JIS Journal of Interdisciplinary Sciences
Volume 4, Issue 1; 28-57
May, 2020. © The Author(s)
ISSN: 2594-3405

Neonatal Intensive Care Unit Communication/Collaboration Among Nursing and Allied Health Students

Lynette Watts*, Randy Case, Jessyca Wagner, Catherine Pankonien and Lauren Jansen
Midwestern State University, Gunn College of Health Sciences and Human Services, USA
lynette.watts@msutexas.edu*

Abstract: *Lack of teamwork among health science students can be especially challenging in emergency settings. A simulated neonatal intensive care (NICU) exercise was held with nursing, radiology, and respiratory therapy students to determine if students valued interdisciplinary education and felt the experience enhanced clinical skills. A mixed methods study was conducted to determine if there was a significant difference in students' perceptions of their resuscitation and professional communication skills after the experience. A t-test addressed the following: H1: There will be an increase in students' perception of their confidence in using their professional skills in a hospital setting after the interdisciplinary communication NICU experience. H2: There will be an increase in students' perception of their ability to communicate with other disciplines after the interdisciplinary communication NICU experience. Students answered six pre-experience open-ended questions and seven post-experience open-ended questions; responses were coded, and multiple themes emerged. Students reported gaining confidence in using their skills within the hospital setting after participating in the experience and reported possessing more high quality interdisciplinary communication skills after participating in the experience. The open-ended questions indicated students valued the simulations, and they felt more prepared to interact in an interdisciplinary manner in the clinical setting. Students also desired more simulations during their education. Limitations were discrepancies in student clinical experiences, sample size, and self-reported levels of communication, skills, and teamwork abilities. This study could determine the potential need for growth and development of interdisciplinary simulation experiences within healthcare education course design and standards.*

Keywords: Interdisciplinary; Simulations; Inter-professional; Communication; Teamwork; Scenarios; Collaboration

Introduction

Because students in respiratory therapy, radiology, and nursing will have to work together as a team in the hospital, especially in emergency situations, they should be taught to work together in a safe environment without experiencing adverse patient consequences (Turner and Harder, 2018). Faculty teaching across disciplines in The Robert D. and Carol Gunn College of Health Sciences and Human Services at Midwestern State University (MSU) identified this gap in learning and have been conducting interdisciplinary communication

experiences since 2013 to ensure students have a fundamental understanding of all nursing and allied health roles in the healthcare setting. Radiology, respiratory therapy, and accelerated program nursing students have been working together to hone communication and teamwork skills through simulated neonatal intensive care unit (NICU) exercises. In the scenarios, twin infants are born prematurely, and soon after birth, experience respiratory distress; to improve the patients' outcomes, all three disciplines must work collaboratively. Prior to the day of the event, faculty across the three disciplines build the scenario, assign roles within their disciplines, group the students so each of the disciplines is represented, and develop a pre- and post-experience survey for data collection of students' perceptions of the activity. Student experiences regarding clinical vary: Respiratory therapy students have some clinical experience while radiology and nursing students have had no clinical experience. However, students are familiar with the equipment they are expected to use in their scenarios.

Although there is support for the use of interdisciplinary simulation experiences as effective in healthcare education (Datta, Upadhyay and Jaideep, 2012; McCoy and Gardner, 2012; Rakhudu, Davhana-Meselesele and Useh, 2016), additional research is necessary to establish the general perceptions and opinions of the students participating in such events. The emphasis of this research was to survey and evaluate student expectations and perceptions of interdisciplinary simulation activities. The surveys asked students a series of pre-experience questions and a series of post-experience questions; based on student responses, faculty will determine if changes in the activity are warranted.

The purpose of the interdisciplinary communication experience was to increase communication and collaboration between the disciplines and to determine if students find value in/feel the interdisciplinary interactions are effective for learning. Although this event has been conducted since 2013, the first formal survey of the event occurred in 2016. Based on those perceptions, the 2017 NICU pre- and post-event surveys were revised. Data collection and analysis was performed in 2017 with the intent on publishing findings to help other health sciences faculty implement similar activities for better student learning outcomes.

