealed that one simulation did not improve critical thinking; multiple exposures to simulation resulted in a significant increase in the nursing students critical thinking skills (Shin et al., 2015a).

Using a factor analysis to test the preidentified constructs can add validity to a research study (Yu, 2018). The use of a confirmatory factor analysis to test constructs in

future nursing research studies may provide an additional means to test instrument validity, thus strengthening research findings.

Methodology

Population

The population of this study consisted of a convenience sample of one group of ADN students at a small community college located in the South-Central United States encompassing the college calendar years of 2012 to 2017. Data consisted of first-year nursing students who completed an initial competency evaluation and subsequently failed and were reevaluated after remediation with simulation-based technology. The population was limited to those students who met the criteria as outlined in the nursing program's syllabus for first-time reevaluation. Students failing to follow the prescribed remediation plan and neglecting to meet remediation deadlines (three students) were deemed automatic third attempts and were excluded from this study. Additionally, those who failed to show up for the prescribed remediation plan and eventually dropped from the program were excluded from this study because no second attempt was made.

Sampling and Sampling Procedures

The posttest convenience sample consisted of previously unanalyzed archival data on file at the college comprised of 149 ADN students who had participated in a nursing faculty administered clinical competency assessments using the nursing program's Clinical Competency Evaluation form. Lavrakas (2011) described a convenience sample is one in which the people that are sampled are chosen because of their convenience as a data source for the researcher. Convenience samples are commonly used in an

educational setting because of the availability of participants who have the characteristics that may answer the research questions. A convenience sample is considered a nonprobability sample which consists of selecting participants that are readily available (Frankfort-Nachmias, C., Nachmias, D., & DeWaard, J., 2015). The participants identified in the archival data were used in this study because the archival data could be used to answer the research question, and the Dean of Nursing agreed to make the archival data available for the study, therefore, meeting the criteria of a convenience sample.

The sample size consisted of all available archived data ranging from Fall of 2012 to Fall of 2017 except for those falling in the exclusion categories. Inclusion criteria include those students who have failed one or more questions on the CDEF and were assigned to complete remediation activities using simulation-based technology to gain mastery in the deficient area(s). Following remediation, the student was required to participate in a second competency evaluation using the same CDEF. The remediation activities entailed participating in experiences using simulation-based technology designed to focus on the deficient area(s). The student must then have been reevaluated using the same CDEF within two weeks of initial failure. The procedure for students who fail competencies and require remediation is described below.

For those nursing students who failed one or more of the clinical competency evaluations, the remediation plan stated the student must contact the Simulation Coordinator within 48-hours of competency failure and complete a set number of remediation activities that included using various simulation-based technology ranging

from high fidelity simulation technology to simulation task trainers. Activities were assigned by the Simulation Lab Coordinator and were intended to aid nursing students in achieving competency on the second skill demonstration. The process developed by Lock (2012) for students who have failed a competency are outlined below:

- Students who fail are required to contact the Simulation Coordinator for a time to begin remediation within 48 hours of failure to pass.
- The remediation process will include a procedure review then remediation with a paid lab tutor or the lab coordinator using the appropriate simulation technology.
- This process could include all or some of the following, simulator task trainers, low-fidelity mannequins, medium fidelity mannequins or volunteer human patient simulators.
- The typical remediation session consists of between 1.5-3 hours of remediation.
- Following remediation, the student will make an appointment with the Simulation Coordinator or an NPU faculty member for a repeat competency check-off.
- Students are allowed a maximum of two repeats with remediation required with each failure.
- The students are allowed a maximum of two weeks to complete remediation and participate in reevaluation (Lock, 2012).

Students, who failed to follow directions and schedule remediation time within the allotted 48-hour time frame were designated automatic second attempt fail and will, therefore, was excluded from this study. Incidental comments or suggests made by the faculty evaluators will also be included as appropriate for understanding a student's

failure. Additionally, students who are unwilling to meeting the time frame stipulations or exhibited unprofessional behavior were excluded from this study. The college destroyed the records prior to 2012.

Adamson and Prion (2013) stated that conducting a power analysis before collecting data can assist the researcher in determining the needed sample size. To determine if the sample size was sufficient for statistical significance, a G*Power 3.1.9.2 analysis, Faul, Erdfelder, and Buchner (2007), was completed set at *A priori: Compute required sample size=given α, power, and effect size*, and a *Wilcoxon signed-rank test* with the setting of *(matched pair).* A sample size of 57 was indicated to show power at a .95 at an alpha level of .05%. The available sample size for this study was 149 students; therefore, the sample size was above the threshold to obtain statistical significance

Archival Data

The archival data consisted of Fall 2012 to Fall 2017 initial failed competency evaluation forms and first-attempt post-simulation-based technology remediation competency evaluations forms. A process with policies and guidelines was established by the nursing program at the college to ensure that each student going to the clinical setting have the fundamental skills needed to provide entry-level patient care with supervision. Students are expected to master certain skills that allow them to safely carry outpatient care in the clinical setting, as well as demonstrate the ability to use available technology to achieve those clinical/program outcomes. The skill categories comprise a list of the essential components that faculty deems necessary for the students to master before they perform them in the clinical setting. Although the skills found on the CDEF forms are

broken down into 8 to 24 questions within each skill category, these questions fall into the following broad categories:

- Assessment- gives the student information about their patient's overall health status or any changes that have occurred.
- Clinical reasoning/judgment- requires students to assess a patient situation and perform appropriate interventions.
- Communication- a critical component for eliciting and imparting valuable information to the patient.
- Patient safety- includes competence in psychomotor skills and actions that would ensure the patient's overall well-being.

Each semester students received lecture content and practice time related to the skills they were expected to demonstrate. Subsequently, competencies demonstrations were then scheduled by the RN faculty to allow students to prove skill mastery. The skills demonstrated during the first semester are vital signs, physical assessment, and position and transfer, then approximately two months later the students will demonstrate a second set of competencies which is medication by mouth, parental and other route medication, injections, and nasogastric tube insertion and care. The same process was repeated during the second-semester rotation with the students demonstrating IV medication administration, peripheral and central venous line blood draw, central line dressing changes, and Foley catheter insertion and removal.

The competency forms are designed to assist students in learning the steps needed to successfully demonstrate the skill while providing faculty with a consistent method to

evaluate a student's competency. Each individualized CDEF was used to evaluate the competency, and the same form was used with students who failed to demonstrate skills competency on one or more of the questions categorized under patient assessment, clinical reasoning/judgment, communication, and patient safety. Students who failed in one or more areas then were directed to remediate and undergo subsequent reevaluation.

The data were collected from archived individual Clinical Competency Evaluation forms (see Appendix A) consisting of the competency skills listed below:

- physical assessment,
- vital signs,
- position and transfer,
- meds by mouth and meds by other routes (eye, ear, rectal, topical, inhalation, patches),
- parental meds (Intramuscular (IM), Subcutaneous (SQ), Intradermal (ID),
- nasogastric tube insertion and removal,
- intravenous catheter (IV),
- intravenous piggyback (IVPB) and Intravenous Push (IVP),
- foley catheter insertion and removal, and

  central venous line dressing change

Each form has a list of pass/fail questions that have been assigned to one of the following categories: (a) patient assessment, (b) clinical reasoning/judgment, (c) communication, and (d) patient safety. Students must pass these competencies before being allowed to perform the skill in the clinical setting.

Students who do not meet clinical objectives or demonstrate competency often require an intervention to assist them in meeting program expectations. Bearman, Molloy, Ajjawi, and Keating (2013) suggested educators used strategies such as preventing errors, early recognition, and remediation, skills practice, timely feedback and seeking help from another faculty as intervention strategies to help struggling students.

A formal written request for access to the archival data of 149 nursing student initial (CDEF) and after remediation with simulation technology (CDEF), was submitted to the Dean of Nursing. Once access was granted, student data were de-identified, and a number was assigned for individual record identification and data analysis. Records containing student names were placed on an encrypted password-protected flash-drive in a locked secure location.

Instrumentation and Operationalization of Constructs

The data that were used were previously collected by the college's nursing program and are therefore considered archival data. The data collection instrument was a Competency Demonstration Evaluation Form created by nursing faculty who have at a minimum of a master's degree in Nursing and provide clinical oversite of students, therefore, are considered by the college to be subject matter experts.

The CDEF has been in use greater than ten years at the college and has been found by the nursing faculty to measure the skills it was designed to measure accurately. The nursing program averages approximately 65 students per year admission rate. Each student must be evaluated on each of the ten skill which equals approximately 650 students over the last 10-years having undergone evaluation with the program's ten

CDEF's. Sullivan (2011) stated that the validity of a specified instrument measures the accuracy of that instrument. The CDEF validity has been established because greater than 90% of students have passed competencies and were able to perform that same skill set on live patients with the same or similar results. Additionally, the students have sustained the ability to perform the evaluated skills at the novice stage in a safe manner at the clinical site following successful completion of evaluation with the instrument.

Reliability is the consistency of an instrument in giving the same results every time it is used (Sullivan, 2011). The reliability has been established through the CDEF's continual use in the ADN program for more than ten years to evaluate a specific set of skills via competency evaluations and the replication of those skill in the clinical environment (hospitals, clinics, and nursing homes). Additionally, support for the use of the CDEF's was evidenced by the college's ADN students having met the national average of RN licensure pass rates of 84% over the past five (5) years confirming the nursing students to continue to demonstrate clinical competency via comprehensive testing of knowledge.

The study's independent variable was remediation with simulation-based technology. The dependent variables were the initial and postremediation with simulation technology CDEF scores. The data collection instrument (CDEF) was a nursing faculty designed competency evaluation form that consists of a varied number of questions depending upon the skill being assessed and that is scored pass or fail. Each question within the instrument was assigned to one of the following clinical outcome categories, patient assessment, clinical judgment/clinical reasoning, communication, and patient

safety. The skills that comprised the data set are, vital signs, physical assessment, and position and transfer, medication by mouth, parental and other route medication, injections, nasogastric tube insertion and care, IV medication administration, peripheral and central venous line blood draw, central line dressing changes, and Foley catheter insertion and removal.

The nursing program requires that students must pass the above competencies before being allowed to perform the skill in the clinical setting. Remediation with simulation-based technology (the intervention) begins when a student fails one or more of the competencies. Each skill specific Clinical Competency Evaluation Demonstration form (the instrument) is used for initial and any reevaluation that should become necessary if a student fails one or more competency evaluations.

