Effectiveness of high-fidelity human patient simulation in learning to manage medically-complex infants

Erin Clinard

James Madison University

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Effectiveness of High-Fidelity Human Patient Simulation in Learning to Manage Medically-Complex Infants

Erin Siobhan Clinard

A dissertation submitted to the Graduate Faculty of

JAMES MADISON UNIVERSITY

In

Partial Fulfillment of the Requirements

for the degree of

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FACULTY COMMITTEE:

Committee Chair: Carol C. Dudding

Committee Members:

Susan B. Ingram
Cynthia R. O’Donoghue
Dedication

This dissertation was a labor of love. I sincerely and whole-heartedly dedicate this to my husband who provided unwavering support. And to my girls, Amelia & Violet, always remember that “life begins at the edge of your comfort zone” so don’t accept limits, take the leap, trust yourself, and make magic happen!
Acknowledgements

It takes a village for sure. I must acknowledge and express my gratitude to everyone who provided support throughout my doctoral program and dissertation research. Thank you to my committee and colleagues for your support and guidance. Thank you to my students for inspiring me to want us all to be better educators and learners. Thank you to Katie Ondo, Jennifer Sarver, and the speech-language pathologists instrumental in collaborating to develop the case scenario and validate assessment measures; may our joint efforts benefit all of the babies who will someday require the skilled services of an SLPs. Thank you to Lauren Mullen, Brandi Burkhart, and Nathan Spencer in the JMU Nursing Simulation Laboratory; without you none of this would be possible and I am blessed to have collaborated with you in creating something wonderful. Thank you to Danika Pfeiffer and Julian White for the hours (and hours) we spent coding the qualitative data. Thank you to my family and friends for believing in me, providing endless and unconditional love, support, and faith. Thank you!
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Abstract

Survival of preterm and medically-complex infants has dramatically increased over the past thirty years due to significant advances in medical care and technology, however the developmental costs of survival are substantial. Comprehensive care of premature babies is critical and there is a need for more neonatal therapists, including speech-language pathologists (SLPs), with the knowledge and confidence to provide that care.

Students in graduate SLP programs often receive little clinical experience or dedicated coursework in pediatric feeding and swallowing, especially with medically-complex infants. However, hands-on and experiential learning can support the development of the necessary foundational knowledge and confidence of students entering into the profession. High-fidelity human patient simulation can provide this experience with high-risk patients in a risk-free learning environment.

This investigation examined the effect of high-fidelity human patient simulation on student knowledge of and confidence with managing physiologic stability of medically-fragile infants. A sequential, two-phase, embedded mixed methods design was employed. Two cohorts of graduate SLP students participated; the control group (Fall 2017; n = 28) and experimental group (Summer 2018; n = 24) both completed required coursework in pediatric dysphagia. All students completed all requirements of the course and also completed assessment measures at three time points: 1) prior to any didactic instruction, 2) following coursework, and 3) following the intervention. The intervention was either a written case study (control group) or a high-fidelity human patient simulation using the Super Tory® manikin (experimental group). Both conditions used
the same case scenario developed by expert SLPs. Rigorous quantitative and qualitative analyses were conducted to examine student knowledge and confidence, as well as perceptions of learning in simulation (experimental group only).

All students improved knowledge performance from pretest to posttest, and there was no significant difference between groups in knowledge at the posttest. There were significant differences between the control and experimental groups on confidence, particularly at the third timepoint. Following the simulation, the experimental group reported higher confidence than the control group with skills requiring hands-on experience. Findings of this investigation support integration of high-fidelity simulation into the SLP graduate curriculum to supplement and complement didactic and clinical training.
Chapter I
Introduction

Approximately 1 in 10 babies (9.6%) born in the United States every year are born preterm, before 37 weeks’ gestation (Martin, Hamilton, Osterman, Driscoll, & Mathews, 2017; World Health Organization [WHO], 2016). Survival rates of preterm and medically-complex infants have dramatically increased over the past thirty years, with some researchers reporting preterm survival rates up to 80-90% (Behrman & Butler, 2007; Lubsen et al., 2011; Pickler et al., 2010). More specifically, Als (2010) reported that 95% of infants less than 28 weeks’ gestation and less than 1250 grams (2.75 pounds) survive. These statistics illustrate the advances in medical care and technology that support the survival of preterm infants. While improvements in the medical care of preterm infants means that “survival has become commonplace” (White, 2011, p. 2), this success in decreasing mortality rates among the youngest populations comes with costs, both societal and individual.

From an economic perspective, the annual costs of perinatal care exceed $18 billion per year in the United States (Behrman & Butler, 2007; Lubsen et al., 2011; Pickler et al., 2010). According to the March of Dimes, of the infants born before 34 weeks’ gestation, more than 90% are reportedly admitted to special care nurseries. The percentage of special care nursery admissions remains high for infants born between 34-36 weeks’ gestation as well, with nearly half (47.8%) being admitted (March of Dimes Perinatal Data Center, 2011). Moreover, surviving preterm infants may experience substantial developmental costs, such as neurological impairments and feeding deficits, as they must subsequently undergo rapid neurological development in a harsh extrauterine environment.
Comprehensive care of these premature babies is critical and there is a considerable need for more neonatal therapists with the knowledge, skills, and confidence to provide that care. Preterm infants are medically and developmentally vulnerable and the youngest among them have the highest rate of complications. Common complications include, but are not limited to, neurological injury, respiratory disorders (both acute and chronic), gastrointestinal complications, immuno-compromise, cardiovascular disorders, and hearing and vision problems (Behrman & Butler, 2007). The immature systems of preterm infants (e.g., respiratory, gastrointestinal, immune system, cardiovascular) are forced to develop outside of the controlled and predictable intrauterine environment, while simultaneously being tasked with managing the sensory demands inherent of the outside world. Particularly vulnerable are the infant’s brain and neural organization.

Neurodevelopment is a broad term that encompasses many systems and functions. Neurodevelopment involves the organization of neural networks as new skills (e.g., feeding and communication) are obtained through experiences and interaction with the environment. It includes the development of the anatomy and physiology of the brain and nervous system, sensory system development and integration, psychosocial development, as well as neurobehavioral organization (Als, 2007). Als (2010) further defined development as “a process of continuous differentiation, integration and modulation of the interrelationships of behaviorally observable subsystems of function” (p. 211). The behaviors observed indicate whether or not the infant is ready to tolerate interaction or stimulation, such as oral feeding, based on how stable their subsystems are while managing the demands of the interaction.
The speech-language pathologist (SLP) is among the specialists who provide care to infants and their families in support of the infant’s neurodevelopment. The SLP has a role on the interprofessional team responsible for providing individualized, developmental care; therefore, it is crucial that SLPs have the requisite knowledge, skills, and confidence to support our most fragile patients (ASHA, 2004). Graduate programs in speech-language pathology have the ability to provide the foundational knowledge upon which students entering the professional can build. This foundational knowledge can benefit those interested in becoming neonatal therapists and is also valuable for early professionals working on feeding and swallowing with infants and children in any setting.

The purpose of this study is to investigate the effects of an immersive high-fidelity human patient simulation, as compared to a traditional written case study, on student knowledge and confidence with the management of medically-complex infants.
Chapter II
Review of the Literature

Neurodevelopment: The Foundation for Feeding

With improvements in the medical care of preterm infants, “survival has become commonplace” (White, 2011, p. 2). The focus of care for these infants needs to shift from survival to supporting the complex neurodevelopmental needs of these young and often fragile infants. Caregivers must recognize that preterm infants are undergoing the most rapid period of brain development in a stressful extrauterine environment. Preterm infants are not born with the ability to manage such repeated exposure to the environmental stressors, which can alter the infant’s neurodevelopment (Als, 2009; Lester et al., 2011; Pickler, Frankel, Walsh, & Thompson, 1996; Weber, Harrison, & Steward, 2012). The goal in special care nurseries must be to create an environment that supports infants’ rapidly developing brains (Als, 2010; Pickler et al., 1996; Pineda et al., 2014). Individualized, developmentally-supportive care is essential to meeting this goal and reducing the stress infants experience during this critical period of growth and development. Developmentally-supportive care includes kangaroo care, non-nutritive sucking, positioning, and support of arousal maintenance and self-regulation (Als, 1986; Als, 2009; Lester et al., 2011).

The synactive theory of development (Figure 1) is the foundation of developmental care and proposes that infants communicate through their behavior (Als, 1986). Recognizing behavior as communication is essential to supporting infant development, which is “a process of continuous differentiation, integration and modulation of the interrelationships of behaviorally observable subsystems of function” (Als, 2010; p. 211). Importantly, behavior reveals the stability of the infant’s subsystems
and the infant’s readiness to interact with the environment. Infant subsystems include autonomic (e.g., heart rate, respiratory rate, oxygen saturation), motor (e.g., tone, sucking), state organization (e.g., maintaining a quiet alert state), and attention/interaction.

The development of each subsystem results from interaction between the infant and its environment. Differentiation and integration of these subsystems is necessary for establishing self-regulation, which is vital to the performance of complex tasks, such as oral feeding (Als, 1986; Als, 2009; Pickler et al., 1996; Weber et al., 2012). Oral feeding is among the most complex tasks infants must learn. Feeding requires adequate behavioral organization, sustained arousal, autonomic system regulation, integration of complex motor tasks, and the ability to self-regulate (McGrath & Bodea Braescu, 2004).

It is undeniable that those working with these infants must be able to assess and manage signs that stability of these systems has been achieved. SLPs are among the professionals that work with medically-complex infants in special care nurseries, clinic

---

programs, and early intervention. Therefore, SLP knowledge of the synactive theory and developmental care is essential to meeting the needs of this high-risk population.

**The Role of the SLP: Knowledge Expected of Students Entering the Profession**

Speech-language pathologists working with infants must have the skills to assess signs of stability including respiratory rate, oxygen saturation, heart rate, color, tone, and state of alertness at rest and with interaction. Stability is essential to a successful transition to oral feeding. When SLPs evaluate infants for oral feeding readiness, the evaluation requires a thorough assessment of behavior including arousal, posture, physiologic indicators of stability, and motor coordination (White-Traut, Berbaum, Lessen, McFarlin, & Cardenas, 2005). Failure to appropriately respond to communicative behaviors can significantly and negatively disrupt an infant’s self-regulation and ability to interact with the environment while maintaining physiologic stability. Therefore, SLPs must be able to recognize and respond to infants’ behaviors that communicate physiologic instability to support a successful transition to oral feeding.

SLPs must meet the standards set forth by the Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association (CFCC ASHA) for certification. According to the 2014 Standards and Implementation Procedures for the Certificate of Clinical Competence in Speech-Language Pathology, Standard IV-B, students must, among other things, demonstrate knowledge of the biological, neurological, and developmental bases of basic human communication and swallowing. Additionally, students must be able to integrate information about development across the lifespan and must be knowledgeable of how to prevent, assess, and intervene (CFCC ASHA, 2013).
In 2004, the American Speech-Language-Hearing Association (ASHA) outlined the knowledge and skills required by SLPs in the neonatal intensive care unit. Among these basic competencies were knowledge of embryology, development, and the foundations of developmentally-supportive care. SLPs must possess the knowledge and skills to assess and intervene with infants and families. Specifically, knowledge and skills of infant communication, cognition, feeding, swallowing, and neurodevelopment to support the infant’s development along a normal trajectory are requisite (ASHA, 2004).

SLP graduate students are required to develop clinical skills in assessment and intervention of swallowing disorders, but it is not required that their experience be with, or even include, pediatrics. Often students do not have sufficient opportunity to learn how to assess and treat the high-risk or medically-complex populations that they might encounter in practice post-graduation and throughout their professional careers. Many graduate programs do not even have a dedicated course in pediatric dysphagia. Presently, according to a survey of the top 107 graduate SLP programs in the United States, only 21% of programs offer a dedicated course in pediatric dysphagia (Zimmerman, 2016). Further, Zimmerman (2016) surveyed 175 practicing SLPs, and of those who had a pediatric dysphagia course in graduate school the majority of (62.7%) reported feeling prepared to serve the pediatric dysphagia population. This is in stark contrast to the SLPs who did not have a course in pediatric dysphagia during their graduate program; only 23.3% of those SLPs reported feeling prepared to serve the pediatric dysphagia population (Zimmerman, 2016).