Methodology

The research approach for this study was a mixed-methods approach designed to evaluate students' expectations and perceptions of an interdisciplinary simulation experience; a t-test was used to determine if there was a significant difference in students' perception of their skills and communication abilities after the event:

> $H_{1:}$ There will be an increase in students' perception of their confidence in using their professional skills in a hospital setting after the interdisciplinary communication `NICU experience.
> H2: There will be an increase in students' perception of their ability to communicate with other disciplines after the interdisciplinary communication NICU experience.

An interdisciplinary simulation experience was utilized as the experimental situation for the participating students. The simulation necessitated students to work collaboratively during a mock neonatal cardiac/respiratory arrest scenario. Prior to the running the codes, students were asked to participate in a pre-experience survey consisting of six Likert scale questions and two open-ended questions. After participation, students were asked to answer a series of seven Likert scale questions and four open-ended questions as a part of the post-experience survey. The results from the six pre-experience Likert scale questions and the seven post-experience Likert scale questions were evaluated through descriptive statistical analysis, and questions 1 and questions 6 on both surveys were evaluated for significance using a t-test comparison. The pre- and post-open-ended questions were analyzed qualitatively to discover the participating students' expectations and perceptions of the interdisciplinary simulation experience. It should be noted while specific analysis for construct validity and reliability was not conducted, content validity was established after a pilot study was conducted; questions were modified for readability, clarity, and brevity.

In Spring 2017, one scenario was built for different student groups comprised of three disciplines: Respiratory Therapy (20); Nursing (19); and Radiology (20). Student groups consisted of two to three students from each discipline. Students arrived 30 minutes prior to the start of the event to fill out the pre-experience surveys, receive instructions about the mock code, and view a brief PowerPoint presentation on sub-optimal/optimal patient care in emergency situations. While each group waited to "run" their code, they were encouraged to meet their group members, explain what their jobs were within their disciplines, and assign discipline-specific roles for their code. Each code was accomplished in 20 minutes, and when all scenarios were completed, students gathered to complete the post-experience survey; after surveys were completed, faculty conducted a major debriefing/question/answer session. Faculty provided their observations and critical feedback, and students were encouraged to do the same.

Data were collected after obtaining IRB consent (17092902); the data were securely locked in the principle investigator's office files and a secured computer program system. The participants of this study were healthcare education students from MSU. Nursing students were required to participate and instructed if they chose/had to withdraw, they would have to make up their participation in a similar experience in the future. Respiratory therapy students were required to participate because successful completion of the Neonatal Resuscitation Program (NRP) is a requirement for them to attend their NICU clinical rotations; this experience provided exposure to skills used in resuscitating newborns. Radiology students' participation was voluntary; because of scheduling conflicts with other courses, not all students were able to participate. Each discipline had contrasting levels of experience in neonatal resuscitative techniques and procedures. All students participating in the study were informed of the interdisciplinary simulation experience by their professors and were notified of the research study prior to the experience. Participants were notified the confidentiality of all students' personal information and survey data would be protected, and no identifying evidence would be conveyed within the research findings.

A literature review was conducted to provide background information and seminal studies noting how interdisciplinary education benefits healthcare students' education and skill sets.

Background

In 2016, medical errors became the third leading cause of death in the United States, claiming the lives of approximately 250,000 people annually (Makary and Daniel, 2016). It is largely because of these statistics there is a phenomena of patient safety in healthcare today (Gordon, Fell, Box, Farrell and Stewart, 2017). To develop an element of trust between healthcare providers and patients, it is important to disclose medical errors when they occur, and proper training for healthcare workers must be undertaken in this area (Poirier et al., 2017). Not unrelated to the issue of trust are two other areas that need attention: inter-professional communication and team performance (Gordon et al., 2017; New et al., 2015; Poirier et al., 2017).

"Enhancement of communication and collaboration skills enables growth in diplomacy within health care teams managing complex care" (New et al., 2015, 396). One method of providing this training is through simulation. Medical simulation offers numerous strategies for training and safer patient care (Datta, Upadhyay and Jaideep, 2012).

Simulation offers "experiences that are artificially contrived, guided, and manipulated to replicate aspects of real life and evoke similar behaviors in an interactive manner" (Patel and Dennick, 2017, 266.e7). Providing the clinical student an environment where mistakes are forgivable provides those students an opportunity to perform in a stress-free area. It is better for clinical students to experience stressful events in a mock setting than in a real life scenario (Sahu and Lata, 2010;Simko, Henry, McGinnis and Kolessar, 2014). Simulation-based training allows trainees to make mistakes and learn in a safe environment with objective feedback and debriefing (Datta et al., 2012; Patel and Dennick, 2017; Sabir, Aran and Abujudeh, 2014). Additionally, during simulation, learning is faster with greater retention (Sahu and Lata, 2010).