Data Analysis Plan

In this study, Statistical Package for Social Sciences (SPSS) software was used to analyze the archival data. A secured record of the previously de-identified data and the new identification code was saved on an encrypted flash drive with access limited to the researcher. Before analysis began, the individual competency evaluation form data were transferred to a spreadsheet that included the individual competency questions, specific to the skill that was evaluated. Each CDEF question was numbered and then allocated a category coded as follows (A) for assessment, (CR) clinical reasoning/clinical judgment, (C) for communication, and (PS) for patient safety. The creation of the selected categories was consistent with the program outcomes and discipline expectations and may illuminate areas for quality improvement. According to faculty at the college, the

CDEF was developed to capture the skills and abilities of novice nursing students before skill performance on actual patients. Sullivan (2011) stated that validity indicates how well an assessment tool measures the "outcome of interest" (para. 2). Two external doctoral prepared registered nurse educators were recruited to review and provide feedback to increase the validity of the study regarding the correct placement of each question in one of the four designated categories. Any disagreements between the external nurse educators and current faculty related to question categorization were further discussed until consensus was reached.

The independent variable was remediation with simulation-based technology, and the dependent variable was the initial and postremediation scores. This study examined the initial and postremediation competency evaluation scores to determine if there was a significant difference in postremediation scores when compared to initial scores.

In this study, the research sought to answer the following research questions:

RQ: What is the difference in the initial competency demonstration evaluation scores of ADN students compared to the reevaluation scores after remediation with simulation-based technology?

H_0: There is no statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology. H_0: μpre = μpost

H_a: There is a statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology. H_a: μpre ≠ μpost

Following the data entry and categorical coding into the spreadsheet, the SPSS was used to run a Wilcoxon signed-rank to compare the median difference of the pre-remediation scores to the postremediation scores to determine if there is a significant difference in the pre-simulation remediation scores and the postremediation scores. A confirmatory factor analysis was also performed to determine if the individual questions fall within their assigned constructs. A confirmatory factor analysis uses various statistical techniques to simplify complex data sets (Kline, 1994). Once the factor analysis was completed the Wilcoxon signed-rank test was used to compare the median difference of the scores of any constructs identified by the factor analysis.

The Wilcoxon ranked-signed test was appropriate for this study because the data were determined to be non-normally distributed therefore ruling out the paired t-Test. The Wilcoxon signed-ranks test can be used when the t-test assumptions are not met (Hinton, McMurray, & Brownlow, 2014). The data were collected from the same group at two points in time, before simulation-based remediation and after simulation-based remediation. The Wilcoxon signed-ranks test will show if there was a significant difference between the medium difference in scores from the initial evaluated group and the same group that participated in a remediation plan using simulation based-technology. A confirmatory factor analysis was performed to determine if the questions of each construct measured what they were intended to measure. An additional Wilcoxon was conducted on the median difference of the initial and postremediation scores of the constructs identified by the factor analysis and provided a more focused comparison of the pre-score-post-scores.

Threats to Validity

The purpose of this study was to examine if there was a significant difference in the competency demonstration scores by comparing initial competency scores with post remediation with simulation-based technology scores. A threat to external validity was acknowledged because the archival data that were available consisted of a convenience sample and lacked randomization. A threat to internal validity was identified related to the use of archival data that lacked a control group. Leavy (2017) describe internal validity as recognition of variables that could support an alternative explanation for the outcomes related to the dependent variable. Threats to internal validity were minimized because the students were expected to remediate and retest within two weeks. A threat exists related to construct validity because the instrument used by faculty to evaluate students has not been formally validated. This threat must be considered, but mitigating factors included the creation of the instrument by master's prepared nursing faculty which can be noted to represent content validity. Salkind (2010) noted that judgement by subject matter experts is a standardized method for assessing content validity. Additionally, the instrument has been in continuous use in the program for greater than ten years with students demonstrating consistent performance in the clinical setting after having undergone a successful evaluation. A confirmatory factor analysis was used to increase the instrument's validity by determining if the questions grouped together to measure the constructs.

An additional threat is one of conclusion validity. A G*Power analysis was conducted at the 0.95 level to decrease the chance of conclusion validity which results in

a 95 out of a 100 chance of concluding there was a relationship when one is there. The data sample size was also greater than the value given for statistical significance. Instrument reliability although not formally established, has a history of performing consistently for a minimum of 10 years.

Ethical Procedures

Upholding the confidence of the students who are the contributors of the archival data is of critical importance. The IRB Guidance for Archival Researchers was used as a guide for the use of archival data and IRB permission was obtained, IRB # 01-30-19-0628313. Permission from the dean of nursing was obtained verbally and in writing using the Walden Data Use Agreement and Confidentially Agreement. The forms were signed by both the researcher and the Dean of Nursing. Student information was coded and identifying information was replaced with a numerical identification code. All archival data were stored on an encrypted-password protected flash drive which was locked in a drawer in the researcher office.

Summary

To summarize, the purpose of this study was to examine whether there was a significant difference in the clinical competency demonstration scores of nursing students at the college who have failed the initial clinical competency evaluation and were re-examined with the same form following the completion of the remediation session with simulation-based technology. The study examined the effect that remediation with simulation-based technology has on the scores of nursing students who fail to demonstrate clinical competence in the skills/knowledge that the college faculty has

deemed essential for safe, competent patient care. A quasi-experimental single group pre-test-post-test design using archived data consisting of a nonrandomized sample of approximately 149 nursing students was used to address the research questions. The data consisted of a convenience sample of 149 nursing students that participated in their first skill competency demonstration evaluation using the CEDF but failed to achieve skills mastery and was remediated with simulation-based technology and were reevaluated using the same form. The data were coded using an excel spreadsheet, and SPSS was used to run a Wilcoxon signed-rank test to examine if there was a statistically significant difference in the pre-and post-test scores. In Chapter Four the data collection methods will be described along with specifics of the data analysis and the statistical analysis findings will be described in detail.

Chapter 4: Reflections and Conclusions

The purpose of this quantitative one group pretest-posttest study was to examine if there was a significant difference in the clinical competency evaluation pretest-posttest scores of students undergoing remediation with simulation-based technology after having failed their initial competency evaluation. The research question, null, and alternate hypothesis guiding this study are as follows:

RQ: What is the difference in the initial competency demonstration evaluation scores of ADN students compared to the reevaluation scores after remediation with simulation-based technology?

H_0: There is no statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology. H_0: μpre = μpost

H_a: There is a statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology. H_a: μpre ≠ μpost

The National Council of the State Boards of Nursing (2015) supports simulation as an adjunctive clinical site. Further, simulation has shown to be an effective teaching pedagogy to increase the critical thinking, communication, and patient safety ability of nursing students. This chapter includes a description of how the data were procured followed by an in-depth explanation of the source of the archival data that were used to answer the above research question. A detailed analysis of the data is provided to assist with the understanding and application of the results to future research studies related to

clinical remediation for underperformance in the healthcare setting. The results of the study are discussed in detail.

Data Collection

Approval to conduct this study was obtained from Walden's IRB and the dean of nursing at the college (see Appendix B). The National Institute of Health training, Protecting Human Research Participants was also completed (see Appendix C). The population examined was 149 nursing students who had undergone initial clinical competency evaluations, failed, and were then remediated using simulation-based technology and reevaluated. The archival data used in the study consisted of a convenience sample encompassing the years 2012 to 2017. Three students were excluded from the study because they failed to meet inclusion criteria. All identifying information was removed, and a unique number was assigned to each subject. The data were then entered in an Excel spreadsheet in preparation for import into SPSS for analysis.

The archival data were derived from the following college procedure: Before being allowed to perform specific skills on live patients, all nursing students at the college are required to demonstrate skill, critical thinking, and patient safety acumen. Students demonstrate this ability by undergoing an evaluation of a select number of critical skills (see Appendix A). Critical thinking challenges as well as patient safety are an integral part of the skill evaluation conducted by nursing faculty. Those students who pass their skill competency can begin performing those skills in the clinical environment. Those students who fail one or more competency evaluation of those skills identified above are required to undergo a remediation process which uses simulation-based

technology to promote skill competency. Following remediation completion, students are subsequently reevaluated using the same competency evaluation form.

The sample encompassed 5 years (2012-2017) of previously unanalyzed archival data collected by the nursing program and was a fair representation of the nursing student body. The student's ages ranged from 17 to 60 years (see Figure 4 for the posttest student age breakdown). The overall community college's population in 2016 was 78% White and 11% African American (National Center for Education Statistics, 2016). The posttest population racial mix was similar to the college population (see Figure 5 for the racial mix for the data set). The data set gender composition was somewhat skewed toward females: 80.5% female compared to 61% in the overall student population at the college (see Figure 6).

A nonprobability archived convenience sample was chosen because of the availability of the data to answer the research question and because the critical nature of the evaluations required that all nursing students be offered the same remediation opportunities because of patient safety issues. Consequently, the results of this study are not generalizable to other nursing students within the United States.

Data Analysis

A one group pretest-posttest quasi-experimental design was used to analyze archival initial and postremediation competency evaluation scores to answer the research question: What is the difference in the initial competency demonstration evaluation scores of ADN students compared to the reevaluation scores after remediation with simulation-based technology? The independent variable was remediation with

simulation-based technology, and the dependent variables were the initial and postremediation clinical evaluation scores. To determine whether the sample size was sufficient for statistical significance, a G*Power 3.1.9.2 analysis was completed set at *A priori:* Compute required sample size = given α, power, and effect size (Faul, Erdfelder, & Buchner, 2007), and a Wilcoxon signed-rank test with the setting of matched pair. A sample size of 57 was indicated to show power at a .95 for an alpha level of .05%. The available sample size for this study was 149 students; therefore, the sample size was above the threshold to obtain statistical significance.

The age range of the posttest population was noted greater than 50% to be 17 to 25 years of age (see Figure 4), and 80.5% of the students were female (see Figure 6). Six ethnic groups were included with 78.5% White, 5.4% African American, 6% Hispanic, 2.7% Asian/Pacific Islander, 6.7% Mixed heritage, and 0.7% identified as Native American (see Figure 5).