Beyond requisite knowledge and clinical skills, Bandura’s theory of self-efficacy suggests that confidence and self-efficacy are critical to skill development and
performance. Self-confidence, one’s belief in their ability to perform actions and skills, is also critical. By developing confidence in their knowledge and skills, students are then able to apply and generalize their knowledge and skills to future clinical situations and make clinical decisions in practice (Bandura, 1997).

While knowledge, skills, and confidence are undoubtedly required when working with this population, it is not clear how students or early professionals might gain this experience. Simulation is a potential solution for these gaps in graduate instruction and experience by providing effective, safe, and risk-free learning through which SLP students can gain the requisite knowledge, skills, and confidence for caring for high-risk populations.

**Simulation in Clinical Education**

In addition to demonstrating the requisite knowledge and skills, graduate students in speech-language pathology must earn 375 clinical clock hours for certification. Meeting this clock-hour requirement is difficult for many graduate programs because of challenges securing adequate placements for students to gain experience. In March 2016, the CFCC of ASHA amended the 2014 Standards to allow the use of alternative clinical education approaches for up to 20% of the required clinical contact hours for certification (CFCC ASHA, 2013). Simulation is one such alternative.

Simulation provides students with simulated, yet realistic, clinical experiences. Simulation tools exist along a continuum of fidelity, or realism, from low to high. Not all simulation requires sophisticated technology, but the possibilities for simulation in education are certainly evolving with technological advances. Simulation includes, but is not limited to, standardized patients, computer-based virtual patients, high-fidelity human
patient simulation, virtual worlds (e.g., Second Life), and immersive virtual reality platforms (e.g., Oculus Rift and HTC VIVE). Well-designed simulated clinical experiences, with clear learning objectives and instruction, provide opportunities for repeated and deliberate practice to achieve mastery of basic clinical skills. Basic skills that can effectively be learned through simulation include collecting case histories, test selection, data interpretation, and report writing (Jansen, 2015). Time spent in simulation can successfully replace or supplement traditional exemplars of clinical learning and can bridge didactic and clinical coursework by supporting students in synthesizing and applying knowledge (Ward et al., 2015).

Simulation is not simply time spent with a technology, but rather a rich and innovative approach to education. Regardless of the technology, simulation is a systematic process that includes a well-planned prebriefing, simulation scenario, and debriefing. The prebriefing sets up the simulation, establishes expectations, and prepares students for the scenario. Students then complete the simulation scenario followed by a reflective debriefing with a trained facilitator (International Nursing Association for Clinical Simulation and Learning [INACSL], 2016). Simulation has been successfully integrated in other health-related disciplines including medicine, nursing, physical therapy, and occupational therapy (Nestel, Jolly, Kelly, & Watson, 2017). It is an innovative and valuable approach to providing a risk-free learning environment for students to develop clinical skills. Furthermore, simulation offers exposure to low-incidence and high-risk populations, such as preterm and medically-complex infants, with which SLP students may not gain experience in clinical placements (Harder, 2010; Jansen, 2015).
In a longitudinal study of pre-licensure nursing programs in the United States, the National Council of State Boards of Nursing examined performance and outcomes based on the amount of simulation used in place of traditional clinical training hours. Students in pre-licensure nursing programs across the United States were randomly assigned to one of three groups that received traditional clinical training experiences with varying amounts of simulation. The amount of simulated experience ranged from no more than 10% of clinical hours in simulation to 50% of clinical hours in simulation. Outcomes were measured during students’ programs and following six months of employment as registered nurses. Results indicated no significant differences between the three groups on measures of knowledge, clinical competence, critical thinking, technical skills, learning needs, and student perceptions. These findings indicate that time spent in simulation was at least as effective as traditional live clinical hours in achieving clinical outcomes. Further, these results suggest that simulation could replace up to 50% of clinical training experiences without significant impact on outcomes (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014).

The findings of the National Council of State Boards of Nursing study and the research literature about simulation in clinical education from nursing, medicine, occupational therapy, and physical therapy pave the way for speech-language pathology clinical training programs to adopt or expand the use of simulation. For SLP graduate programs, simulation can address challenges of securing clinical placements and providing experience and exposure to high-risk and low-incidence populations (Hayden et al., 2014; Watson et al., 2012). While many health professions have embraced the use
of simulated clinical training, speech-language pathology has only recently embraced the potential benefits and uses of simulation within the graduate curriculum.

A national survey of ASHA-accredited SLP graduate programs examined the use of and barriers to the use of simulation in clinical education (Dudding & Nottingham, 2018). Of the 309 programs invited to participate, 136 programs (44%) responded. Findings indicated that 51% \((n = 69)\) of the 136 programs that responded were using simulation in clinical education and 49% \((n = 66)\) of programs agreed that simulated experiences could account for up to 25% of required clinical hours. Barriers to using simulations included limited knowledge, insufficient financial resources, undertrained faculty, and limited guidance from accrediting bodies (Dudding & Nottingham, 2018). In spite of the fact that this survey was conducted prior to the March 2016 change in the 2014 Standards which allowed for alternative clinical education to be counted for up to 20% of clinical clock hours (CFCC ASHA, 2013), the findings presented by Dudding and Nottingham (2018) suggest that while SLP graduate programs are beginning to recognize the suitability of simulation in clinical education, however much work remains to overcome barriers to implementation. With advancements in the acceptance of simulation in SLP education and the approval of simulation for clinical clock hours, it is essential that the integration of simulation in graduate programs be critically evaluated and best practices be established.

Strategic application of simulation has the potential to change how we educate students to enter an ever-expanding field. Limited access to the breadth and depth of experiences across the scope of practice and inadequate opportunities to assess and treat high-risk and low-incidence populations has real consequences for patients and their
families. Without exposure, students enter the field lacking confidence, knowledge, and skills. Simulation benefits the profession and the patients served by providing the experience students need to increase knowledge, skills, and confidence.

**Purpose**

This investigation is vital to determining the viability of simulation as a meaningful, safe learning tool for students to gain knowledge and confidence with high-risk, medically-complex infants. Integrating simulation into SLP programs is innovative and has the potential to fill gaps in student knowledge and confidence. By improving knowledge and confidence of graduate students, programs can significantly improve the quality of care provided by SLPs when they enter special care nurseries.

The specific purpose of this study is to examine the influence of high-fidelity human patient simulation on student knowledge of and confidence with managing physiologic stability of medically-complex infants. This study is an important step in evaluating the use of high-fidelity human patient simulation in graduate SLP programs. Traditional, didactic classroom instruction with a written case study will be compared to traditional, didactic classroom instruction with high-fidelity human patient simulation to address the following questions:

1) Does the inclusion of high-fidelity human patient simulation increase student knowledge of infant physiologic stability as compared to a written case study?

2) Does the inclusion of high-fidelity human patient simulation increase student self-assessed confidence with the assessment and management of infant physiologic stability as compared to a written case study?
3) What are student perceptions of learning to assess and manage medically-complex infants through high-fidelity human patient simulation?

**Hypotheses**

The following research hypotheses have been developed for the quantitative questions above:

1) With respect to research question 1, it is hypothesized that there would be no significant difference in knowledge gains between the groups.

2) With respect to research question 2, it is hypothesized that the students who completed the high-fidelity human patient simulation will have higher self-assessed confidence scores at posttest 2 than the students who completed the written case study.

3) With respect to question 3, it is expected that students will have positive perceptions of learning in simulation.
Chapter III
Methodology

Design

This sequential, two-phase, embedded mixed methods study examined student knowledge and confidence in the assessment and management of physiologic stability in medically-complex infants (Figure 2). The control and experimental conditions were two independent, sequential phases with data integration and interpretation following completion of both phases. Phase one (Fall 2017) was the control condition during which the first cohort of students participated in a traditional, didactic course in pediatric dysphagia and completed a relevant written case study. Phase two (Summer 2018) was the experimental condition during which the second cohort of students took the same didactic course and participated in a high-fidelity human patient simulation scenario of a medically-complex infant with dysphagia. The same case study scenario was used for both the control and experimental conditions. The case provided students with the opportunity to apply the knowledge they learned in the course to assess and manage the physiologic stability and oral feeding readiness of an infant.

To reduce the influence of confounding variables, both groups received the same course content taught by the same instructor (the researcher) and completed the same measures at the same time points throughout the course. The experimental group did complete two additional surveys at the third time point that were not completed by the control group. These additional surveys were specific to perceptions of learning in simulation.

The quantitative (QUAN) and qualitative (qual) strands were integrated for interpretation following the completion of data collection. The quantitative (QUAN)
strand of this mixed methods design held greater weight than the qualitative (qual) strand, which sought to enrich and provide a deeper understanding of the quantitative results.

**Figure 2.** Sequential, embedded mixed methods intervention design and measures. Pretest measures were obtained prior to coursework. Immediately following the completion of coursework, the confidence survey were repeated. The intervention was either written case study (control) or high-fidelity human patient simulation (experimental). Final posttest measures were completed immediately following intervention. All data was integrated for interpretation and group comparisons. Quantitative is weighted heavier, indicated by QUAN; Qualitative is for support and indicated by qual.
Students

A convenience sample of two sequential cohorts of second-year graduate students enrolled in the full-time, residential master’s degree in speech-language pathology program at James Madison University participated in this study. Students at this point in the program had minimal clinical experience with pediatric feeding or swallowing, as these clients are not seen in the on-campus clinic where students were placed for their first year. Exclusion criteria included experience working with pediatric feeding and swallowing clients or if students had children of their own. Students whose data were excluded still completed all course objectives and received the same benefit from the instructional and learning activities. All students were at least 18 years of age and consented to allow their data to be used by the researcher. All students are referred to as students as they all participated in completing the coursework, intervention, and measures even if their data was excluded from analysis.

All students were enrolled in a one-credit course in pediatric dysphagia (CSD 625) as prescribed by the program curriculum. The course took place over six weeks and each session was 2.5 hours. Instruction was made up of lecture, small and large group discussions, literature reviews, presentations, and team-based activities. All materials, readings, lectures, and assignments were identical for both groups. The researcher was the instructor for the course and was the same for the control and experimental groups to maintain consistency in coursework and eliminate instructor variables as a confound. Performance and responses on the assessment measures used in this study did not contribute to student grades in CSD 625. There were no incentives for participation and students were free to withdraw their data from the study at any time, with no
consequences. The instructor (researcher) was blind to participant consent and all data until after official grades were officially recorded for the semester.

**Control group.** The control group ($N = 34$) consisted of second-year graduate students enrolled in CSD 625: Pediatric Dysphagia during the fall semester of 2017 (Phase One). Different from the experimental group, these students were concurrently participating in their first externship placements, four days per week and had completed a one-credit Early Intervention course. The Early Intervention course covered basic information about the impact of preterm birth and related interventions on child development. The data from six students were excluded because of experience with pediatric feeding and swallowing ($n = 4$), for having children of their own ($n = 1$), and for incomplete data ($n = 1$), resulting in an $n$ of 28 students. Following the completion of the didactic coursework, students in the control group completed a written case study to apply their learning and clinical judgement in the assessment and management of a medically-complex infant.