It should be noted that simulation training has been used in a variety of professions for many years: pilots, military personnel, firefighters, and medical personnel all incorporate simulation training into their curriculums (Berragan, 2013; Chetlen et al., 2015; Desser, 2007; Klein and Neal, 2016; Liaw, Palham, Chan, Wong and Lim, 2014; Teixeira et al., 2015). Nursing, physicians, respiratory therapy, and medical imaging have incorporated individual and interdisciplinary simulations into their own professions for some time (Dikshit, Wu, Wu and Zhao, 2005; Papamichail, Pantelis, Papagiannis, Karaiskos and Geourgiou, 2014).

Interdisciplinary collaboration is important in healthcare as the interdisciplinary healthcare team is consistent in care, has a specific purpose, and strives toward positive patient outcomes (International Nursing Association for Clinical Simulation and Learning [INACSL], 2016; Wiecha and Pollard, 2004). Learning to work together with others in the

healthcare setting has demonstrated improved patient outcomes and safety and reduced mortality rates (Maxon et al., 2011; Morey et al., 2002).

Interdisciplinary collaboration also increases satisfaction and reduces tension among healthcare professionals (Maxon et al., 2011). Providing opportunities for students to work together allows them to learn the roles of other disciplines and learn to communicate effectively (Aebersold and Tschannen; 2013). Key components of this type of activity include role clarification, respect for other team members, and open communication. Collaboration between team members of different disciplines has demonstrated increased awareness of each other's knowledge and skills, enhanced decision making, and improved patient outcomes (Maxson et al., 2011).

These simulation programs can be low-, medium-, or high-fidelity (Klein and Neal, 2016) and can be used for both procedural and non-procedural skills. To practice procedural skills, different types of educational tools are utilized: synthetic models, animal models, human cadavers, virtual reality models, part-task trainers, phantoms, and mannequin simulators (Chetlen et al., 2015; Desser, 2007). Multiple uses of simulators include functions such as obtaining patient histories, medication administration via various routes, and overall and focused assessments (Walsh and Wolf, 2012). They provide human-like anatomy and physiology as well as performing functions such as hemodynamic monitoring and respiratory movements (Simko et al., 2014).

Simulation methods using virtual reality, computer software, and role-play are being used for non-procedural skills such as interpretive skills, management of medication reactions, professionalism, and interpersonal and communication skills (Chetlen et al., 2015; Desser, 2007; Klein and Neal, 2016). However, real-life situations such as trauma or caring for age-specific patients require a collaborative, inter-professional team-based approach to patient care (Doumouras, Keshet, Nathens, Ahmed and Hicks, 2014), and managing this team-based approach is not always effectively accomplished using high-fidelity mannequins and virtual reality.

According to New et al. (2015), there is an expectation that students who graduate from healthcare professional programs are ready to work collaboratively, but this assumption is not always the reality. Walsh and Wolf (2012) reported new graduate nurses who have not had the advantage of experiencing clinical mock codes in undergraduate programs have more difficulty with regard to critical thinking; they possess a smaller knowledge base and decreased time management and prioritization skills. Use of inter-professional education could enhance these skill sets, thus better preparing students for the clinical setting. It is important for educators to understand the best way to implement these experiences into current curriculum.

Boet, Dould, Burn and Reeves (2014) offered tips for a successful interdisciplinary simulation activity including focusing on the 'inter-professional' to foster experiential learning, deeper understanding of others' roles, and an awareness of the value of coordinated decision-making; anticipating complex logistical challenges and finding simulation

'champions' from each profession; balancing diversity with equity to ensure no profession is privileged and to help remove hierarchical stereotypes; and developing scenarios that are relevant to all professions. Using simulation to add value within the broader interdisciplinary curriculum rather than as a stand-alone activity, supporting the inter-professional simulation educators, and using teaching opportunities to foster research because inter-professional simulated learning is under-researched are important strategies to honing inter-professional skills (Boet et al., 2014).