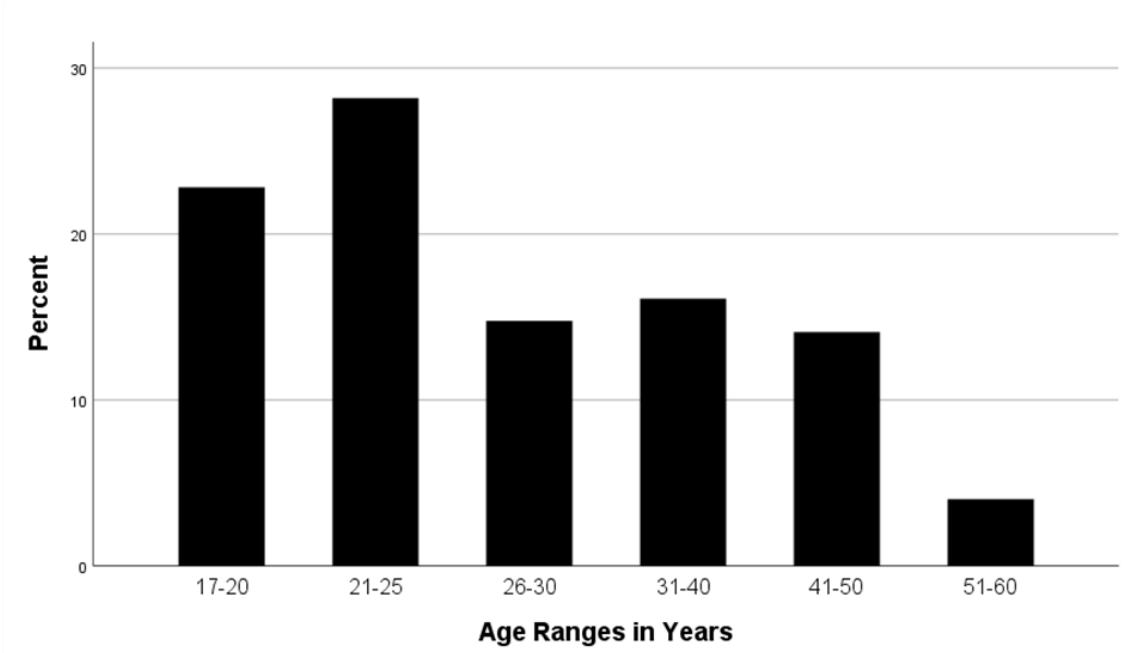

Figure 4. Population by age.

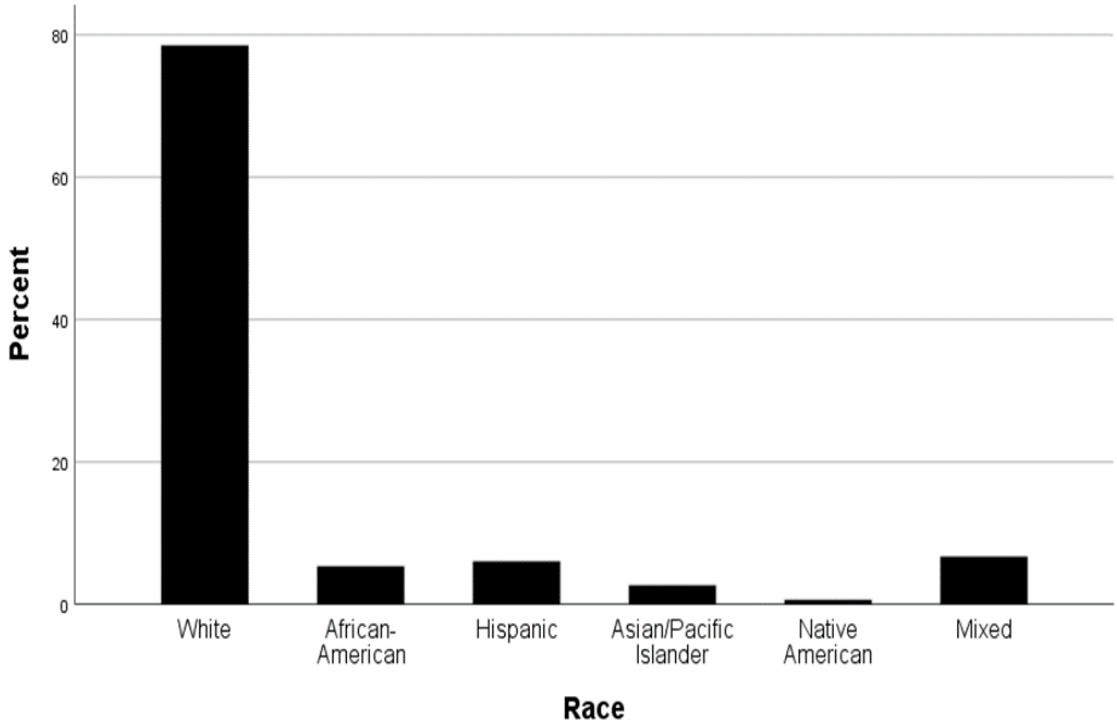

Figure 5. Population by race.

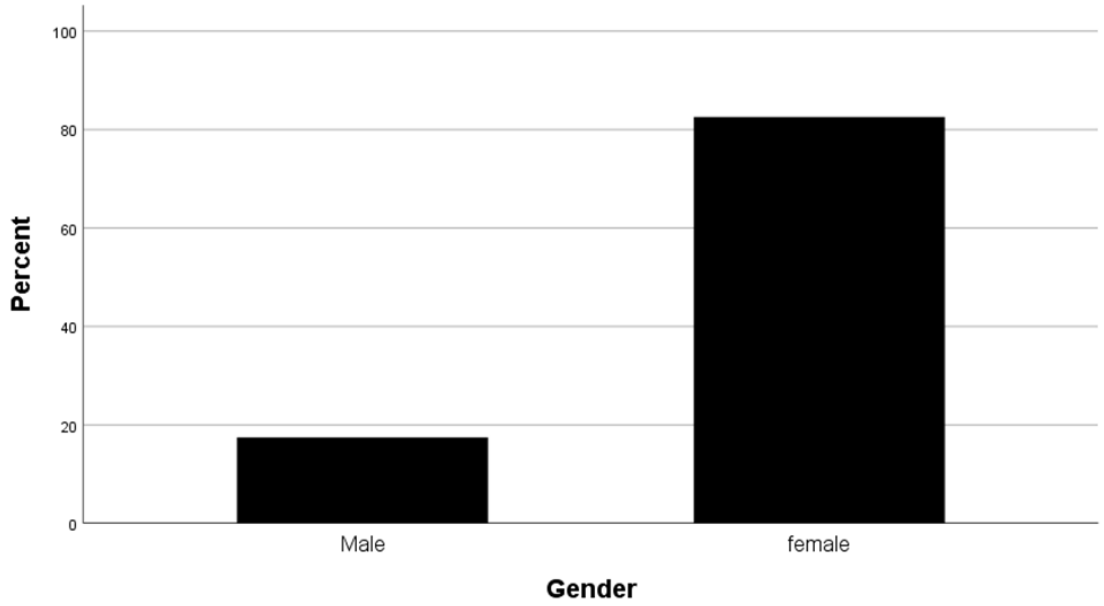

Figure 6. Population by gender.

Initially, a paired *t* test was selected, but because data assumptions were not met for this test, I determined that the Wilcoxon signed-rank test, the nonparametric counterpart of the paired *t* test, was appropriate. Assumptions for the Wilcoxon signed-rank test stated that the data do not have to be normally distributed but rather have approximate symmetrical distribution. Although the assumption requirement of the *t* test is not required with the Wilcoxon test, there are two noteworthy considerations: When the difference in scores are zero, the sample must be excluded, and if the sample size is very small, the difference between them may not be distinguishable (Hinton et al., 2014). Additionally, Hinton et al. (2018) stated that if the sample is large enough and all goes in the same direction, either positive or negative, then there is sufficient evidence that there is a difference between the groups.

Results

Data were entered into SPSS Version 25 to perform the Wilcoxon signed-rank test to compare paired samples. The descriptive statistics as noted in Table 1 indicated mean pretest score of 15.66 and mean posttest score of 21.536. The median pretest score was 18.00 and the posttest score was 21.00 with a median difference noted to be (-3). The Wilcoxon signed-rank test determines whether the median difference between the paired group is (0) zero (Hinton et al., 2014).

Table 1

Pretest-Posttest Means

	N	Mean	Std. Deviation	Minimum	Maximum
Posttest	149	21.5369	3.03476	18.00	32.00
Pretest	149	15.6644	6.35292	1.00	31.00

The Wilcoxon signed-rank test noted in Figure 7 shows there were $N = 149$ positive differences and $N = 0$ negative differences. The results indicated that all, $N = 149$, students showed positive differences or improvement in the posttest scores when compared to the initial (pretest) scores.

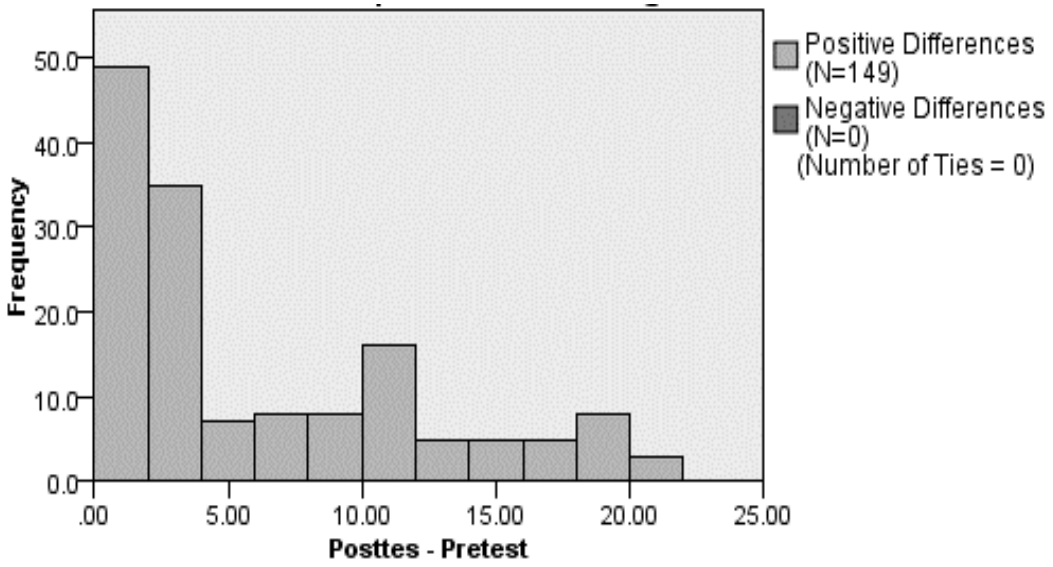

Figure 7. Wilcoxon positive and negative differences.