**Experimental group.** The experimental group ($N = 24$) consisted of second-year graduate students enrolled in CSD 625: Pediatric Dysphagia during the summer semester of 2018 (Phase Two). Students in the experimental group were concurrently enrolled in on-campus clinic placements and had not yet completed the one-credit Early Intervention course. No student data were excluded from the experimental group as none met the exclusion criteria. Following completion of the didactic coursework, students in the experimental group participated in a high-fidelity simulation to apply their learning and demonstrate clinical judgement in the assessment and management of a medically-complex infant.
Measure

Knowledge Assessment. The 10-item knowledge assessment was developed by the primary researcher and some items included were from Ferguson (2013). Items were aligned with the 2014 Standards for the Certificate of Clinical Competence in Speech-Language Pathology (CFCC ASHA, 2013) and the knowledge and skills required of SLPs in special care nurseries (ASHA, 2004). The assessment was validated by three content experts to ensure accuracy and validity. The assessment initially included 12 items, two of which were eliminated because of lack of agreement on the experts’ responses. The remaining multiple choice, fill-in-the-blank, and short answer items had 97% agreement among the content experts. Students completed the web-based assessment through Qualtrics® (2018) at two time-points: 1) prior to the start of instruction on the first day of class (pretest) and 2) at the end of the final class meeting (posttest), as illustrated in Figures 2 and 3. Items targeted participant knowledge of

<table>
<thead>
<tr>
<th></th>
<th>Control Group Didactic + Written Case Study</th>
<th>Experimental Group Didactic + High-fidelity Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-coursework</td>
<td><strong>November 2017</strong></td>
<td><strong>May 2018</strong></td>
</tr>
<tr>
<td>(Pretest)</td>
<td>• Knowledge assessment</td>
<td>• Knowledge assessment</td>
</tr>
<tr>
<td></td>
<td>• Confidence survey</td>
<td>• Confidence survey</td>
</tr>
<tr>
<td>Coursework</td>
<td></td>
<td>Classes #1-4 traditional, didactic instruction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(same instructor, same content)</td>
</tr>
<tr>
<td>Post-coursework</td>
<td><strong>December 2017</strong></td>
<td><strong>June 2018</strong></td>
</tr>
<tr>
<td>only (Posttest 1)</td>
<td>• Confidence survey</td>
<td>• Confidence survey</td>
</tr>
<tr>
<td>Intervention</td>
<td><strong>End of Class #5</strong></td>
<td><strong>End of Class #5</strong></td>
</tr>
<tr>
<td></td>
<td>• Case study</td>
<td>• Orientation to simulation laboratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Next day</td>
</tr>
<tr>
<td>Post-intervention</td>
<td><strong>December 2017</strong></td>
<td><strong>June 2018</strong></td>
</tr>
<tr>
<td>(Posttest 2)</td>
<td>• Knowledge assessment</td>
<td>• Knowledge assessment</td>
</tr>
<tr>
<td></td>
<td>• Confidence survey</td>
<td>• Confidence survey</td>
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<tr>
<td></td>
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<td>• Educational Practices Questionnaire</td>
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<tr>
<td></td>
<td></td>
<td>• Simulation Effectiveness Tool-Modified</td>
</tr>
</tbody>
</table>

*Figure 3. Timeline of assessment measures*
critical measures, signs of instability, and approaches to managing instability in the infant.

**Confidence.** Confidence was evaluated via a researcher-developed, web-based confidence and self-efficacy survey through Qualtrics®. This survey asked students to rate their sense of confidence with the assessment and management of infant physiologic stability on a four-point Likert scale (1 = “strongly disagree;” 4 = “strongly agree”). Cronbach’s alpha is a measure of internal consistency, measuring how closely items on the scale are related in order to provide a reliability coefficient for the scale. A value >.70 is generally considered acceptable (Bland & Altman, 1997). The calculated Cronbach’s alpha was .93 overall for this confidence survey. The confidence survey also contained open-ended questions to contribute qualitative exploration of confidence and factors that influence student self-assessed confidence. As outlined in Figures 2 and 3, confidence was assessed at three time points: 1) prior to the start of instruction on the first day of class (pretest), 2) following didactic coursework but before the case study or simulation (posttest 1), and 3) at the end of the final class meeting (posttest 2). Assessment at these time points allowed for the examination of changes due to coursework alone versus the addition of the simulation scenario.

**Educational Practices Questionnaire.** The Educational Practices Questionnaire, Student Version (EPQ) from the National League for Nursing (2005) was completed by students in the experimental group at the end of the semester (posttest 2), as outlined in Figures 2 and 3. The questionnaire is a 16-item survey for students to rate their experience with simulation and perceptions of how important certain learning experiences were to them. This tool was selected because of its use in nursing research
and published reliability ratings; Cronbach’s alpha has been reported in the literature as .86 for the educational practice questions and .91 for the questions exploring the value of those practices, as perceived by the student (NLN, 2005). It was only completed by students in the experimental condition because it is specifically a measure of perceptions of learning through simulation. Students completed this questionnaire, via Qualtrics®, immediately following the simulation.

**EPQ Survey Items.** Item categories include: Active Learning, Collaboration, Diverse Ways of Learning, and High Expectations. Students responded to each question based on their agreement with a statement regarding educational practices (experience in simulation) on a five-point Likert scale (1 = “strongly disagree with the statement;” 5 = “strongly agree with the statement”). An option to select NA (“not applicable; the statement does not pertain to the simulation activity performed”) is also provided. Similarly, students responded, on a five-point Likert scale (1 = “not important;” 5 = “very important”), to the same statements based on how important the item is to them.

**Simulation Effectiveness Tool – Modified.** The Simulation Effectiveness Tool – Modified (SET-M) from Leighton, Ravert, Mudra, & Macintosh (2015) was completed by the students in the experimental group following completion of the simulation (posttest 2). Like the EPQ, this 20-item survey asked students to rate their experience and confidence following the simulation. Students rated nineteen items on a three-point Likert scale (1 = “do not agree;” 2 = “somewhat agree;” 3 = “agree”) and responded to one open-ended question; one item was not included because it was not relevant (“I developed a better understanding of medications”). This tool was administered in addition to the EPQ because it specifically addressed the three phases of simulation:
prebriefing, scenario, and debriefing. It offered insight into the students’ experience during each phase of the simulation. The students’ responses to the SET-M provided complimentary data points to the other measures being completed to better understand participant experience and confidence. The SET-M was selected because of its growing use in simulation research, recency of validation, and high internal consistency ratings; previous published reports of Cronbach’s alpha yielded values between .833–.913 for each subsection (Boling, Hardin-Pierce, Jensen, & Hassan, 2016; Elfrink Cordi, Leighton, Ryan-Wenger, Doyle, & Ravert, 2012; Katwa, Jenner, MacDonald, & Barnett, 2018; Leighton et al., 2015). This tool was only completed by students in the experimental condition because it is specifically a measure of perceptions of learning through simulation. Students completed this questionnaire, via Qualtrics®, immediately following the simulation.

**Intervention**

**Case Scenario.** The case scenario was developed for this study based on real cases to maximize fidelity, but did not represent any single infant. Rather, the case scenario was designed to emulate the infant behaviors being targeted. The scenario was designed in collaboration with expert speech-language pathologists in the level IV regional neonatal intensive care unit at Cincinnati Children’s Hospital Medical Center. The same case scenario was used for both the written case study (control group) and the high-fidelity human patient simulation (experimental group).

The case scenario involved an infant born at 36 weeks, 5 days with gastroschisis. At the time of the evaluation he was two-weeks old (corrected age: 38 weeks, 5 days) weighing 5 pounds, 3 ounces, was status post gastroschisis repair, and was receiving tube
feedings via nasogastric tube. Students were given this information during the prebriefing and told that they were to assume the role of the speech-language pathology team called to evaluate his oral feeding skills because he had taken two bottle feedings, but demonstrated a wet gurgly burp and emesis. The primary objective of the case scenario was that students would identify behavioral and physiological markers of instability. Behavioral markers included coughing, gulping, drooling, hiccupping, change in muscle tone, and change in state of alertness (Ferguson, 2013; Jones, 2012; Shaker, 2013; Thoyre, Shaker, & Pridham, 2005). Physiological markers included changes in heart rate, respiratory rate, oxygen saturation, and color changes (Ferguson, 2013; Jones, 2012; McGrath & Bodea Braescu, 2004; Shaker, 2013). Additional objectives included student interpretation of the markers of instability and utilization of strategies to assist the infant in maintaining stability. Finally, students judged the infant’s readiness to feed, the quality of bottle feeding, and made feeding recommendations.

**Written Case Study (Control Group).** The case scenario was programmed into Qualtrics® as an unfolding case study. In randomly assigned groups of three, students in the control group completed the written case study. During the prebriefing, initial case information was provided and students were instructed to assume the role of the SLP team consulted to assess the infant’s readiness and safety with oral feedings. Information was provided and students responded to questions that guided them through the process of completing an assessment and bottle feeding. Additional information was provided based on the teams’ responses. At critical points, such as after completing a baseline assessment or initiating oral feeding, students were provided with physiologic and behavioral information and were prompted to interpret that information and make
decisions about how to proceed. Immediately after completing the case study, the whole class was engaged in a group debriefing to discuss the case, reflect on what they did well, and what they would do differently.

**High-Fidelity Human Patient Simulation (Experimental Group).** The simulation was planned according to the Standards of Best Practice developed by the International Nursing Association for Clinical Simulation and Learning (INACSL, 2016; Motola, Devine, Chung, Sullivan, & Issenberg, 2013). The clinical case scenario was used to develop the simulation in collaboration with certified healthcare simulation educators (CHSE) in the JMU School of Nursing. The simulation was a hybrid simulation that used a high-fidelity simulation manikin, Super Tory® (Gaumard® Scientific, 2017) and an embedded (standardized) participant who performed the role of the bedside nurse. The simulation was piloted prior to the experimental group participating in the simulation in accordance with best practice guidelines (INACSL, 2016).

**Pilot.** A pilot was conducted with three SLPs. Two of the SLPs had graduated from the graduate program one month prior and the third SLP had six years of experience in an adult-only medical setting. None of the SLPs had extensive clinical experience with pediatric feeding and swallowing, consistent with the students in the experimental and control groups. The two recent graduates did have experience using computer-based simulation, but not manikin simulation. The pilot participants were oriented to the environment and participated in all parts of the simulation (prebriefing, scenario, and debriefing). They were assigned roles, just as the students would be assigned for the actual simulation.
The objectives of the pilot were to identify any changes or adjustments needed, work through logistics, and ensure optimal programming of the manikin. As a result of the pilot, the following changes were made: 1) information about the manikin presented in the orientation was expanded to include that the manikin’s mouth was “tight” and how to insert the pacifier or bottle was demonstrated; 2) lubricant was applied to the manikin’s mouth and to the nipples on the prepared bottles; 3) the report given by the embedded participant, assuming the role of the bedside nurse, to the team of SLP students was improved to focus only on relevant information, eliminating detail that would overload the students; 4) the embedded participant (bedside nurse) was only in the room to give the initial report and then she left the room to allow students to conduct the assessment; she then returned to prompt the students to provide a report of their findings and recommendations. In addition, following the pilot, adjustments were made to the manikin’s programming to ensure a logical sequence of responses and programming to student actions. For example, the speed at which changes in sucking rate or other physiologic measures occurred was adjusted to facilitate the students’ evaluation of the infant’s performance.

**Simulation.** One of the CHSE nurses, along with the researcher, programmed the Super Tory® manikin and conducted the scenario for each group of students. In randomly assigned groups of three, students participated in 1) a prebriefing to establish expectations for the simulation experience, 2) a scenario that required students to assess and manage physiologic stability with a Super Tory® manikin, and 3) a debriefing with the researcher who was trained to facilitate simulation debriefing using the Debriefing with Good Judgment model from Rudolph, Simon, Dufresne, & Raemer (2006).
The ability to assess and respond appropriately to maintain an infant’s physiologic stability is a critical foundation of pediatric feeding assessment and intervention. During the simulation scenario, students were required to assess the physiologic stability of a medically-complex infant in preparation for and during oral feeding. Measures reflecting physiologic stability included, but were not limited to: heart rate, respiratory rate, oxygen saturation, color, and arousal. Specific objectives were aligned with the 2014 Standards for the Certificate of Clinical Competence in Speech-Language Pathology (CFCC ASHA, 2013) and the knowledge and skills required of SLPs in special care nurseries (ASHA, 2004).

The simulation scenario also allowed students the opportunity to develop practical skills, such as establishing a baseline assessment, safely swaddling and picking up the infant, and positioning the infant in preparation for oral feeding. Throughout the scenario, students were to monitor the infant’s physiologic status and respond appropriately.

**Procedures**

The control condition occurred during the final five-week block of the fall semester of 2017. The experimental condition occurred during the first five-week block of the summer semester of 2018. Prior to the first class meeting, students were randomly assigned to groups of three to complete the intervention. During the first class meeting students completed the initial assessments, including both knowledge and confidence assessments (pretest), before any instruction. All students, regardless of if they consented for their data to be used, completed all requirements for the course, the intervention, and all measures for this study. Course materials included current literature about the
provision of pediatric feeding and swallowing services across settings. For the second
time point, immediately following the didactic portion of the instruction but prior to the
intervention, students completed the confidence survey (posttest 1). At the third time
point, immediately following the intervention debriefing, students completed the
knowledge assessment (posttest) and confidence survey (posttest 2). Additionally, the
experimental group completed the EPQ and the SET-M at this third time point.

During the week before the final class meeting, all students in both groups were
required to watch and participate in a discussion board about the video “Setting the stage:
Clinical practice in the Neonatal Intensive Care Unit” (Shaker & Zingeser, 2000) in order
to provide them more information about the unique needs of medically-fragile infants and
their families.