To break the results down further, Table 3 shows the number of positive ranks, the number of negative ranks, as well as the median rank of 75 and the sum of ranks equaling 11175. 00.

Table 2

Wilcoxon Signed Ranks

		N	Mean Rank	Sum of Ranks
Posttest – Pretest	Negative ranks	0[a]	.00	.00
	Positive ranks	149[b]	75.00	11175.00
	Ties	0[c]		
	Total	149		

Note. a. Posttest < Pretest

b. Posttest > Pretest

c. Posttest = Pretest

One hundred and forty-nine students' archival data were examined to determine if there was a statistical difference in the initial competency evaluation scores when compared to the remediation with simulation-based technology post competency evaluation scores. The post remediation competency evaluation scores showed a statistically significant median increase when compared to the initial competency evaluation scores with z= -10.64, p=<.05 (see Table 4). Thus, accepting Ha1- the alternative hypothesis that there is a statistically significant difference in the reevaluation scores after remediation with simulation-based technology and rejecting Ho1- the null hypothesis that states there is no statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology.

Table 3

Wilcoxon Signed-Rank Pretest-Posttest Hypothesis

Null hypothesis	Test	Sig.	Decision
The median of differences between Pretest and Posttest equals 0.	Related-Samples Wilcoxon Signed Rank Test	0.00	Reject the null hypothesis

Table 4

Wilcoxon Z-Score

Posttest -Pretest	Score/Significance
Z	-10.641[b]
Asymp. Sig. (2-tailed)	.000

Note. a Wilcoxon Signed Ranks Test
b Based on negative ranks.

Additionally, in consultation with a research analyst, a confirmatory factor analysis was performed to determine how a selection of questions under each skill (construct) loaded or hung together. Yu (2018) noted that one of the primary purposes of a confirmatory factor analysis was to examine relationships between constructs and variables which can then be used to test an instruments construct validity. The advantages of running a confirmatory factor analysis were to determine whether the questions under each construct measured the specific skill they were designed to measure.

Factor analysis supports construct validation by establishing that a selection of constructs load to a factor as expected (Brown, 2015).

Data for the confirmatory factor analysis consisted of archival data from 149 students who had failed to demonstrate competency as outlined by each question under the umbrella of the specific skill (construct) being evaluated by faculty. Preparation for the confirmatory factor analysis included selecting a sample of questions that were thought to measure student knowledge for each of the ten constructs (vital signs, physical assessment, position & transfer, PO&OR Meds, parenteral meds, nasogastric tube, peripheral IV, CVL dressing change, IVP/IVPB, and Foley catheter).

Data were prepared for the confirmatory factor analysis by creating an excel spreadsheet and giving each question under each construct a sequential number from Q1-Q210. Because the individual questions for each skill (construct) were pass/fail, pass questions were assigned the number (1) and fail questions were assigned (0). Each student's unique de-identified ID was used and the outcome for the preselected questions, pass or fail, was entered into the spreadsheet for the skill or skills in which the student passed or failed to meet competency. A confirmatory factor analysis, with the assistance of a research analyst, was performed. A confirmatory factor analysis was chosen because it allows the researcher to determine if a relationship exists between the variables and the underlying construct.

Additionally, to provide a context for evaluating the results, note that the closer the factor loadings are to -1 or 1 the stronger the relationship is to the underlying construct.

The results of the confirmatory factor analysis were:

- Q1 to Q17 had a factor loading of -0.96 and loaded highest to the construct vital signs, which were the questions designed to measure competency in this category
- Q27 to Q50 had a factory loading of 0.97 to the construct physical assessment
- Q56 to Q59 had a factor loading of 0.97 to the construct position & transfer
- Q77 to Q89 had a factor loading of -0.97 to the construct PO meds & other routes

- Q95 to Q110 had a factor loading of <0.4 across all constructs; therefore, a relationship to one construct was not shown.
- Q117 to Q131 had a factor loading of 0.98 to the construct nasogastric tube
- Q136 to Q150 also had a factor loading of 0.98 to the construct peripheral IV
- Q155 to Q172 had a factor loading of 0.98 to the construct CVL dressing change
- Q177 to Q190 had a factor loading of 0.95 to the construct IVP/IVPB
- Q198 to Q210 had a factor loading of 0.97 to the construct Foley catheter

In all, the questions used to measure nine out of the ten constructs previously identified indicated that those questions were measuring the ability they were designed to evaluate. The exceptions, Q95-Q110, were excluded leaving nine constructs for a second analysis using the Wilcoxon signed-rank test. See Table 5 for the results and Figure 8 for a visual representation of the nine constructs and the questions showing a relationship.

Table 5

Factor Loading and Cronbach Alpha for Identified Constructs

Factors	Loadings
Vital signs	
Checked doctor's order	-0.96
Identified client. Check armband.	-0.96
Checked for allergies. Checked allergy band	-0.96
Measured, confirmed correct size of B/P cuff is being used	-0.96
Assessed pain level	-0.96
Demonstrates proper placement of thermometer	-0.96
Obtained pulse rate within 2 beats of instructor	-0.96
Obtained respiratory rate within 2 breaths of instructors	-0.96
Obtained blood pressure reading within + or – 4 mm/hg of instructor	-0.96
Bed in low position; side rails up; call light in reach; over the bed table in reach before leaving client	-0.96
Physical assessment	
Make appropriate assessments	0.97
Identified client. Check armband.	0.97
Checked for allergies to drug/solutions. Checked armband	0.97
Demonstrate assessing LOC; Demonstrate assessing orientation (Person, Place, Time)	0.97
Demonstrate assessing pupils (PERRLA)	0.97
Demonstrate assessing hair/scalp/ears/nose	0.97
Demonstrate assessing mouth: teeth; gums; moisture, tongue turgor	0.97
Demonstrate assessing all peripheral pulses and stating volume (strength of pulse)	0.97
Demonstrate auscultating the heart: valves and apical pulse	0.97
Demonstrate auscultating the lungs (anterior, posterior, lateral)	0.97
Demonstrate inspecting the abdomen (shape, symmetry, skin, use of accessory muscles)	0.97
Demonstrate muscle strength using the 5-point scale for upper and lower extremities	0.97
Position and transfer	
Selected appropriate equipment	0.97
Identified client (name, DOB, allergies). Check armband.	0.97
Demonstrate correct body mechanics when placing the client in correct position using supportive devices and bridging	0.97
Demonstrate correct body mechanics when placing the client in the Supine position	0.97
Demonstrate safety for client with repositioning and transferring (√ all locks)	0.97
Accurately states how to log roll a client	-0.97

(table continues)

Factors	Loadings
Medication administration (PO & Other Routes)	
Knowledge of drug (classification, dosage, rate of administration, side effects, expected outcomes	-0.97
Accurately calculated amount of medication to be given	-0.97
Demonstrated the use of the 10 Rights	-0.97
Demonstrated performing the three medication check	-0.97
Make appropriate assessments	-0.97
Demonstrate checking ID band and asking client to state name and birth date.	-0.97
Demonstrate assessing for allergies on armband and verbally asking client.	-0.97
Demonstrated administering medications (pills, eye drops, suppository, topical)	-0.97
Nasogastric tube	
Selected appropriate equipment (NG tube; lubricant; syringe; cup; water; tape; towel; emesis basin)	0.98
Identified client. Check armband.	0.98
Checked for allergies to drug/solutions. Checked armband.	0.98
Measured appropriate length for tube insertion and marked with tape	0.98
Demonstrate correct insertion technique	0.98
Demonstrate checking correct placement of tube	0.98
Demonstrate correct connection to wall suction	0.98
Demonstrate correct removal of NG tube	0.98
Peripheral IV start	
Selected appropriate equipment (Correct IV fluid and tubing, IV catheter, IV start kit)	0.98
Identify the client and check armband	0.98
Check for allergies	0.98
Allows for input related to site (is client right- or left-hand dominant?)	0.98
Demonstrates correct assessments	0.98
Properly uses tourniquet to identify possible site	0.98
Demonstrates proper technique in performing venipuncture	0.98
Connects IV tubing and secures site	0.98
Sets IV Pump mL/hr to deliver med appropriately	0.98
Central venous line dressing change	
Check for allergies	0.98
Position patient	0.98
Remove dressing from CAD insertion/exit site with clean gloves.	0.98
Disinfect catheter-skin junction using septic solution	0.98
Use friction, apply 2% tincture of chlorhexidine in a sweeping motion.	0.98
Apply transparent dressing over site, leaving the catheter hub and tubing	0.98
Label new dressing with date, time and nurse initials	0.98

(table continues)

Factors	Loadings
Intravenous piggyback and intravenous push	
Knowledge of medication	0.98
Accurately calculated drip rate or amount of medication to draw	0.98
Demonstrated use of the 7 rights	0.98
Performed the three medication checks	0.98
Identified client and checked for allergies	0.98
IVPB through infusing IV	0.98
IVPB through saline lock	0.98
IVP through infusing IV	0.98
IVP through saline lock	0.98
Correctly used saline flush for lock if indicated	0.98
Foley catheter insertion	
Introduce self	0.97
Identify client	0.97
Identify client	0.97
Position client while maintaining privacy	0.97
Sets up supplies without breaking sterile technique	0.97
Puts on sterile gloves	0.97
Connects syringe and checks balloon (optional)	0.97
Properly cleanses client	0.97
Demonstrates correct insertion technique	0.97
Demonstrates properly securing catheter	0.97
Leaves client clean and safe (Bed low, side rails up, call light in reach)	0.97

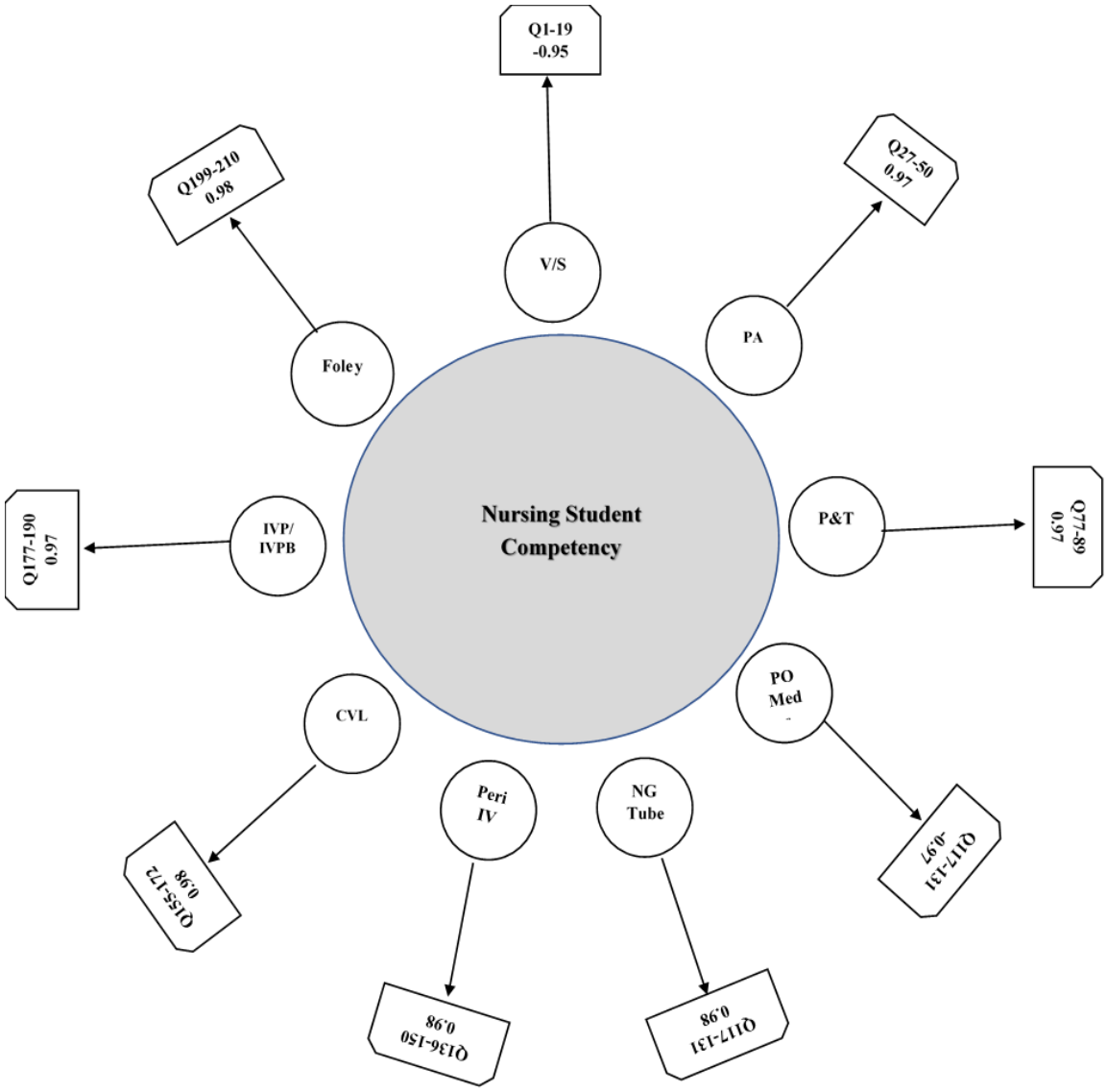

Figure 8. Factor loading for the nine constructs.

Following the factor analysis, a Wilcoxon signed-rank test was conducted using SPSS on items (questions) under each of the nine constructs identified by the factor analysis. The Wilcoxon signed- rank test takes the difference between the initial students' scores (pretest) and the postremediation scores (posttest) ranking the size of the difference lowest to highest (Hinton et al., 2014). For this sample, all the scores were positive with zero negative ranks noted. The rank results are displayed in Table 6.

Table 6

Wilcoxon Signed-Rank Test of Nine Constructs

		N	Mean Rank	Sum of Ranks
Vital signs	Negative ranks	0	.00	.00
Post-Test - PreTest	Positive ranks	18	9.50	171.00
	Ties	0		
	Total	18		
Physical assessment	Negative ranks	0	.00	.00
Post-Test - PreTest	Positive rank	10	5.50	55.00
	Ties	0		
	Total	10		
Position & Transfer	Negative ranks	0	.00	.00
Post-Test - PreTest	Positive ranks	9	5.00	45.00
	Ties	3		
	Total	12		
PO and other routes	Negative ranks	0[j]	.00	.00
PostTest - PreTest	Positive ranks	31	16.00	496.00
	Ties	4		
	Total	35		
NG tube	Negative ranks	0	.00	.00
PostTest - PreTest	Positive ranks	4	2.50	10.00
	Ties	0		
	Total	4		
Peripheral IV	Negative ranks	0	.00	.00
PostTest - PreTest	Positive ranks	4	2.50	10.00
	Ties	0		
	Total	4		
CVL dressing change	Negative ranks	0	.00	.00
PostTest - PreTest	Positive ranks	1	1.00	1.00
	Ties	0		
	Total	1		
IVP/IVPB	Negative ranks	0	.00	.00
PostTest - PreTest	Positive ranks	4	2.50	10.00
	Ties	0		
	Total	4		
Foley catheter	Negative ranks	0	.00	.00
PostTest - PreTest	Positive ranks	10	5.50	55.00
	Ties	0[aa]		
	Total	10		

A summary of the ranks was as follows:

- vitals signs had 18 positive ranks, zero negative ranks with a mean rank of 9.50.
- physical assessment had 10 positive ranks, zero negative ranks with a mean rank of 5.50
- position & transfer had three positive ranks with three ties with a mean rank of 5.00
- PO & other routes had 31 positive ranks with four ties with a mean rank of 16.00
- NG tube had four positive ranks with a mean rank of 2.50
- peripheral IV had four positive with a mean rank of 2.50
- CVL had one positive rank with a mean rank of 1.00
- IVP/IVPB had four positive ranks with a mean rank of 4.50
- Foley catheter had 10 positive ranks with a mean rank of 5.50

The overall results indicated statistical significance for five out of the eight constructs. Therefore, I can accept (H_a) the alternative hypothesis that there is a statistically significant difference in the reevaluation scores after remediation with simulation-based technology and reject (H_o) the null hypothesis that states there is no statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology for the following constructs were statistically significant:

- vital signs z= -3.943, N=18, p=<.05
- physical assessment z=-2.814, N=10, p=<.05
- position & transfer z=-2.724, N=9, p=<.05
- PO & other routes z=4.912, N=31, p=<.05
- Foley catheter z=-2.840, N=10, p=<.05

By looking at individual constructs in this manner, it was possible to identify the areas that showed a statistically significant difference between pre and post-test scores. The constructs NG tube z=-1.890, N=4, p=0.59, Peripheral IV z=1.890, N=4, p=0.66, and IVPB & IVP z=1.890, N=4, p=0.66 therefore, accepting (H_o) the null hypothesis that states there is no statistically significant difference in the initial and postremediation competency evaluation scores and rejecting (H_a) the alternative hypothesis that there is a statistically significant difference in the reevaluation scores after remediation with simulation-based technology because p= >.05 in these three instances. CVL had N=1, therefore was excluded (see Table 7).

Table 7

Wilcoxon Z-Scores and Significance

	V/S Posttest Pretest	PA Posttest Pre-Test	P & T Posttest Pretest	PO&OR Posttest Pretest	NG Tube Posttest Pretest	Perip IV Posttest Pretest	IVP/IVPB Posttest Pretest	FC Posttest Pretest
Z	-3.943	-2.814	-2.724	-4.912	-1.890	-1.841	-1.841	-2.840
Asymp. Sig. (2-tailed)	.000	.005	.006	.000	.059	.066	.066	.005

Summary

The research question is what is the difference in the initial competency demonstration evaluation scores of ADN students compared to the reevaluation scores after remediation with simulation-based technology? The null hypothesis (H_o) states there is no statistically significant difference in the initial and postremediation competency evaluation scores and the alternative hypothesis (H_a) states there is a statistically significant difference in the reevaluation scores after remediation with simulation-based technology. Initially, the Wilcoxon signed-rank test was used to analyze N=149 archived student initial and postremediation competency evaluation scores to examine if there was a statistically significant difference in the initial and postremediation scores. The results, $z= -10.64$, $p=<.05$, indicated that there was a statistically significant median increase when comparing the initial competency evaluation scores to the postremediation competency scores. Therefore, these findings allow the rejection of the null hypothesis that there is no statistically significant difference in the initial and postremediation competency evaluation scores and acceptance of the alternative hypothesis that there is a statistically significant difference in the reevaluation scores after remediation with simulation-based technology.

After the initial analysis, a confirmatory factor analysis was performed with the assistance of a research analyst to measure construct validity. The confirmatory factor analysis revealed that the questions of nine out of the ten constructs had factory loading ranging from -0.96 to 0.98 and loaded to the construct that they were designed to

measure. Note that the closer the factor loadings are to -1 or 1 the stronger the relationship is to the underlying contract. The tenth construct was eliminated from the second analysis due to a factor loading that loaded similarly to all constructs ranging from -0.24 to 0.35.

A second analysis, using the Wilcoxon signed-rank, was conducted on the individual nine constructs identified by the confirmatory factor analysis. The results indicated statistical significance for vital signs, physical assessment, position & transfer, and Foley catheter p=<.05, therefore, rejecting the null hypothesis of no statistical significance and accepting the alternative hypothesis of statistical significance. The constructs NG tube, peripheral IV, and IVP/IVPB all had p=>.05, therefore, accepting the null hypothesis of no statistical significance and rejecting the alternative hypothesis of statistical significance.

Chapter 5 will restate the purpose and nature of the study and summarize key findings. This chapter will also seek to interpret the findings by confirming, disconfirming, or extending the educational knowledge by comparing the findings to the peer-reviewed literature. The limitations, generalizability, validity, and reliability will also be discussed. Any recommendations and implications will be highlighted in this chapter, along with a “take away” message for future researchers.