**Written Case Study (Control Group).** The case scenario was completed as a
written case study using Qualtrics®. Students in the control group worked in their
randomly-assigned groups of three to complete the case during the last class period.
Prior to beginning the case study, the whole class was prebriefed, during which they were
provided with the objectives of the case study and expectations. During the prebriefing,
students were introduced to the infant they would be assessing during the case study, they
were encouraged to work collaboratively to complete their objective of assessing the
infant’s oral feeding readiness, and any student questions were addressed. All students
had experience using Qualtrics® for other surveys and activities, but the instructor
(researcher) was available throughout the case study for any questions or technical
difficulties. Students had thirty minutes to complete the case study, with most groups
taking approximately 25 minutes to finish. Immediately following the completion of the
case study, the entire class participated in a thirty-minute reflective debriefing during which the instructor facilitated a discussion of students’ questions and how they came to make certain decisions about what to do during their assessment. All students participated and were encouraged to reflect on the case study and discuss what went well, what they would change if they could do it again, and how this might translate to a real infant they might see in the hospital setting. Debriefing a written-case study as a whole class with the instructor facilitating a guided discussion is typical of case-based learning (Krain, 2010).

**High-Fidelity Human Patient Simulation (Experimental Group).** The experimental group completed the case scenario using a high-fidelity human patient simulator, Super Tory®. The high-fidelity simulation experience took place during the final week of the class. Students were randomly assigned in groups (three students per group) and were assigned a time during which they completed the simulation scenario.

**Orientation.** The day before the simulation, students watched a short (7-minute) “Introduction to JMU Nursing Simulation Labs” (Burkhart, 2018) video orienting them to the simulation laboratories and simulation process. Then, in their groups of three, students had a 30-minute orientation in the simulation laboratory. The orientation was conducted by the researcher and the CHSE nurse who programmed the simulator and was going to be facilitating the operation of the manikin during the simulation. A different CHSE nurse, who was performing the role of the embedded participant, was not present during orientation in order for students to fully-embrace her role as the bedside nurse and not a simulation educator. Students were allowed time to explore the space, handle the manikin and equipment, and ask questions in order to become comfortable in the space.
Students were also provided a demonstration of the manikin’s capabilities (e.g., color changes, movements, respirations, sucking).

**Prebriefing.** In alignment with simulation best practices, a prebriefing took place for each group immediately before the simulation to discuss the expectations and objectives of the simulation. Just as with the control group, students in the experimental group were provided basic information about the case (i.e., name, diagnosis, age, reason for referral) before the simulation. Each student was randomly assigned a role to help guide what they would do during the scenario. The three roles, defined by the researcher, were 1) primary assessor who was responsible for baseline assessment and monitoring/assessing physiologic and behavioral stability throughout the scenario; 2) primary feeder who was responsible for obtaining the bottle, transitioning and positioning the infant in preparation for feeding, and providing the bottle feeding if deemed appropriate; and 3) primary communicator who was responsible for facilitating communication within the team, collecting information throughout the assessment, and communicating findings and recommendations with the bedside nurse (embedded participant). During the prebriefing, students discussed their roles and what they anticipated doing during the simulation scenario. The roles were not rigid and students were encouraged to talk, work together, and help each other in the interest of providing the best possible care to the patient.

**Simulation Scenario.** Students entered the room and were greeted by an embedded participant assuming the role of the bedside nurse. The embedded participant was a licensed registered nurse with a Master of Science in Nursing degree and Certified Health Simulation Educator (CHSE) certification. The nurse provided a bedside report
providing details of the infant’s case and the reason for referral. She also reminded the students of where items, such as the bottle, were located in the room. Students had the opportunity to ask questions of the nurse before she left the room, stating “I will be back for your results in a few minutes.” The simulation scenario lasted for an average of 17 minutes, 43 seconds.

**Debriefing.** Immediately following the simulation scenario, students, in their groups of three, participated in a facilitated debriefing with the researcher. Debriefing was conducted in student groups, rather than as a whole class, in order to adhere to best practice guidelines and maintain the integrity of the learning activity by debriefing immediately following completion of the simulation scenario (Cantrell, 2008). The researcher was trained and utilized the “Debriefing with Good Judgement” model (Rudolph et al., 2006; Rudolph, Simon, Rivard, Dufresne, & Raemer, 2007) to ensure consistent debriefing across all student groups. On average, the debriefing sessions were 25 minutes, 7 seconds. There were three phases to the debriefing session: 1) the reaction or decompression phase allowed students an opportunity to vent or express their initial thoughts, feeling, and reactions to the simulation experience, 2) the reflection phase engaged students in discussion with action-inquiry statements based on the simulation, feedback on performance, and information to fill any gap in knowledge and performance, and 3) the summary phase during which the objectives were reviewed and summarized, any final questions or performance gaps were addressed, and students were asked “if you could go back and do one thing differently, what would you change?”

**Fidelity.** Each prebriefing and debriefing was recorded and observed by a CHSE to confirm fidelity. A faculty guide to prebriefing, based on the Debriefing with Good
Judgment model, was used as a checklist and of 80 opportunities across all of the prebriefings, the researcher completed 79 of the items (98.5%). The Debriefing Assessment for Simulation in Healthcare, student version short form (DASH-SV© Short Form; Simon, Raemer, & Rudolph, 2010) is a tool designed for students to rate the overall effectiveness of each element of the debriefing. The DASH-SV was not used as a student rating form, but was used to ensure that the researcher completed all elements of a quality debriefing with each group of students. For the purposes of this fidelity check, elements were rated as observed or not observed. The six elements on the DASH-SV© include the following actions of the researcher: 1) set the stage for an engaging learning experience, 2) maintained an engaging context for learning, 3) structured the debriefing in an organized way, 4) provoked in-depth discussions that led the students to reflect on their performance, 5) identified what students did well or poorly, and why, and 6) helped students to see how to improve or how to sustain good performance. Of the six elements on the DASH-SV©, the researcher was observed to complete all elements with every group indicating 100% consistency of information provided and quality of debriefing.
Chapter IV
Analysis

This sequential, embedded mixed methods study employed a pretest/posttest design comparing student knowledge and confidence in the management of infant physiologic stability following didactic instruction with a written case study or high-fidelity human patient simulation. Both quantitative and qualitative analyses were conducted and integrated for interpretation.

Knowledge

The independent variables were Group (control and experimental) and Time (pretest and posttest). The dependent variable was the total score (number correct out of 10) on the knowledge assessment. It was expected that knowledge, as reflected in number of correct responses, would significantly increase from pretest to posttest for both groups.

To examine the effects of Group and Time on knowledge outcomes, an omnibus 2x2 mixed analysis of variance (ANOVA) was performed with factors of Group (between 2 levels: case study and simulation) and Time point (within 2 levels: pretest, posttest). It was expected that the main effect of Time would be significant, with knowledge scores significantly improving from pretest to posttest. It was hypothesized that there would be no significant difference between the group scores at posttest. Effect size was calculated for all comparisons using partial eta squared ($\eta^2$) and alpha was 0.05.

Group scores were compared at pretest and at posttest, using one-way ANOVAs. Then the degree of change in knowledge over time was calculated as a percentage to examine knowledge assessment changes within each group due to observed differences between groups at baseline. To further examine specific within group changes in
knowledge scores, one-way repeated measures ANOVAs were conducted to compare the pretest and posttest scores for each group. Effect size was calculated as partial eta squared ($\eta^2$) and alpha was 0.05.

**Confidence**

**Quantitative (QUAN).** Confidence surveys had both quantitative and qualitative questions. To answer the question of whether simulation experience results in a greater increase in confidence than a written case study, a 2x3 repeated measures ANOVA was completed to evaluate the groups across time points. Independent variables were Group (between 2 levels: case study and simulation) and Time (within 3 levels: pretest, posttest 1, and posttest 2). The dependent variable was the response to questions answered on a four-point Likert scale. Main effects of Group and Time were expected to be significant with confidence scores improving as a function of time and greater improvement observed with the experimental group as compared to the control. The Group x Time interaction was expected to be significant, reflecting that the two groups changed at different rates, with the experimental group expected to have a greater increase in confidence scores than the control, especially at posttest 2.

A planned, one-way ANOVA conducted to further compare group scores at time point three (posttest 2) to examine effects of the intervention (case study or simulation) on student confidence. It was expected that students in the experimental group would show greater confidence than students in the control group following the intervention. Additional follow up analyses included repeated measure ANOVAs to compare within group effects of time (pretest v. posttest 1 and posttest 1 v. posttest 2) to examine if
greater change occurred following the didactic instruction or the intervention. Effect size was calculated for all comparisons using partial eta squared ($\eta^2$).

**Qualitative (qual).** Qualitative analysis of the open-ended confidence survey questions was conducted to examine factors that influenced participant confidence following class instruction and following the intervention. An inductive coding approach, with no a priori codes, was employed. Two doctoral speech-language pathology students, not participating in the research study, were trained in qualitative coding and served with the researcher as the coding team.

Before beginning initial coding, all three members of the coding team met and reviewed the text to familiarize themselves with the questions and data. A hierarchical coding approach (initial coding, focused coding, and axial coding) was conducted to determine themes related to participant self-assessed confidence and reported change over time. The data were then integrated with the quantitative results and analyses for integration and interpretation.

The coding procedure was a rigorous, multistage process. The coding team first isolated participant responses that indicated factors related to confidence and then examined initial codes that emerged for themes in the text. The team identified two main categories of factors: intrinsic and extrinsic. The researcher and team created an initial codebook and the team coded each text. The team then met again and discussed all codes until consensus was reached on defining and identifying examples of each code in the text; redundancies were removed. The codebook was then updated and the team used these refined codes for focused coding of the all of the transcripts. Any emergent themes identified during focused coding were again brought to the team and were discussed until
consensus was reached. Coders then performed another round of focused coding on the remaining transcripts to strengthen confirmability and credibility. Again, the team met to establish consensus.

The third and final stage of coding was axial coding. First, a code audit of all codes was conducted to identify the frequency with which codes occurred. Codes were then organized and consolidated into broad themes. This stage of axial coding was conducted collaboratively and consensus was obtained for each of the primary themes identified.

**Perceptions of Learning in Simulation**

**Educational Practices Questionnaire.** The EPQ was only administered to the experimental group following the completion of the simulation. The purpose of this measure was to obtain some insight into the students’ experience and perception of learning in simulation. Data were summarized using group means and standard deviations for each question and category. Frequency distributions were examined for trends in the data.

**Simulation Experience Tool – Modified.** The SET-M was only administered to the experimental group following the completion of the simulation. The purpose of this measure was to obtain further insight into which aspects of the simulation process influenced the students’ learning. Data were summarized using group means and standard deviations for each question. Additionally, there was one open-ended question on the SET-M that was qualitatively coded by the primary researcher.
Chapter V
Results

Knowledge

An omnibus, 2x2 mixed analysis of variance (ANOVA) comparing the two groups scores from pretest to posttest indicated a significant interaction of Time and Group \((F(1, 50) = 7.297, p = .009, \eta^2_p = .127)\). There were also significant main effects of Time \((F(1, 50) = 98.369, p < .001, \eta^2_p = .663)\) and Group \((F(1, 50) = 5.010, p = .030, \eta^2_p = .091)\). A follow up one-way ANOVA was conducted to examine the difference between groups at each time point. There was a significant difference between groups at the pretest \((F(1, 50) = 9.757, p = .003, \eta^2_p = .163)\), with the control group performing higher at baseline than the experimental group. There was no significant difference between the groups at posttest \((F(1, 50) = .061, p = .806, \eta^2_p = .001)\). See Figure 4.

Follow up repeated measures ANOVAs were also conducted for each group to examine change in knowledge scores from pretest to posttest. Both groups made statistically significant change from pretest to posttest indicating learning, control group \(F(1, 27) = 31.333, p < .001, \eta^2_p = .537,\) experimental group \(F(1, 23) = 66.194, p < .001, \eta^2_p = .742\). There was a significant difference between the groups at baseline (pretest); therefore, to compare the amount of knowledge gains made by each group, the degree of

![Pre/Post Mean Knowledge Scores](image)

Figure 4. Knowledge scores at pretest and posttest. Both groups made significant improvement in knowledge \((p < .001)\). No significant difference between groups at posttest \((p = .806)\). Error bars: 1 standard deviation.
change from pretest to posttest was calculated as a percentage. The control group began with a mean score of 5.5 and improved to a mean score of 7.3, resulting in a 33% improvement from pretest to posttest. The experimental group began with a mean score of 4.1 and improved to a mean score of 7.2, resulting in a 76% improvement from pretest to posttest. While the groups demonstrated no significant difference in their final knowledge scores at posttest, as hypothesized, the degree of change between the two groups was remarkable, with the experimental group improving from a significantly lower baseline to achieve knowledge scores equal to those of the control group.