Chapter 5: Discussion, Conclusions, and Recommendations

Students must formally show that they have acquired the skills and knowledge necessary to provide safe, competent nursing care before they can perform those skills on actual patients in the healthcare setting. The purpose of this quantitative quasi-experimental one-group pretest posttest was to examine whether there was a significant difference in the clinical competency demonstration scores of nursing students at the college who have failed the initial clinical competency evaluation and were reevaluated following the completion of the remediation session with simulation-based technology. In this study, I used a one-group pretest-posttest quasi-experimental design to address the research question:

RQ: What is the difference in the initial competency demonstration evaluation scores of ADN students compared to the reevaluation scores after remediation with simulation-based technology*?*

H_0: There is no statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology.

H_a: There is a statistically significant difference in the initial competency demonstration evaluation scores compared to the reevaluation scores after remediation with simulation-based technology.

According to the literature, there is an abundance of studies related to the benefits of using simulation to assist students in acquiring the skills needed to become safe, competent nurses. However, there is a lack of research related to simulation when used

specifically to remediate nursing students who experience problems with the clinical competency requirements in nursing education. Further research is needed to determine if remediation with simulation-based technology can provide an effective remediation option for nursing students at risk for clinical competency failure.

The overall results of the initial Wilcoxon signed-ranked test was shown to be statistically significant, $p = <.05$, indicating that there was an increase in postremediation scores when compared to initial remediation scores. The factor analysis identified nine out of the 10 constructs were measuring the skill they were intended to measure. The 10th construct, parenteral meds, loaded similarly across the 10 constructs and therefore was excluded from the second Wilcoxon signed-rank test. Results of the second Wilcoxon signed-rank test conducted on the nine constructs identified in the factor analysis showed that the scores to be statistically significant, $p = <.05$, for vital signs, physical assessment, position & transfer, PO & other routes, and Foley catheter while NG tube, peripheral IV, IVP, and IVPB failed to show statistical significance with $p = >.05$.

Interpretation of the Findings

Clinical competency evaluations are a necessary component of nursing education to assure a student's readiness to perform patient care in the healthcare environment safely. Components of the Clinical Competency Evaluation Forms from which the students' ability to perform safely in the clinical setting is assessed must include, but are not limited to, assessment ability, patient safety, knowledge acquisition, clinical judgment, critical thinking, communication, decision making, caring ability, and cultural competence. Some students find it difficult to master or apply these competencies in the

clinical setting. This study addressed a gap in the literature related to the use of simulation as a remediation tool for those students who struggle with clinical competency.

The first Wilcoxon signed-rank test addressed the research question: What is the difference in the initial competency demonstration evaluation scores of ADN students compared to the reevaluation scores after remediation with simulation-based technology? Findings indicated that there was a statistically significant difference in the postremediation competency demonstration evaluation scores when compared to the initial competency demonstration evaluation scores.

A confirmatory factor analysis was conducted to increase construct validity. The confirmatory factor analysis indicated that the Competency Demonstration Evaluation Form used to measure the student competencies of vital signs, physical assessment, position & transfer, PO meds & other routes, NG tube, peripheral IV, IVP, and IVPB, CVL dressing change, and Foley catheter were measuring the skills they were intended to measure with factor loadings of -0.96 to 0.98 on a scale of 1 to -1. The only exception was the parenteral medication skill, which showed a factor loading of -0.24 to 0.33. One possible explanation for this finding could be that only a selection of questions under each construct was used to complete the factor analysis and using a different set of questions or all the questions may have provided a different outcome. CVL was excluded because $N=1$. For transparency, this could be true for the other skill categories as well.

The second Wilcoxon signed-rank test that was conducted individually on the eight constructs named above indicated statistically significance, $p = <.05$, for vital signs,

physical assessment, position & transfer, PO & other routes, and Foley catheter while NG tube, peripheral IV, IVP, and IVPB, which failed to show statistical significance at $p = >.05$. Of note, the size of *N* was much smaller when conducting the Wilcoxon test on the individual constructs, $N = 1$ to $N = 31$, compared to the overall Wilcoxon test of $N = 149$, which may have impacted test results.

This study supports the previous findings of peer-reviewed literature that stated simulation was found to be a useful pedagogy to assist students in acquiring those key skills and abilities that are needed to become safe, competent nurses. Specifically, simulation has been found to increase student's decision making, satisfaction, self-confidence, patient safety, knowledge acquisition, clinical judgment, critical thinking, communication, assessment acumen, caring ability, and cultural competence and to decrease student anxiety (Basak et al., 2016; Foronda et al., 2013; Khalaila, 2014; Konieczny, 2016; Lynn & Twigg, 2011; Roberts et al., 2014). Simulation has also been noted as a useful teaching tool (Davis et al., 2014; Mariani et al., 2015; Skrable & Fitzsimons, 2014). In the few studies available, simulation has shown to have positive results when used as a remediation tool for students who perform poorly in the clinical setting (Bremner et al., 2006; Camp & Legge, 2018; Cascoe et al., 2017; Custer, 2018; Radhakrishnan et al., 2013; Reinisch & Kwong, 2014).

The findings of this study confirm previous studies, which have found simulation and the use of simulation-based technology to have a positive effect on student outcomes. The results of this study add to the limited research available related to the use of

simulation-based technology as a remediation tool. Additionally, the findings may compel future researchers to explore this under investigated use for simulation.

Benner's novice to expert model (1982) and Kolb's experiential learning theory (1984) provided an appropriate framework to describe how novice nursing students participated in a concrete experience, in this case, remediation with simulation-based technology. The students then reflected on that experience through dialog with faculty and a peer tutor, followed by abstract conceptualization where the student learns from the experience, and finally the active experimental phase where the student practices what they have learned and advances to Benner's next stage of development, which is advanced beginner. Benner (1982) stated that students whose skill level could be classified as marginally acceptable would be considered an advanced beginner. Though remediation with simulation-based technology, the student can repeat this cycle until she/he has mastered the skill or concept.

Faculty who have students in the clinical environment who struggle with clinical competency often do not have the time to devote the one-on-one attention that may be needed for the student to be successful. The results of this study indicate that remediation with simulation-based technology may provide a means for filling a void in evidenced-based remediation options. Those faculty looking for an additional means to remediate students may want to look at the way simulation is currently being used within their programs and expand those options by offering simulation-based remediation options in addition to or instead of the current practice(s).

The results of this study indicate that remediation with simulation-based technology may provide a means for students to pass skills competencies successfully. It may also prove beneficial to include simulation-based technology in the teaching of those skills, thus lessening the incidence of skills competency failures. For those students who perform poorly in the clinical setting, simulation and the use of simulation-based technology may allow the students to practice in a safe environment, thus lessening the students' anxiety while building confidence through repetition and practice.

Limitations of the Study

One limitation of this study is that an archival convenience sample with a pretest-posttest one-group design lacked a control group for comparison. The lack of randomized selection and a control group could have affected the internal validity of the study. Another limitation is that a student's exposure to the initial competency evaluation could have impacted the reevaluation score. It was acknowledged that unknown external factors during the 2 weeks between the initial and postremediation evaluation could have influenced the student's performance during the postremediation simulation evaluation. Another recognized limitation was that nursing students must pass their competency to remain in the nursing program; this knowledge could have affected the students' desire to succeed by motivating the student to study and practice more often outside the remediation with simulation requirement.

Additionally, having a different pre- and post-faculty evaluator could have affected student scoring in the areas of anxiety and individual expectations. Mitigating this possibility, nursing faculty meet before each competency to discuss specific criteria

and set guidelines to promote consistency among faculty evaluators and lessen evaluation differences. Additionally, to facilitate optimal student performance, a different faculty evaluator would be selected for initial and postevaluations. Because the lab coordinator is responsible for reevaluations, it is not always possible to achieve this goal.

Recommendations

There are few research studies available that specifically address remediation with simulation-based technology. The results of this study add to this small body of knowledge related to the use of simulation as a remediation option. Because clinical faculty are challenged with ways to help students who struggle in the clinical setting, time and safety concerns often impede their ability to remediate students in the clinical environment. Additionally, as the need for competent, safe nurses grows, so will the need for additional ways to teach and retain nursing students to fill the void that will be left by retiring nurses. For these reasons, more research needs to be directed to ways to retain students, not only in the academic setting but the clinical setting as well.

Further studies need to be conducted using simulation and simulation-based technology to remediate, and possibly improve students' performance in the clinical setting. Research studies that use a control group, perhaps using a different form of remediation are suggested to strengthen the validity of the study. For future studies, I also recommend using a competency evaluation tool that has proven validity and reliability. It was in these areas that this study could have been strengthened.

This study can have a positive impact on social change because remediation with simulation has the potential to increase the clinical competence of nursing students who

struggle in the clinical setting by creating safer, more competent nurses to provide patient care in the state and local communities. This study promotes positive social change at the local level by providing further research on additional ways to remediate nursing students who struggle clinically. Additional ways that this study can affect positive social change is by offering remediation strategies that can decrease the time that clinical instructors spend working with clinically at-risk nursing students. The study will benefit the local college and community because simulation-based remediation may assist the college's nursing graduates in becoming a more skilled, knowledgeable, and easily marketable workforce available for community employment. More skilled nursing graduates can assist in alleviating the national nursing shortage. Jung et al. (2017) reported that negative effects on healthcare continue to occur due to national and international nursing shortages. Ultimately, this study can positively impact social change in the nursing profession because if shown to be effective, it can suggest an additional means to remediate nursing students, which could result in a higher number of competent nursing students graduating from the college's nursing program. More nursing students who complete the nursing programs and pass their licensure exam, result in a greater number of nurses available to care for patients in hospitals, rural clinics, and underserved areas.

Implications

This study may add to the body of knowledge supporting the use of simulation for purposes other than a clinical substitute or clinical evaluation. It can also provide an additional resource for others wishing to conduct studies in the area of remediation with simulation-based technology for nursing education. This study can serve as a reminder

for those interested in nursing research that the uses for simulation have only just begun to be realized. It can also provide a steppingstone or motivation to explore other areas where simulation might improve student outcomes related to clinical education.