Confidence

Quantitative (QUAN). The confidence survey measured student self-efficacy with 17 items with a high level of internal consistency, as calculated by a Cronbach’s alpha of .943. With the dependent variable as the average of each participant’s score across all 17 questions, an omnibus 2x3 repeated measures ANOVA was conducted with Group (2 levels: control and experimental) and Time (3 levels: pretest, posttest 1, and posttest 2) as the independent variables. The assumption of sphericity was not met (Mauchly’s $W = .000$), therefore Greenhouse-Geisser correction was used for interpretation. Illustrated in Figure 6, collapsing across all of the questions, the Group x Time interaction was not significant ($F(1.598, 76.722) = 3.218, p = .056, n_p^2 = .063$) indicating that the degree of change (slope) for each group over time was not significantly different. The main effect of Group was significant ($F(1, 4.322) = 10.645, p = .002, n_p^2 = .182$). The main effect of Time was significant ($F(2, 96) = 229.179, p < .001, n_p^2 = .827$). When collapsed across questions, both groups improved significantly from pretest to posttest 1 ($p < .001$) and from pretest to posttest 2 ($p < .001$). There was
not a significant change in confidence from posttest 1 to posttest 2 ($p = .177$) overall for all questions, see Figure 5.

Follow-up one-way ANOVAs were run to compare group confidence overall for each time point. The experimental group was statistically significantly higher in confidence overall at each time point, as seen in Figure 5. In consideration of the research questions, further analysis was needed to examine the differences between and within groups for each individual question.

For each individual question, one-way ANOVAs were conducted at each time point to gain more meaningful insight to the differences between groups and the change each group made over the three time points (Table 1). At the first time point (pretest), the experimental group had significantly higher confidence ratings than the control group on five items (#1, 2, 3, 4, and 13). At the second time point (posttest 1), the experimental group responded significantly higher than the control group on four items (#3, 13, 15, and 16), two of which were statistically significantly different at time point 1 as well (#3 and #13). At the third time point, the experimental group responded significantly higher than the control group on ten items (#4, 5, 8, 9, 10, 11, 12, 13, 14, and 15), of which only #13 had significantly higher scores for the experimental group at the first and second time
points. Item #13 was “accurately analyzing, interpreting, integrating, and synthesizing information to make accurate impressions and diagnosis.” A few items at each time point did not meet the assumptions of normality, as indicated in Table 1. Therefore, a Mann Whitney U non-parametric test was conducted for those items. The non-parametric and parametric results were compared and there was no difference in significance, therefore only the parametric test results are reported. Table 1 presents the between group comparisons for participant ratings of confidence at each time point for every question.
Table 1.

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*Note. Results of one-way ANOVA at each time point for each question of the confidence survey. Significant findings indicated (*); α < .05. Items that did not meet the assumption of normality is indicated (#). Partial eta squared (\(\eta_p^2\)) was calculated to examine the magnitude of the difference between the groups at each time point, for each question. Per Cohen (1988), 0.01 is a small, 0.06 is a medium, and 0.14 is a large effect. Medium effect sizes are indicated (°) and large effect sizes are indicated (†).
To account for the differences between groups at baseline and to examine the question of whether or not the simulation had an impact on increased confidence among students in the experimental group, the degree of change was calculated. In Table 2, the average percent change in confidence is reported for the questions that had statistically significant group differences at the third time point.

Table 2.

Percent change in confidence over time, for each group

<table>
<thead>
<tr>
<th>Question</th>
<th>Control</th>
<th></th>
<th></th>
<th>Experimental</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1 to Time 2</td>
<td>Time 1 to Time 3</td>
<td>Time 2 to Time 3</td>
<td>Time 1 to Time 2</td>
<td>Time 1 to Time 3</td>
<td>Time 2 to Time 3</td>
</tr>
<tr>
<td></td>
<td>(T1-T2/T1) *100</td>
<td>(T1-T3/T1) *100</td>
<td>(T2-T3/T2) *100</td>
<td>(T1-T2/T1) *100</td>
<td>(T1-T3/T1) *100</td>
<td>(T2-T3/T2) *100</td>
</tr>
<tr>
<td>4</td>
<td>62.16</td>
<td>56.96</td>
<td>-3.21</td>
<td>45.00</td>
<td>82.50</td>
<td>25.86</td>
</tr>
<tr>
<td>5</td>
<td>50.00</td>
<td>41.38</td>
<td>-5.75</td>
<td>36.84</td>
<td>38.60</td>
<td>1.28</td>
</tr>
<tr>
<td>8</td>
<td>2.35</td>
<td>-10.59</td>
<td>-12.64</td>
<td>9.72</td>
<td>19.44</td>
<td>8.86</td>
</tr>
<tr>
<td>9</td>
<td>41.07</td>
<td>44.64</td>
<td>2.53</td>
<td>55.10</td>
<td>65.31</td>
<td>6.58</td>
</tr>
<tr>
<td>10</td>
<td>77.78</td>
<td>75.56</td>
<td>-1.25</td>
<td>89.74</td>
<td>120.51</td>
<td>16.22</td>
</tr>
<tr>
<td>11</td>
<td>80.88</td>
<td>83.72</td>
<td>1.57</td>
<td>86.84</td>
<td>107.90</td>
<td>11.27</td>
</tr>
<tr>
<td>12</td>
<td>85.37</td>
<td>78.05</td>
<td>-3.95</td>
<td>105.88</td>
<td>117.65</td>
<td>5.71</td>
</tr>
<tr>
<td>13</td>
<td>76.74</td>
<td>72.09</td>
<td>-2.63</td>
<td>53.19</td>
<td>59.57</td>
<td>4.17</td>
</tr>
<tr>
<td>14</td>
<td>32.81</td>
<td>34.38</td>
<td>1.18</td>
<td>43.40</td>
<td>54.72</td>
<td>7.90</td>
</tr>
<tr>
<td>15</td>
<td>56.00</td>
<td>54.00</td>
<td>-1.28</td>
<td>62.22</td>
<td>68.89</td>
<td>4.11</td>
</tr>
</tbody>
</table>

Note. T1 = timepoint 1 (pretest), T2 = timepoint 2 (posttest 1), T3 = timepoint 3 (posttest 2)

To further examine the change related to the simulation, an analysis of covariance (ANCOVA) was conducted for each question, using confidence scores at the second time...
point as the covariate. This analysis allowed for comparison between groups, controlling for any differences at the second time point in order to examine the difference between groups as a result of the intervention (posttest 2). The ANCOVA revealed a statistically significant difference between groups at the third time point, following the intervention, on eight items, represented in Figure 6. Effect sizes, partial eta squared ($\eta_p^2$), were calculated to examine the magnitude of the difference between groups for each question, see Table 3. Effect sizes indicated medium-to-large effects for all significant findings. Two items were statistically significant between groups at the level of the one-way ANOVA, but were not significant in ANCOVAs, when controlled for group differences at the second time point. These items were “positioning an infant for oral feeding” and “making appropriate recommendations based on observations and assessment;” however, both were noted to still have medium effect sizes suggesting practical significance between the groups on their confidence.

Table 3.

<table>
<thead>
<tr>
<th>Question</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta_p^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Thoroughly reviewing client history/reason for referral</td>
<td>0.051</td>
<td>.823</td>
<td>.001</td>
</tr>
<tr>
<td>2. Securing necessary information from caregivers and other professionals</td>
<td>0.010</td>
<td>.920</td>
<td>.000</td>
</tr>
<tr>
<td>3. Appropriately responding to questions and concerns from caregivers or other professionals</td>
<td>0.548</td>
<td>.463</td>
<td>.011</td>
</tr>
<tr>
<td>4. Understanding the equipment and monitors at bedside</td>
<td>22.064</td>
<td>&lt;.001*</td>
<td>.315†</td>
</tr>
<tr>
<td>5. Demonstrating the ability to integrate knowledge from academic courses and research to formulate a diagnostic hypothesis</td>
<td>4.137</td>
<td>.047*</td>
<td>.078°</td>
</tr>
<tr>
<td>6. Conducting baseline observation/assessment to determine oral feeding readiness</td>
<td>1.461</td>
<td>.211</td>
<td>.029</td>
</tr>
<tr>
<td>7. Observing performance of the client with insight</td>
<td>1.884</td>
<td>.176</td>
<td>.037</td>
</tr>
<tr>
<td>8. Picking up and holding an infant</td>
<td>22.782</td>
<td>&lt;.001*</td>
<td>.317†</td>
</tr>
<tr>
<td>9. Positioning an infant for oral feeding</td>
<td>3.557</td>
<td>.065</td>
<td>.068°</td>
</tr>
<tr>
<td>10. Assessing infant stability while being held/fed</td>
<td>24.776</td>
<td>&lt;.001*</td>
<td>.336†</td>
</tr>
<tr>
<td>11. Assessing infant's performance with oral feeding</td>
<td>5.533</td>
<td>.023*</td>
<td>.103°</td>
</tr>
<tr>
<td>Question</td>
<td>Mean</td>
<td>Standard Error</td>
<td>Lower 95% CI</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>12. Modifying intervention to improve oral feeding and/or infant stability</td>
<td>4.189</td>
<td>.046*</td>
<td>.079°</td>
</tr>
<tr>
<td>13. Accurately analyzing, interpreting, integrating, and synthesizing information to make accurate impressions and diagnosis</td>
<td>4.810</td>
<td>.033*</td>
<td>.089°</td>
</tr>
<tr>
<td>14. Integrating knowledge from academic courses into assessment interpretation</td>
<td>4.144</td>
<td>.047*</td>
<td>.078°</td>
</tr>
<tr>
<td>15. Making appropriate recommendations based on observations and assessment</td>
<td>3.797</td>
<td>.057</td>
<td>.072°</td>
</tr>
<tr>
<td>16. Verbally explaining results of a pediatric feeding/swallowing assessment</td>
<td>0.187</td>
<td>.667</td>
<td>.004</td>
</tr>
<tr>
<td>17. Providing written results of a pediatric feeding/swallowing assessment</td>
<td>3.210</td>
<td>.079</td>
<td>.061°</td>
</tr>
</tbody>
</table>

**Note.** Results of one-way ANCOVA at the third timepoint, with the second timepoint as the covariate, for each question of the confidence survey. Significant findings indicated (*); $\alpha < .05$. Partial eta squared ($\eta^2_p$) was calculated to examine the magnitude of the difference between groups at each time point, for each question. Per Cohen (1988), 0.01 is a small, 0.06 is a medium, and 0.14 is a large effect. Medium effect sizes are indicated (°) and large effect sizes are indicated (†).
Figure 6. Differences in confidence between groups for items that were statistically significant at the third time point on ANCOVA, when controlled for responses at the second time point. Likert scale responses: 1 = strongly disagree; 4 = strongly agree. Error bars: 1 standard deviation.
Correlations between knowledge scores and confidence ratings were explored to determine if there was any relationship between the students’ knowledge and their feelings of confidence. There were no significant correlations between knowledge and confidence at any time point for either group ($r = -.165$ to $.142; p > .24).

**Qualitative (qual).** Qualitative codes emerged from students’ responses on the confidence survey during the rigorous, multi-stage team coding process. Codes were organized into four primary themes to understand factors that influenced participant confidence in assessing and treating medically-complex infants. These primary themes representing factors that influence student confidence, were: 1) Experience, 2) Related Knowledge, 3) Individual Qualities, and 4) External Sources of Information. One additional theme, Anxiety, also emerged related to students’ feelings of lack of confidence. A breakdown of the proportion of codes from each theme for each question is provided in Figures 7-10.

**Experience.** Overwhelmingly, experience was the most important factor reported by students as influencing their sense of confidence or that they required in order to be confident with medically-complex infants and young children (Figure 7). Experience included clinical experience, hands-on experiences, practice, observing others, and learning from feedback and supervision. Students clearly expressed that hands-on practice was necessary for them to truly feel confident in their skills. One participant stated, “hands-on experience is the most beneficial for me as a professional. I do not feel confident in an area unless I have experienced it first-hand.” And another said, “having experience with these infants will be the only way to feel more confident.”
Students did not anticipate, based on responses at the first time point, that the course would provide them any experience. However, at the third time point, the experimental group reported experience, specifically the simulation, as beneficial to increasing their confidence (Figure 8). One participant reported, “I feel much more confident having had the experience of the simulation lab.” While students in the experimental group indicated that the simulation was a positive experience and increased their confidence, students in both groups did assert that additional opportunities and experiences was necessary for them to feel more confident (Figure 9).

**Related Knowledge.** Knowledge related to the field and to the management of medically-complex infants and children was the second most frequently designated factor impacting confidence (Figure 7). Students consistently, over the three time points, attributed confidence with being knowledgeable and particularly having the foundational knowledge to build upon and receive from coursework and resources provided. Coursework in pediatric feeding and swallowing is necessary for providing students with an adequate foundation of knowledge; students in both the control and experimental groups reported increased knowledge improving their confidence at the second and third time points (Figures 8 and 9).

**Individual Qualities.** A proportion of responses, especially at the first time point, attributed personal qualities, such as being motivated or hard-working, as being an important factor in their confidence (Figures 7 and 8). These intrinsic qualities seem to reassure students of their ability to learn and become competent with this population. For example, one participant stated, that she feels confident because “I am resourceful and able to think quickly in most situations that were unforeseen. I am flexible and adaptable
to new situations.” Additionally, this theme encompassed learned professional qualities, such as the ability to build rapport, communicate with others, and conduct assessments and interventions.

**External Sources of Information.** Outside of their coursework and clinical experience, some students also referred to information or learning from other sources. Some of these sources included independent research, asking questions of professionals (in the field or in related fields), learning through previous job experience, and undergraduate training. Although this theme did not represent a significant proportion of the students’ responses, it encompassed a category that was relevant to understand the sources of confidence among graduate students in the course (Figure 7).

*Figure 7.* Distribution of themes, in percentage of total codes, identifying factors students identified as contributing to their sense of confidence. Students in both groups indicated Experience as the most important factor contributing to their sense of confidence, with Related Knowledge as the second contributing factor.
Figure 8. Distribution of themes, as a percentage of total codes, based on what students expected to gain from coursework. Related Knowledge was identified as most expected from the course and initially neither group anticipated Experience to be a significant benefit. By the third time point, the experimental group identified their experience in simulation as a contributing factor.
Anxiety. One final theme that emerged during coding did not directly respond to the research questions, but did help explain factors related to students’ anxiety with medically-complex infants and young children. These factors were organized into those that were 1) clinician-focused, including: fear of doing harm, making an error, negative outcomes of intervention, and being responsible for an infant’s care or 2) patient-focused, including: the infant’s fragile status, general safety, handling and holding the infant, and working with parents and families in a very stressful situation. The most prevalent source of anxiety was fear of doing harm to the infant or making an error that put the
infant at further risk, as illustrated in Figure 10. Students did indicate that, with additional experience, they anticipated that they would feel more confident.

Integration of QUAN and qual confidence data. The quantitative (QUAN) and qualitative (qual) data obtained from the confidence surveys at each of the three time points were assessed side-by-side and integrated. The qualitative data were used to further understand the results of the quantitative analyses.

Experience was indicated by both groups to be the most substantial factors contributing to their sense of confidence, with related knowledge the second key factor. When examined in relation to the quantitative ratings, the items that the experimental group rated higher in confidence were skills that are learned and developed through
hands-on experience with the medically-complex population. The more general skills, such as reviewing a client’s history or gathering information from caregivers or other professionals, are those that relate to knowledge and can be taught in class and practiced in classroom activities. Both groups demonstrated improved confidence in these areas when they gained the knowledge from coursework.

Working with medically-complex infants and young children is understandably an area that causes anxiety among students. The students in the experimental group indicated greater levels of confidence with clinical skills developed through experience, such as holding an infant, understanding the equipment in the room, assessing infant stability and feeding while being held, and modifying interventions to maintain infant stability. The control group reported increased confidence from pretest to posttest 1. From posttest 1 to posttest 2, the control group had little increase and for several questions an actual decrease in confidence ratings. Students in the control group confirmed that they gained related knowledge from coursework and the written case study, but not experience which aligns with the quantitative changes across time points. With increased knowledge without the opportunity to gain experience, the control group became more aware of the requisite skills for treating medically-complex infants but did not have the opportunity to gain confidence with performing those tasks.

Some of the other skills to which the experimental group responded with greater levels of confidence, including demonstrating the ability to integrate knowledge from academic courses and research to formulate a diagnostic hypothesis and accurately analyzing, interpreting, integrating, and synthesizing information to make accurate impressions and diagnosis may have also been higher for the experimental group
following the simulation because the hand-on opportunity of the simulation allowed them the experience of applying the knowledge gained from coursework.

**Perception of Learning in Simulation**

**Educational Practices Questionnaire.** The EPQ was administered to the experimental group only, as it is a measure of students’ perception of learning in simulation. A Cronbach’s alpha was calculated for this data set to examine internal consistency; a score of .845 for educational practices and .913 for importance indicated reliability with this sample. Descriptive statistics, including means and standard deviations are in Table 4. Responses on this questionnaire were not particularly helpful in responding to the research question and it is possible that this tool was not as sensitive to student learning experience in a one-time simulation as perhaps it might be for evaluating participant perceptions of learning over multiple simulation experiences. Students largely responded positively about their learning experience in the simulation and the importance of each element of the simulation experience to their learning. Consistent with the findings of the SET-M, students did indicate that items related to the prebriefing and debriefing were experienced and were important to their learning. These items on the EPQ, included: “I learned from the comments made by the teacher before, during, or after the simulation,” “I had the chance to discuss the simulation objectives with my teacher,” and “I had the opportunity to discuss ideas and concepts taught in the simulation with my instructor.”
Table 4.

Student responses on the *Educational Practices Questionnaire, Student Version*, experimental group only

<table>
<thead>
<tr>
<th>Educational Practice</th>
<th>Active Learning</th>
<th>Mean (SD)</th>
<th>Count (%)</th>
<th>Count (%)</th>
<th>Mean (SD)</th>
<th>Count (%)</th>
<th>Count (%)</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 4 5</td>
<td>3 4 5</td>
<td>3 4 5</td>
<td>3 4 5</td>
<td></td>
<td>3 4 5</td>
<td></td>
</tr>
<tr>
<td>1. I had the opportunity during the simulation activity to discuss the ideas and concepts taught in the course with the teacher and other students.</td>
<td>4.83 (0.38)</td>
<td>0 (0)</td>
<td>3 (12.5)</td>
<td>21 (87.5)</td>
<td>4.75 (0.44)</td>
<td>0 (0)</td>
<td>6 (25)</td>
<td>18 (75)</td>
</tr>
<tr>
<td>2. I actively participated in the debriefing session after the simulation.</td>
<td>4.75 (0.44)</td>
<td>0 (0)</td>
<td>6 (25)</td>
<td>18 (75)</td>
<td>4.63 (0.49)</td>
<td>0 (0)</td>
<td>9 (37.5)</td>
<td>15 (62.5)</td>
</tr>
<tr>
<td>3. I had the opportunity to put more thought into my comments during the debriefing session.</td>
<td>4.79 (0.41)</td>
<td>0 (0)</td>
<td>5 (20.83)</td>
<td>19 (79.17)</td>
<td>4.67 (0.48)</td>
<td>0 (0)</td>
<td>8 (33.33)</td>
<td>16 (66.67)</td>
</tr>
<tr>
<td>4. There were enough opportunities in the simulation to find out if I clearly understand the material.</td>
<td>4.13 (0.74)</td>
<td>2 (8.33)</td>
<td>14 (58.33)</td>
<td>7 (29.17)</td>
<td>4.67 (0.56)</td>
<td>1 (4.17)</td>
<td>6 (25)</td>
<td>17 (70.83)</td>
</tr>
<tr>
<td>5. I learned from the comments made by the teacher before, during, or after the simulation.</td>
<td>4.96 (0.20)</td>
<td>0 (0)</td>
<td>1 (4.17)</td>
<td>23 (95.83)</td>
<td>4.71 (0.55)</td>
<td>1 (4.17)</td>
<td>5 (20.83)</td>
<td>18 (75)</td>
</tr>
<tr>
<td>6. I received cues during the simulation in a timely manner.</td>
<td>4.42 (0.65)</td>
<td>2 (8.33)</td>
<td>10 (41.67)</td>
<td>12 (50)</td>
<td>4.50 (0.66)</td>
<td>2 (8.33)</td>
<td>8 (33.33)</td>
<td>14 (58.33)</td>
</tr>
<tr>
<td>7. I had the chance to discuss the simulation objectives with my teacher.</td>
<td>4.96 (0.20)</td>
<td>0 (0)</td>
<td>1 (4.17)</td>
<td>23 (95.83)</td>
<td>4.79 (0.41)</td>
<td>0 (0)</td>
<td>5 (20.83)</td>
<td>19 (79.17)</td>
</tr>
<tr>
<td>8. I had the opportunity to discuss ideas and concepts taught in the simulation with my instructor.</td>
<td>4.87 (0.34)</td>
<td>0 (0)</td>
<td>3 (12.5)</td>
<td>20 (83.33)</td>
<td>4.79 (0.51)</td>
<td>1 (4.17)</td>
<td>3 (12.5)</td>
<td>20 (83.33)</td>
</tr>
<tr>
<td>9. The instructor was able to respond to the individual needs of learners during the simulation.</td>
<td>4.55 (0.60)</td>
<td>1 (4.17)</td>
<td>8 (33.33)</td>
<td>13 (54.17)</td>
<td>4.67 (0.56)</td>
<td>1 (4.17)</td>
<td>6 (25)</td>
<td>17 (70.83)</td>
</tr>
<tr>
<td>10. Using simulation activities made my learning time more productive</td>
<td>4.91 (0.29)</td>
<td>0 (0)</td>
<td>2 (8.33)</td>
<td>21 (87.5)</td>
<td>4.83 (0.38)</td>
<td>0 (0)</td>
<td>4 (16.67)</td>
<td>20 (83.33)</td>
</tr>
</tbody>
</table>

**Collaboration**

| 11. I had the chance to work with my peers during the simulation. | 4.96 (0.20) | 0 (0) | 1 (4.17) | 23 (95.83) | 4.92 (0.28) | 0 (0) | 2 (8.33) | 22 (91.67) |
| 12. During the simulation, my peers and I had to work on the clinical situation together. | 4.96 (0.20) | 0 (0) | 1 (4.17) | 23 (95.83) | 4.96 (0.20) | 0 (0) | 1 (4.17) | 23 (95.83) |

**Diverse Ways of Learning**

| 13. The simulation offered a variety of ways in which to learn the material. | 4.50 (0.59) | 1 (4.17) | 10 (41.67) | 13 (54.17) | 4.71 (0.46) | 0 (0) | 7 (29.17) | 17 (70.83) |
| 14. This simulation offered a variety of ways of assessing my learning. | 4.67 (0.48) | 0 (0) | 8 (33.33) | 16 (66.67) | 4.71 (0.55) | 1 (4.17) | 5 (20.83) | 18 (75) |

**High Expectations**

| 15. The objectives for the simulation experience were clear and easy to understand. | 4.63 (0.71) | 0 (0) | 6 (25) | 17 (70.83) | 4.79 (0.51) | 0 (0) | 3 (12.5) | 21 (87.5) |
| 16. My instructor communicated the goals and expectations to accomplish during the simulation. | 4.92 (0.41) | 1 (4.17) | 0 (0) | 23 (95.83) | 4.88 (0.34) | 1 (4.17) | 2 (8.33) | 21 (87.5) |

**Note.** The frequency (count) of responses and percentage for each question. Items were rated on a 5-point Likert scale for educational practice and importance. Responses for ratings of 3 or above are listed. For educational practice, 3 = Undecided, 4 = Agree, 5 = Strongly Agree. For importance, 3 = Neutral, 4 = Important, 5 = Very Important. Few items were rated below “3” on the EPQ.
Simulation Effectiveness Tool – Modified. The SET-M was only administered to the experimental group, as it is a measure of learning in simulation. This measure was sensitive to participant perceptions following one simulation experience and specifically addressed the components of the simulation, which was the focus of this inquiry. One item, “I developed a better understanding of medications” was removed from the survey analysis because it did not apply to this simulation. Internal consistency for this data set was measured by Cronbach’s alpha (.867) and was found to be consistent with the rating reported in the literature (Boling et al., 2016; Elfrink Cordi et al., 2012; Katwa et al., 2018; Leighton et al., 2015). The percent of responses is in Table 5. Using the three-point Likert scale (1 = do not agree, 2 = somewhat agree, and 3 = strongly agree), students were asked to rate their agreement with each statement. As apparent by the frequency of responses, the area with the greatest impact was the debriefing.