Conclusion

Nursing students struggle not only academically but in the clinical setting as well. There is a lack of remediation options for nursing students who fall in the latter category. Clinical faculty that accompany nursing students to the clinical setting often do not have the one-on-one time to devote to those students who struggle with the clinical component of nursing education. Remediation with simulation-based technology may be one way to address this problem. Postremediation scores were noted to be statistically significantly higher when compared to the initial remediation scores. The confirmatory factor analysis indicated high factor loadings to all (nine) constructs but one, Parental Meds. The second analysis conducted individually on the confirmatory factor analysis identified constructs indicated a statically significant difference in five of the eight constructs when comparing initial to postremediation scores. The combined use of Benner's Novice to Expert theory in conjunction with Kolb's ELT supported the framework for this study.

Further research is needed in the area of remediation options for nursing students, specifically related to the use of simulation and simulation-based technology. Positive social change can be supported by finding more ways to support students who struggle clinically. More nursing students who graduate and pass the licensure exam means more nurses to support local, state, and national healthcare needs.

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Appendix A: Clinical Competency Evaluation Forms

DIVISION OF NURSING
COMPETENCY DEMONSTRATION EVALUATION SHEET: VITAL SIGNS

YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **Vital Signs** and I am ready to demonstrate competency. I have practiced three times. _____ Student Signature

I have observed the above student correctly demonstrate this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Observer Signature)

Pass	Fail	Technique
		Checked doctor's order
		Wash hands
		Selected appropriate equipment
		Knowledge of drug (classification, dosage, rate of administration, side effects, expected outcomes)
		Provide for privacy
		Introduction of self
		Explained procedures in layman terms to include role expectation of client
		Make appropriate assessments
		Identified client. Check arm band
		Checked for allergies to drug/solutions. Checked arm band
		Positioned client
		Used proper body mechanics
		Put on gloves when appropriate
		Assessed pain level
		Demonstrates proper placement of thermometer
		Obtained pulse rate within 2 beats of instructor
		Obtained respiratory rate within 2 breaths of instructors
		Measured and confirmed correct size of B/P cuff is being used. Obtained blood pressure reading within + or – 4 mm/Hg of instructor
		Obtained an apical pulse rate within 2 beats of instructor
		Obtained Apical/Radial pulse rate within 2 beats of instructor
		Secured tubes or lines
		Bed in low position; side rails up; call light in reach; over the bed table in reach before leaving client
		Followed sequential actions which made procedure safe and comfortable for client
		Completed procedure within allotted time frame: 15 minutes

Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.

Instructor_____ Date_____

DIVISION OF NURSING

COMPETENCY DEMONSTRATION EVALUATION SHEET: PHYSICAL ASSESSMENT

YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **Physical Assessment** and I am ready to demonstrate competency. I have practiced three times. _____ Student Signature

I have observed the above student correctly demonstrate this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Observer Signature)

Pass	Fail	Technique
		Checked client's chart for any pertinent information
		Selected appropriate equipment (stethoscope, penlight, tongue blade, gloves)
		Wash hands. Provide for privacy. Introduction of self
		Explained procedures in layman terms to include role expectation of client
		Identified client. Check arm band. Checked for allergies to drug/solutions Checked arm band
		Positioned client. Used proper body mechanics
		State the elements of the health history (biographical data, presenting problem, medications, past medical history) and assessment of vital signs
		Demonstrate assessing LOC; Demonstrate assessing orientation (Person, Place, Time)
		Demonstrate assessing pupils(PERRLA) and consensual eye movement
		Demonstrate assessing hair/scalp/ears/nose
		Demonstrate assessing mouth: teeth; gums; moisture, tongue turgor
		Demonstrate assessing all peripheral pulses (carotid, brachial, radial, femoral, popliteal, posterior tibial, and dorsalis pedis) and stating volumes: 0, 1+, 2+, 3+
		Demonstrate ROM of neck, upper extremities, lower extremities
		Demonstrate inspecting chest (shape, use of accessory muscles, skin and pattern of respiration)
		Demonstration palpation of skin for temperature and tenderness and skin turgor
		Demonstrate auscultating the heart: valves (Aortic, Pulmonic, Tricuspid, Mitral); apical pulse
		Demonstrate auscultating the lungs (anterior, posterior, lateral)
		Demonstrate inspecting the abdomen (shape, symmetry, skin, use of accessory muscles)
		Demonstration auscultation of the abdomen (all four quadrants)
		Demonstrate light palpation and percussion of abdomen (to include bladder)
		Demonstrate inspection and palpation of upper and lower extremities for temperature, tenderness, skin turgor, and edema
		Demonstrate capillary refill on upper and lower extremities
		Demonstrate grip strength on upper extremities
		Demonstrate muscle strength using the 5-point scale for upper and lower extremities
		Demonstrate assessing gait and posture, joint deformities, contractures
		State will ensure all support equipment is functioning and secure
		Bed in low position; side rails up; call light in reach; table in reach before leaving client
		Complete in 30 minutes. **Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.**

Instructor _____ Date _____

DIVISION OF NURSING

COMPETENCY DEMONSTRATION EVALUATION SHEET: POSITION AND TRANSFER

YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **Positioning and Transferring** and I am ready to demonstrate competency. I have practiced three times. _____ Student Signature

I have observed the above student correctly demonstrate this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Observer Signature)

Pass	Fail	Technique
		Checked doctor's order
		Wash hands
		Selected appropriate equipment(pillows, towels for trochanter rolls, wheelchair)
		Provide for privacy
		Introduction of self
		Explained procedures in layman terms to include role expectation of client
		Make appropriate assessments
		Identified client. Check arm band.
		Checked for allergies to drug/solutions. Checked arm band
		Place client on bedpan correctly.
		Demonstrate correct body mechanics when placing the client in the following positions: Supine Lateral Semi-Fowler's
		Demonstrates correct bridging techniques
		Demonstrates evaluation of client for correct alignment after each change in position
		Demonstrates correct body mechanics when transferring client from bed to wheelchair
		Demonstrate safety for client with repositioning and transferring (√ all locks)
		Accurately states how to log roll a client
		Demonstrates how to move client up in bed using the instructor as second person
		Bed in low position; side rails up; call light in reach; over the bed table in reach before leaving client
		Completed procedure within allotted time frame: 15 minutes

Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.

Instructor_____ Date_____

DIVISION OF NURSING

COMPETENCY DEMONSTRATION EVALUATION SHEET: MEDICATION ADMINISTRATION

YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **Medication Administration** and I am ready to demonstrate competency. I have practiced three times. _____ Student Signature

I have observed the above student correctly demonstrate this skill.

First Time: _____(Observer Signature)

Second Time: _____(Observer Signature)

Third Time: _____ (Observer Signature)

Pass	Fail	Technique
		Checked MD orders
		Wash hands
		Selected appropriate equipment
		Demonstrate comparing physician orders with MAR for accuracy
		Knowledge of drug (classification, dosage, rate of administration, side effects, expected outcomes, etc.)
		Accurately calculated amount of medication to be given
		Demonstrated the use of the 10 Rights
		Demonstrated performing the three medication check (when pulled from med cart and put on MAR, when taken from MAR and put in medicine cup, and in client's room with MAR before giving to client)
		Provide for privacy
		Introduction of self
		Explained procedures in layman terms to include role expectation of client
		Make appropriate assessments(i.e. vital signs, apical pulse, bowel sounds, etc)
		Demonstrate checking ID band and asking client to state name and birth date
		Demonstrate assessing for allergies on armband and verbally asking client
		Positioned client appropriately
		Used proper body mechanics
		Demonstrated administering medications(pills, eye drops, suppository, topical)
		Demonstrate proper documentation of medication administration
		Bed in low position; side rails up; call light in reach; over the bed table in reach before leaving client
		Completed procedure within allotted time frame: 30 minutes

Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.

Instructor_____ Date_____

DIVISION OF NURSING
COMPETENCY DEMONSTRATION EVALUATION SHEET: PARENTERAL MEDICATION ADMINISTRATION

YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill **Parental Medication Administration** and I am ready to demonstrate competency. I have practiced three times. _____ Student Signature

I have observed the above student practice this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Observer Signature)

Pass	Fail	Technique
		Checked MD orders
		Wash hands
		Selected appropriate equipment(syringe size, needle size, blunt or filter needle with ampules)
		Demonstrate comparing physician orders with MAR for accuracy
		Knowledge of drug (classification, dosage, rate of administration, side effects, expected outcomes)
		Accurately calculated amount of medication to be given
		Demonstrated the use of the 10 Rights
		Demonstrated performing the three medication check (when pulled from med cart and put on MAR, when taken from MAR and put in medicine cup, and in client's room with MAR before giving to client)
		Provide for privacy
		Introduction of self
		Explained procedures in layman terms to include role expectation of client
		Make appropriate assessments (i.e. vital signs, pain level)
		Demonstrate checking ID band and asking client to state name and birth date
		Demonstrate assessing for allergies on armband and verbally asking client
		Positioned client appropriately
		Used proper body mechanics
		Demonstrated use of medical and surgical asepsis
		Demonstrate all IM, SQ and Intradermal injection sites
		Demonstrate and give rationales for injection techniques (including Z-Track)
		Demonstrate disposal of needle and syringe without recapping in appropriate receptacle
		Demonstrate proper documentation of medication administration
		Bed in low position; side rails up; call light in reach; over the bed table in reach before leaving client
		Completed procedure within allotted time frame: 20 minutes

Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.

Instructor_____ Date_____

DIVISION OF NURSING
COMPETENCY DEMONSTRATION EVALUATION SHEET FOR
NASOGASTRIC TUBE

Skills Lab Practice Slip
YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **Nasogastric Tube** and I am ready to demonstrate competency. I have practiced three times.

Student Signature: _____

I have observed the above student practice this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Observer Signature)

Skills Lab Practice Slip Signed_____ Number of Demonstrations: 1 2 3

Pass	Fail	N/A	Technique
			Checked doctor's order
			Wash hands
			Selected appropriate equipment (NG tube; lubricant; syringe; cup; water; tape; towel; emesis basin)
			Provide for privacy
			Introduction of self
			Explained procedures in layman terms to include role expectation of client
			Make appropriate assessments
			Identified client. Check arm band.
			Checked for allergies to drug/solutions. Checked arm band
			Positioned client
			Used proper body mechanics
			Measured appropriate length for tube insertion and marked with tape
			Put on gloves
			Demonstrate correct insertion technique
			Demonstrate checking correct placement of tube
			Demonstrate correct connection to wall suction
			Demonstrate giving an intermittent nasogastric feeding
			Demonstrate correct removal of NG tube
			Bed in low position; side rails up; call light in reach; over the bed table in reach before leaving client
			Followed sequential actions which made procedure safe and comfortable for client
			Completed procedure within allotted time frame

*Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.