There was one open-ended question “[w]hat else would you like to say about today's simulated clinical experience?” This question was examined and coded by the researcher for any information related to student perception or experience with simulation. Of the 24 responses, students referred to the simulation experience as positive 17 times. Students report learning and feeling that the simulation was realistic (six mentions each), which was the goal of creating this high-fidelity simulation that included an embedded participant along with the manikin. Students had the opportunity to apply their knowledge (5) and experienced increased confidence (4), but also indicated that they wanted more opportunities (4).
Note. Students responded to prompts about their simulation experience on a three-point Likert scale. All responses, with the exception of one was rated as “somewhat agree” (2) or “strongly agree” (3), with the majority of ratings in the category of “strongly agree” (3).

### Table 5.

<table>
<thead>
<tr>
<th>Percent of responses on the Simulation Effectiveness Tool-Modified, experimental group only</th>
<th>Mean (SD)</th>
<th>% Do Not Agree (1)</th>
<th>% Somewhat Agree (2)</th>
<th>% Strongly Agree (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prebriefing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Prebriefing increased my confidence.</td>
<td>2.42 (0.50)</td>
<td>0</td>
<td>58%</td>
<td>42%</td>
</tr>
<tr>
<td>2. Prebriefing was beneficial to my learning.</td>
<td>2.92 (0.28)</td>
<td>0</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td><strong>Scenario</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I am better prepared to respond to changes in my patient's condition.</td>
<td>2.88 (0.34)</td>
<td>0</td>
<td>12.50%</td>
<td>87.50%</td>
</tr>
<tr>
<td>4. I developed a better understanding of the pathophysiology.</td>
<td>2.63 (0.49)</td>
<td>0</td>
<td>37.50%</td>
<td>62.50%</td>
</tr>
<tr>
<td>5. I am more confident of my assessment skills.</td>
<td>2.71 (0.46)</td>
<td>0</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>6. I felt empowered to make clinical decisions.</td>
<td>2.67 (0.48)</td>
<td>0</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>7. I had the opportunity to practice my clinical decision-making skills.</td>
<td>2.96 (0.20)</td>
<td>0</td>
<td>4%</td>
<td>96%</td>
</tr>
<tr>
<td>8. I am more confident in my ability to prioritize care and interventions.</td>
<td>2.54 (0.51)</td>
<td>0</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>9. I am more confident in communicating with my patient.</td>
<td>2.65 (0.49)</td>
<td>0</td>
<td>33%</td>
<td>62.50%</td>
</tr>
<tr>
<td>10. I am more confident in my ability to teach patients about the illness and interventions.</td>
<td>2.36 (0.66)</td>
<td>8.33%</td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>11. I am more confident in my ability to report information to health care team.</td>
<td>2.54 (0.51)</td>
<td>0</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>12. I am more confident in providing interventions that foster patient safety.</td>
<td>2.75 (0.44)</td>
<td>0</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>13. I am more confident in using evidence-based practice to provide care.</td>
<td>2.58 (0.50)</td>
<td>0</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td><strong>Debriefing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Debriefing contributed to my learning.</td>
<td>3.00 (0.00)</td>
<td>0</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>15. Debriefing allowed me to verbalize my feelings before focusing on the scenario.</td>
<td>2.92 (0.28)</td>
<td>0</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>16. Debriefing was valuable in helping me improve my clinical judgment.</td>
<td>2.96 (0.20)</td>
<td>0</td>
<td>4%</td>
<td>96%</td>
</tr>
<tr>
<td>17. Debriefing provided opportunities to self-reflect on my performance during simulation.</td>
<td>3.00 (0.00)</td>
<td>0</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>18. Debriefing was a constructive evaluation of the simulation.</td>
<td>3.00 (0.00)</td>
<td>0</td>
<td>0</td>
<td>100%</td>
</tr>
</tbody>
</table>
Chapter VI
Discussion

Speech-language pathologists provide valuable and critical care that supports the neurodevelopment of medically-fragile and complex infants and young children. To effectively deliver services, the SLP must possess foundational knowledge and confidence working with this population. Among the primary goals that SLPs target in the NICU is advancement to oral feeding. Oral feeding is a complex task that requires integration of the infant’s physiologic, motor, state, and interaction subsystems. Early feeding competence can be predictive of long-term developmental outcomes (Griffith, Rankin, & White-Traut, 2017; Jones, 2012). Feeding difficulties arise from interactions between the infant’s subsystems and environment, resulting in behavioral and/or physiologic instability (Als, 2010; Browne & Ross, 2011).

Among the knowledge that the SLP must possess is how to assess an infant’s physiologic and behavioral stability, intervene to support the transition to oral feeding, and to educate caregivers about oral feeding and oral feeding readiness. Further, consistent with Bandura’s (1997) description of self-efficacy, students need to develop confidence and belief in their knowledge and abilities in order to function effectively in unpredictable and novel situations, including management of these complex infants and their families (Bandura, 1997; Franklin & Lee, 2014; Lavoie et al., 2018; Shinnick, Woo, & Mentes, 2011). Surprisingly though, few graduate programs offer a course dedicated to pediatric feeding and swallowing and have limited opportunity for students to work with medically-complex infants (ASHA, 2004; Hall, 2001; Zimmerman, 2016). The findings of this study demonstrate the growth in knowledge and confidence possible with coursework and adds to the growing body of literature demonstrating the benefits of
high-fidelity human patient simulation in preparing graduate students for working with high-risk populations, such as medically-complex infants.

All students gained knowledge from the start of the course to the posttest. As anticipated, there was no significant difference in knowledge between the two groups at the posttest. This finding is consistent with the findings of the large ($N = 666$), multisite and randomized control trial by the National Council of State Boards of Nursing in 2014, which found no significant difference in knowledge among nursing students receiving up to 10%, 25%, or 50% of their clinical hours in simulation (Hayden et al., 2014). Other published studies in nursing have also reported no significant difference in knowledge as a result of simulation, as compared to other instructional approaches (Ferguson & Estis, 2018; Jeffries & Rizzolo, 2006; Kardong-Edgren, Lungstrom, & Bendel, 2009; Scherer, Bruce, & Runkawatt, 2007).

For this investigation, there was a significant difference in knowledge between groups at baseline, therefore the degree of improvement was calculated. The experimental group made a greater degree of growth in their knowledge from pretest to posttest (76% change) than the control group (33% change), indicating that they may have learned more from their starting point. The gain in knowledge associated with coursework contributes to students’ sense of confidence, as highlighted by the themes that emerged from their open-ended responses. As Zimmerman (2016) reported, almost 63% of SLPs who had a dedicated course in pediatric feeding and swallowing indicated that they felt prepared to serve the pediatric dysphagia population, as compared to only 23.3% of those who did not have a course in their graduate programs. If knowledge was the only factor in determining the best teaching approach, then opting for case studies as
the less expensive option would seem logical. While knowledge gained in coursework is critical and supports the need for a course dedicated to pediatric feeding and swallowing, students in both the control and experimental groups consistently reported that hands-on, clinical experience and observation would be necessary to have the confidence to work with the medically-fragile or complex infant population.

Students in graduate programs located in areas without large medical centers may have limited opportunity for hands-on experience with high-risk, medically-complex infants (Hall, 2001). Yet students in this study overwhelmingly accredited experience as the critical factor contributing to their sense of confidence. Chase and Gonzales (2016) found that in their SLP master’s program fear, anxiety, and limited opportunity to apply dysphagia knowledge and skills in previous placements contributed to a disparity between student performance in health care settings versus school settings. Consistent with the findings of this study, lack of opportunity significantly impacts students’ confidence. Affording experiential learning that targets application, synthesis, and reflective evaluation of their knowledge and skills supports further knowledge construction, development of professional skills, and confidence that students need as they enter the field (Chase & Gonzales, 2016; Kolb, 2015; Lavoie et al., 2018).

Students in both conditions made significant change in confidence from pretest to posttest. The greatest degree of change in overall confidence was from the first time point (pretest) to the second time point (posttest 1), following the didactic coursework. Overall, the experimental group was overall more confident than the control group at all time points. To examine the impact of the intervention on confidence, each item at the third time point was analyzed and revealed significant differences between the groups.
The experimental group was significantly more confident on eight of 17 items at the third time point, following intervention, suggesting that the increase in confidence on these items was resulting from the simulation experience.

The learning benefits of simulation are reinforced when considering the specific skills that the experimental group indicated higher confidence than the control group. Skills included, but were not limited to, becoming comfortable with monitors and equipment in a hospital environment, handling an infant and assessing their stability and performance with oral feeding, and modifying intervention to maintain an infant’s stability. These are skills that cannot be taught in a classroom, but must be experienced, and simulation provides hands-on, experiential learning opportunities in a risk-free environment for the development of skills that are not taught through lecture, literature review, or videos. Kolb’s (2015) experiential learning theory is a critical guiding principle for adult learning and simulation-based education. According to Kolb, adult learners seek to be engaged and active in the learning process such that it is necessary for instructors to incorporate authentic opportunities for students to practice applying their knowledge and skills (Kolb, 2015). This student desire for experience and hands-on practice with complex populations is clearly supported by the results of this study.

In graduate programs in speech-language pathology, clinical training is an essential and required component. High-fidelity simulation complements and supplements in-person clinical experiences by providing hands-on opportunities with high-risk patients, such as medically-complex infants. Through simulation the gap between classroom learning and clinical practice can be bridged (Jansen, 2015; Ward et al., 2015). Students who participated in experiential learning through simulation...
demonstrated significantly greater confidence as compared to those who did not have hands-on opportunity to apply the knowledge they gained through coursework. These findings are consistent with documented benefits of simulation and with the literature from nursing (Boling & Hardin-Pierce, 2016; Engum, Jeffries, & Fisher, 2003; Jansen, 2015; Watson et al., 2012).

The advantages of simulation were further supported by the quantitative and qualitative results of the SET-M. Students in the experimental group clearly identified the prebriefing and debriefing as beneficial to their learning experience. They reported that the hands-on practice was effective in improving their confidence because it provided them with an opportunity to apply what was learned in class. This aligns with the nursing literature that supports debriefing as an essential aspect of the simulation experience and highlights the importance that debriefing should be given in the process of supporting students as they connect their knowledge with their experiences (Fanning & Gaba, 2007; Gardner, 2013; Hunter, 2016; Sawyer, Eppich, Brett-Fleegler, Grant, & Cheng, 2016; Shinnick, Woo, Horwich, & Steadman, 2011).

The outcomes of this study demonstrate the ways that simulation benefit students in gaining knowledge and confidence in learning to manage medically-complex infants. Further, students expressed positive perceptions of simulation and its contribution to their knowledge, skills, and confidence, which provides additional support for integrating simulation into graduate programs to provide hands-on experience in a clinical setting with high-risk populations. While other health professions such as medicine and nursing have simulation integrated into professional training, only recently are SLP graduate programs examining the role of simulation in training future SLPs. According to
Dudding and Nottingham (2018), nearly 50% of responding SLP programs indicated that simulation could count for clinical hours, but that barriers such as insufficient funding and limited knowledge of how to conduct simulations impacted integration of simulation into the curriculum. This investigation demonstrates that students’ experience improved knowledge and confidence as a result of one high-fidelity human patient simulation and supports the assertion that graduate SLP programs should determine a strategic approach to effectively using simulation to supplement clinical opportunities with hands-on learning experiences.