Instructor_____ Date_____

DIVISION OF NURSING
COMPETENCY DEMONSTRATION EVALUATION SHEET FOR
Peripheral IV Start

Skills Lab Practice Slip
YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **IV Start** and I am ready to demonstrate competency. I have practiced three times.

Student Signature: _____

I have observed the above student practice this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Observer Signature)

Skills Lab Practice Slip Signed_____ Number of Demonstrations: 1 2 3

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Number of Demonstrations: 1 2 3

Pass	Fail	Technique
		Checked Doctor's orders
		Selected appropriate equipment)Correct IV fluid and tubing, IV catheter, IV start kit)
		Washes hands
		Introduce self and explain the procedure and the clients expected role
		Identify the client and check armband
		Check for allergies
		Allows for patient input related to site (right or left handed)
		Demonstrates correct assessments
		Uses proper body mechanics
		Properly uses tourniquet to identify possible site
		Prepares supplies and checks catheter tip
		Properly cleans site
		Demonstrates proper technique in performing venipuncture
		Connects IV tubing and secures site
		Sets IV Pump cc/hr to deliver med appropriately
		Leaves client safe (Bed low, side rails up, call light in reach)
		Followed sequential actions which made procedure safe and comfortable for the client
		Completed procedure in allotted time

*Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.

Student _____ Date _____

Instructor_____ Date _____

DIVISION OF NURSING
COMPETENCY DEMONSTRATION EVALUATION SHEET FOR
IVPB and IVP

Skills Lab Practice Slip
YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **IVPB and IVP** and I am ready to demonstrate competency. I have practiced three times.

Student Signature: _____

I have observed the above student practice this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Observer Signature)

Skills Lab Practice Slip Signed_____ Number of Demonstrations: 1 2 3

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Pass	Fail	Technique
		Checked Doctor's orders
		Wash hands
		Selected appropriate medication piggyback and checked against MAR
		Knowledge of medication (classification, dosage, any dilution, rate of administration, side effects, expected outcomes)
		Accurately calculates amount of medication to draw
		Demonstrates use of the 7 rights (patient, drug, dose, time, route, documentation and refusal)
		Performs the three medication checks
		Provide for privacy
		Introduces self
		Identifies client and checks for allergies
		Explains procedure and the role expectation of the client
		Assures patency of IV or Saline Lock
		Demonstrates proper technique for administering: IVPB through infusing IV IVPB through saline lock IVP through infusing IV IVP through saline lock
		Correctly uses SAS/SASH as indicated (Saline-Administer-saline) (Saline-Administer-Saline-Heparin)
		Demonstrates proper documentation
		Completed procedure in required time frame

**Critical Thinking and ability to provide rationales for nursing actions are expected components of competency demonstrations.

Instructor Signature: _____ Date:_____

DIVISION OF NURSING
COMPETENCY DEMONSTRATION EVALUATION SHEET FOR
INDWELLING FOLEY CATHETER

Skills Lab Practice Slip
YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of _____ and I am ready to demonstrate competency.
I have practiced three times.

Student Signature: _____

I have observed the above student practice this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: _____ (Faculty Signature)

Skills Lab Practice Slip Signed_____ Number of Demonstrations: 1 2 3

Pass	Fail	Technique
		Check Doctor's order
		Determine purpose of procedure (In & Out Cath, Specimen collection, Indwelling)
		Wash Hands
		Gather appropriate equipment
		Provide for privacy
		Introduce self
		Identify client
		Explain procedure in laymans terms and include role expectations of the client
		Assess for allergy to betadine and latex
		Position client while maintaining privacy
		Uses proper body mechanics
		Sets up supplies without breaking sterile technique
		Puts on sterile gloves
		Connects syringe and checks balloon
		Properly cleans client
		Demonstrates correct insertion technique
		Demonstrates properly securing catheter
		Leaves client clean and safe (Bed low, side rails up, call light in reach)
		Followed sequential actions which made procedure safe and comfortable for client
		Completed procedure within allotted time frame
		States information needed for proper documentation

*Critical Thinking and ability to provide rationales for nursing actions are expected component of the competency demonstration.

Student_____ Date_____

Instructor_____ Date_____

DIVISION OF NURSING

COMPETENCY DEMONSTRATION EVALUATION SHEET FOR
CVL Dressing Change

Skills Lab Practice Slip
YOU MUST PRESENT THIS COMPLETED SLIP AT TIME OF DEMONSTRATION

I have practiced the skill of **CVL Dressing Change** and I am ready to demonstrate competency. I have practiced three times.
Student Signature: _____

I have observed the above student practice this skill.

First Time: _____ (Observer Signature)

Second Time: _____ (Observer Signature)

Third Time: (Observer Signature)

Skills Lab Practice Slip Signed_____ Number of Demonstrations: 1 2 3

Supplies needed: Dressing Change Kit- 2 mask- 1 Patient 1 Nurse, sterile gloves, alcohol sticks if patient is allergic to chlorhexidine Clean gloves-for old dressing removal		
Pass	Fail	Gather your equipment: See list above
		Identify patient and introduce yourself
		Prior to Beginning Procedure A. Check for allergies. B. Wash hands. C. Don clean gloves. D. Open dressing change kit. E. Use aseptic technique and observe standard precautions throughout procedure.
		Position patient. Turn his/her head away from the dressing to make the insertion site more accessible and to minimize risk of contamination (put make on patient).
		Equipment Inspection Inspect and monitor the following vascular access equipment: A. Connections B. Fluids being infused C. Pump function including flow rate
		Visual Examination: A. Don mask. Don patient with mask. B. Remove dressing from CAD insertion/exit site with clean gloves. C. Inspect site for signs of infusion-related complications to include but not limited to: 1) Discoloration (i.e., blanching, erythema) 2) Disruption of sensation (i.e., pain, tenderness, numbness) 3) Edema (i.e., pitting, non-pitting) 4) Localized swelling – Exudate (i.e. drainage)
		Dressing Change A. Don sterile gloves. B. Disinfect catheter-skin junction using septic solution: 1) Using friction, apply 2% tincture of chlorhexidine in a sweeping motion. 2) If sensitivity to chlorhexidine exists, use friction to apply 70% alcohol three times in a sweeping motion and allowing air dry between applications. 3) Cover an area approximately the size of the dressing. 4) Allow solution to air dry. 5) Repeat if necessary. C. Apply transparent dressing over site, leaving the catheter hub and tubing
		Post-Dressing Change A. Discard used supplies. B. Remove gloves. C. Wash hands. D. Label new dressing with date, time and nurse initials. E. Document in patient's medical record assessment of site, what was used to cleanse area and new dressing applied

Instructor Signature: _____ Date: _____

Appendix B: Program/Initiative Oversight and Data Use Agreement

Program/Initiative Oversight and Data Use Agreement

[redacted]
Dean of Nursing
[redacted]

Date: 1/11/19

Nursing Faculty member Janna Lock is involved in the competency evaluation process which is conducted under our organization's supervision within the scope of our standard operations. I understand that Janna Lock seeks to write about this process as part of a doctoral project for Walden University. To this end, we agree to share a de-identified dataset with the student for doctoral project purposes, as described below.

I understand that the student will not be naming our organization in the doctoral project report that is published in Proquest.

The Walden University Institutional Review Board (IRB) will be responsible for ensuring that the student's published doctoral project meets the university's ethical standards regarding data confidentiality (outlined below). All other aspects of the implementation and evaluation of the initiative are the responsibility of the student, within her role as our employee.

The doctoral student will be given access to a Limited Data Set ("LDS") for use in the doctoral project according via the ethical standards outlined below.

This Data Use Agreement ("Agreement"), effective as of 01/11/2019 is entered into by and between Janna Lock ("Data Recipient") and [redacted]'s Dean of Nursing, [redacted] ("Data Provider"). The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in the doctoral project **in accord with laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.** In the case of a discrepancy among laws, the agreement shall follow whichever law is more strict.

1. *Definitions. Unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the "HIPAA Regulations" codified at Title 45 parts 160 through 164 of the United States Code of Federal Regulations, as amended from time to time.*

2. *Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable HIPAA or FERPA Regulations*

3. *Data Fields in the LDS. No direct identifiers such as names may be included in the Limited Data Set (LDS). In preparing the LDS, Data Provider or shall include*

the data fields specified as follows, which are the minimum necessary to accomplish the doctoral project: De-identified dataset of 1st year nursing students competency demonstration evaluation forms that were 1st attempt failures and their re-evaluation competency demonstration evaluation forms encompassing the years 2012 thru Fall of 2017.

4. *Responsibilities of Data Recipient. Data Recipient agrees to:*

   a. *Use or disclose the LDS only as permitted by this Agreement or as required by law;*

   b. *Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;*

   c. *Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;*

   d. *Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and*

   e. *Not use the information in the LDS to identify or contact the individuals who are data subjects.*

5. *Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS for the present project activities only.*

6. *Term and Termination.*

   a. *Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.*

   b. *Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.*

   c. *Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.*

   d. *For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms*

for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

e. *Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.*

7. *Miscellaneous.*

a. *Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.*

b. *Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.*

c. *No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.*

d. *Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.*

e. *Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.*

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

Partner Organization

Signed: [redacted]

Print Name: [redacted]

Print Title: Dean of Nursing & Health Sciences

Doctoral Student

Signed: Janna Lock

Print Name: Janna Lock

Print Title: Nursing Lab Coord.

Appendix C: NIH Certificate of Completion

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Janna Lock** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 03/24/2016.

Certification Number: 2040140.

Appendix D: Permission to use Laerdal Photograph

jannalock@msn.com

From: jannalock@msn.com
Subject: FW: Laerdal Image for use in a dissertation

From: Brian Vigorita <Brian.Vigorita@laerdal.com>
Sent: Wednesday, May 22, 2019 8:32 AM
To: Janna Lock[redacted]
Subject: Re: Laerdal Image for use in a dissertation

Janna,
You have permission to use the image for your purposes.

Thank you,
Brian

Brian Vigorita
Director of Marketing Communications

Laerdal Medical
167 Myers Corners Road | Wappingers Falls, NY 12590
Office: 845-297-7770 ext. 3483
Mobile: 845-242-8532

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