Future studies should consider determining optimal iterations, frequency, and variety of simulations. By understanding the ideal dosing, simulation can be most effectively and efficiently integrated into the curriculum, ensuring students are receiving the experiences and opportunities that would best prepare them for entry into the profession. Based on the results of this study, one example would be offering students multiple opportunities in the simulation with different or scaffolded objectives. Initial objectives may focus on comfort in the environment, handling the infant, and performing a basic assessment. Additional experiences can then build on that initial experience by targeting objectives that engage students in developing understanding of the pathophysiology, interacting with a variety of embedded students (i.e., nurses, parents, physicians), and providing report of the assessment in both verbal and written form to other professionals. Additionally, future research should include an exploration of approaches to evaluating students’ clinical skill development and clinical decision-making through simulation.
Limitations of the Current Study

There were limitations of this study that are inherent to the complexity of research in the areas of teaching and learning. Such limitations included convenience sampling of students and having control and experimental groups that were a semester different in the progression of their program sequence which meant that the control group had already take the one-credit Early Intervention course. The Early Intervention course covered general information regarding risk factors for and some implications of preterm birth, some common diagnoses, use of corrected age, and basics of intervention considerations. The knowledge students in the control group gained from Early Intervention may have accounted for some of the difference in knowledge at baseline. However, regardless of the discrepancy in baseline knowledge, there was no significant difference between groups at the posttest. The experimental group rated their confidence higher than the control group, which may have been a result of natural variation in the students in the cohort and their comfort level with infants and young children. There is also the possibility that the students in the experimental group wanted to improve because they knew they were participating in research about simulation, however it should be noted that the experimental group had higher confidence ratings from the start. Such expectancy effects are possible, so to minimize the impact of examiner or group expectations on student performance, students in both groups were provided with the same consent form and were only informed of the expectations of their course to participate in either a case study (control) or simulation (experimental). Specific research questions and hypotheses were not shared with either group.
Conclusions

Students crave more clinical experience to complement their classroom learning. They want to be actively engaged in their learning. They want guided opportunities to apply their theoretical knowledge in authentic clinical situations that are safe and supported by clinical educators. Graduate students know how to take classes and accumulate theoretical knowledge, but they need clinical training to learn how to synthesize and use that knowledge to serve complex patients. With advances in technology, graduate programs can improve the preparation of speech-language pathologists to effectively and confidently manage medically-complex infants and young children. Students in this study demonstrated growth in knowledge with coursework dedicated to pediatric feeding and swallowing and significant increase in confidence with clinical skills following hands-on experience in simulation. Strategic and systematic implementation of high-fidelity simulation into the graduate curriculum will advance the profession by graduating students who enter into practice with the foundational knowledge and confidence upon which to build their skills to effectively manage the care of high-risk and medically-complex patients.
References


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March of Dimes Perinatal Data Center (2011). Special care nursery admissions. National


The Journal of Pediatrics, 164(1), 52-60.e2.


Appendix A. Knowledge Assessment
http://jmu.co1.qualtrics.com/jfe/form/SV_071yc2c9op3lamN

Name (this information will be replaced with a participant number before being viewed by the researchers.)

Please complete the following assessment to the best of your ability. Answer every question completely. This assessment will not apply toward your grade in this course.

1. In many NICUs, readiness to transition to oral feedings is evaluated between ____ weeks because primitive reflexes are present and infants begin to display interest in oral feeding.
   a. 30-32
   b. 32-34
   c. 34-36
   d. 36-38

2. An infant with a respiratory rate above 60 breaths per minute is said to be _________.
   a. Within normal range
   b. Bradycardic
   c. Apneic
   d. Tachypneic

3. What would you recommend if, while bottle feeding a preterm infant, the infant presents with cyanosis?
   a. Stop the bottle feeding
   b. Increase milk flow rate
   c. Continue bottle feeding without modifications
   d. Thicken milk to decrease flow rate

4. Signs of disorganization during oral feeding are often behaviorally observable. List three (3) of these behavioral markers that indicate that an infant is disorganized.

5. Infants are able to communicate when they are ready to engage in interaction and when they are not. List three (3) cues that an infant might communicate to indicate that they are ready to engage in interaction and oral feeding trial.

6. List three (3) physiologic markers of instability that may be observed in an infant having difficulty with oral feedings.

7. According to the Synactive Theory of Development (Als, 1985), in order for an infant to manage complex tasks such as oral feeding, they must first be able to maintain stability in which subsystems?
8. Up until three years old, the infant’s ___________ age is used to measure
development and is calculated as (chronological age - # of weeks premature)

9. ______________ is when an infant’s heart rate decreases below 100 beats per
minute.

10. The brain and sensory organs, along with their neural connections, are highly
influenced by ______________.
Appendix B. Self-Efficacy (Confidence) Survey
http://jmu.co1.qualtrics.com/jfe/form/SV_8igx9UkQJk4YbpX

The purpose of this survey is to better understand your level of confidence in your knowledge and clinical skills in the area of pediatric dysphagia. Additionally, some information about your personality will be collected.

There are four segments to this survey: Background information, Confidence levels (aka self-efficacy), a Ten-Item Personality Inventory (TIPI), and five open-ended questions.

Please complete this survey based on your perceptions as of today. Your individual responses will be confidential and not shared with anyone at the university. Any data shared will be group data with all identifying information removed.

**Background Information**

1. Name: this information will be replaced with a participant number before being viewed by the researchers.

2. Please indicate all of the courses you have completed or are currently enrolled in at the graduate level.
   - CSD 500 Introduction to Research in Communication Sciences and Disorders
   - CSD 522 Communication Disorders of the Traumatically Brain Injured
   - CSD 527 Aging and Communication
   - CSD 528 Autism
   - CSD 529 Augmentative Communication
   - CSD 530 Early Intervention
   - CSD 544 Evaluation and Treatment of Swallowing Disorders
   - CSD 560 Neuromotor Speech Disorders
   - CSD 604 Neuroanatomy and Neurophysiology of Speech and Language
   - CSD 605 Physiological and Acoustical Phonetics
   - CSD 623 Advanced Study of Phonological Disorders
   - CSD 625 Pediatric Dysphagia
   - CSD 632 Processes and Disorders of Speech Fluency
   - CSD 640 Advanced Children's Language Disorders
   - CSD 641 Language Disorders in Adults
   - CSD 651 Disorders of Speech Resonance
   - CSD 656 Voice Disorders

3. What is your approximate GPA in the program? ________

4. In which clinical settings have you had experience? (check all that apply)
   - JMU Speech and Language Clinic
Voice and Swallow Center
Public or Private School Setting
Private Practice
Rehabilitation Center or Nursing Home
Early Intervention
Hospital or Medical Center - Adult
Hospital or Medical Center - Pediatric
Other, Specify __________________________

5. Indicate the approximate number of hours spent in direct client contact to date.
   _____ Adult evaluation
   _____ Adult intervention
   _____ Child evaluation
   _____ Child intervention
   _____ Adult swallowing (dysphagia)
   _____ Pediatric Feeding and/or Swallowing

6. Do you have any prior professional or personal experience with pediatric dysphagia?
   If yes, please explain. ________

7. How many children do you have? ________

8. If you have children, how many of your children were premature? (If you do not have
   children, enter 0) ________

Confidence Levels

9. Rate your present level of confidence for each of the following areas of assessment
   and intervention of pediatric dysphagia. (1 = strongly disagree, 2 = disagree, 3 =
   agree, 4 = strongly agree)

   I feel confident in…
   • Thoroughly reviewing client history/reason for referral
   • Securing necessary information from caregivers and other professionals
   • Appropriately responding to questions and concerns from caregivers or other
     professionals
   • Understanding the equipment and monitors at bedside
   • Demonstrating the ability to integrate knowledge from academic courses and
     research to formulate a diagnostic hypothesis.
   • Conducting baseline observation/assessment to determine oral feeding readiness
   • Observing performance of the client with insight
   • Picking up and holding an infant
   • Positioning an infant for oral feeding
   • Assessing infant stability while being held/fed
- Assessing infant's performance with oral feeding
- Modifying intervention to improve oral feeding and/or infant stability
- Accurately analyzing, interpreting, integrating, and synthesizing information to make accurate impressions and diagnosis
- Integrating knowledge from academic courses into assessment interpretation
- Making appropriate recommendations based on observations and assessment
Appendix C. Educational Practices Questionnaire, Student Version (NLN, 2005)

http://jmu.co1.qualtrics.com/jfe/form/SV_9pKcwE8oPruwqgd

Educational Practices Questionnaire (Student Version)

In order to measure if the best practices are being used in your simulation, please complete the survey below as you perceive it. There are no right or wrong answers, only your perceived amount of agreement or disagreement. Please use the following code to answer the questions.

Use the following rating system when assessing the educational practices:
1 - Strongly Disagree with the statement
2 - Disagree with the statement
3 - Undecided - you neither agree or disagree with the statement
4 - Agree with the statement
5 - Strongly Agree with the statement
NA - Not Applicable; the statement does not pertain to the simulation activity performed.

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>NA</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I had the opportunity during the simulation activity to discuss the ideas and concepts taught in the course with the teacher and other students.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>2. I actively participated in the debriefing session after the simulation.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>3. I had the opportunity to put more thought into my comments during the debriefing session.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>4. There were enough opportunities in the simulation to find out if I clearly understand the material.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>5. I learned from the comments made by the teacher before, during, or after the simulation.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>6. I received cues during the simulation in a timely manner.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>7. I had the chance to discuss the simulation objectives with my teacher.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>8. I had the opportunity to discuss ideas and concepts taught in the simulation with my instructor.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>9. The instructor was able to respond to the individual needs of learners during the simulation.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
</tr>
<tr>
<td>10. Using simulation activities made my learning time more productive.</td>
<td>O 1</td>
<td>O 2</td>
<td>O 3</td>
<td>O 4</td>
<td>O 5</td>
<td>O NA</td>
<td>O 1</td>
<td>O 2</td>
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<td>O 4</td>
<td>O 5</td>
</tr>
</tbody>
</table>
Educational Practices Questionnaire (Student Version)

Use the following rating system when assessing the educational practices:
1 - Strongly Disagree with the statement
2 - Disagree with the statement
3 - Undecided - you neither agree or disagree with the statement
4 - Agree with the statement
5 - Strongly Agree with the statement
NA - Not Applicable; the statement does not pertain to the simulation activity performed.

Rate each item based upon how important that item is to you.
1 - Not Important
2 - Somewhat Important
3 - Neutral
4 - Important
5 - Very Important

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<tr>
<th>Item</th>
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<th>3</th>
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<td>Collaboration</td>
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</tr>
<tr>
<td>11. I had the chance to work with my peers during the simulation.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ NA</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
</tr>
<tr>
<td>12. During the simulation, my peers and I had to work on the clinical situation together.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ NA</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
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<tr>
<td>Diverse Ways of Learning</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>13. The simulation offered a variety of ways in which to learn the material.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ NA</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
</tr>
<tr>
<td>14. This simulation offered a variety of ways of assessing my learning.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ NA</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
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<tr>
<td>High Expectations</td>
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<tr>
<td>15. The objectives for the simulation experience were clear and easy to understand.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ NA</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
</tr>
<tr>
<td>16. My instructor communicated the goals and expectations to accomplish during the simulation.</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
<td>☐ NA</td>
<td>☐ 1</td>
<td>☐ 2</td>
<td>☐ 3</td>
<td>☐ 4</td>
<td>☐ 5</td>
</tr>
</tbody>
</table>
After completing a simulated clinical experience, please respond to the following statements by circling your response.

<table>
<thead>
<tr>
<th>PREBRIEFING:</th>
<th>Strongly Agree</th>
<th>Somewhat Agree</th>
<th>Do Not Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prebriefing increased my confidence</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Prebriefing was beneficial to my learning.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>SCENARIO:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am better prepared to respond to changes in my patient’s condition.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I developed a better understanding of the pathophysiology.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I am more confident of my nursing assessment skills.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I felt empowered to make clinical decisions.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I developed a better understanding of medications. (Leave blank if no medications in scenario)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I had the opportunity to practice my clinical decision making skills.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I am more confident in my ability to prioritize care and interventions</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I am more confident in communicating with my patient.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I am more confident in my ability to teach patients about their illness and interventions</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I am more confident in my ability to report information to health care team.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I am more confident in providing interventions that foster patient safety.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I am more confident in using evidence-based practice to provide nursing care.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>DEBRIEFING:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debriefing contributed to my learning.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Debriefing allowed me to verbalize my feelings before focusing on the scenario</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Debriefing was valuable in helping me improve my clinical judgment.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Debriefing provided opportunities to self-reflect on my performance during simulation.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Debriefing was a constructive evaluation of the simulation.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

What else would you like to say about today’s simulated clinical experience?