Starkweather and Kardong-Edgren (2008) suggested videotaping mock codes to give students a better opportunity to review their performance and critique their communication patterns, behavior, and assessment skills. Videotaping the code also provides them a chance to verbalize their feelings about the experience including what went well and where improvement is needed during debriefing (Starkweather and Kardong-Edgren, 2008).

This brings about another important aspect of interdisciplinary scenarios: pre-briefing and debriefing. It is necessary to put all of the professions on the same page with pre-briefing (Boet et al., 2014). In debriefing, interdisciplinary challenges should be noted, and all professions should be allowed to discuss their perceptions and offer possible solutions (Boet et al., 2014).

Debriefing is the "essential methodology to fully promote thinking along a continuum from 'knowing what' to 'knowing how' and 'knowing why'" (National League for Nursing [NLN], 2015, 2). Simko et al. (2014) concluded true learning takes place during the debriefing stage. This stage not only reinforces learning but enables the participants to "ask questions, clarify misconceptions, reflect on the experience, give a chance to synthesize and reflect on the decisions that were made, critically analyze the simulation, and develop critical thinking skills" (p.101). Cho (2015) expanded on this by stating the benefit of debriefing is that it reduces medical errors, increases communication among team members, and focuses on leadership skills.

Previous research has tested inter-professional simulation education experiences for students in a variety of professional programs (King et al., 2016; Stow, Morphet, Griffiths, Huggins and Morgan, 2017; Thomas, Rybski, Apke, Kegelmeyer and Kloos, 2017). King et al. (2016) developed collaborative experiences for nursing, physiotherapy, and respiratory therapy students; Stow et al. (2017) piloted inter-professional handover simulations for nursing, paramedic, and physiotherapy students; and Thomas et al. (2017) assessed an inter-professional simulation for occupational and physical therapy students. All three studies reported overall beneficial experiences for the students with participants citing improvement in their competencies and skills after completing the scenarios and an increase in confidence levels (King et al., 2016; Stow et al., 2017; Thomas et al., 2017). Students felt well-briefed and supported, received adequate feedback, and considered the simulations to have a high degree of fidelity (Stow et al., 2017). Students also appreciated the opportunity to better understand the roles of other healthcare professionals in the patient care process (King et al., 2016).

Overall, simulation experiences can be beneficial to healthcare professionals by honing individual skills and enhance inter-professional collaboration and team skills. By taking action to cultivate these skills while students are still in professional programs, patient care and safety can be improved once students graduate and begin working. When the simulation experiences are well thought-out, planned, and implemented, students can improve confidence levels, skills, and competencies and demonstrate an appreciation for other healthcare professionals' roles in the patient care process.

Results

Data Analysis – Quantitative

Through a series of pre- and post-experience surveys, data were collected from participating nursing, radiology, and respiratory therapy students. Students were asked a series of Likert scale questions, including six pre-experience survey questions and seven post-experience survey questions, to determine the percentage of students who agreed or disagreed with each statement. The six pre-experience survey questions varied in content; however, general concepts in the questions were structured around students' perceptions of their current abilities within the healthcare environment and their views on utilizing interdisciplinary experiences within the curriculum.

The majority of students surveyed agreed on the importance and value of implementing interdisciplinary experiences into healthcare education. According to question two, "I believe more exposure to hands-on scenarios would improve my clinical skill levels", 100% of all students surveyed agreed or strongly agreed with the statement. Table 1 represents the comprehensive findings for the pre-experience survey results.

Table 1: *2017 Pre-Experience Survey Results*

	2017 Pre-Experience Survey			
Q1	Today, I would feel confident using my patient care skills in the hospital setting.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	5.3	5.0	0.0
	Disagree	52.6	20.0	0.0
	Agree	36.8	55.0	30.0
	Strongly Agree	5.3	20.0	70.0
Total		100	100	100
Q2	I believe more exposure to hands-on scenarios would improve my clinical skills levels.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	0.0	0.0	0.0
	Agree	21.1	15.0	26.3
	Strongly Agree	78.9	85.0	73.7

Total		100	100	100
Q3	I believe that my confidence to perform in an emergency situation in a healthcare setting would increase if I was exposed to more hands-on scenarios and exercises in the classroom.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	5.0
	Disagree	0.0	0.0	0.0
	Agree	26.3	15.0	15.0
	Strongly Agree	73.7	85.0	80.0
Total		100	100	100
Q4	I believe hands-on scenarios incorporating multiple disciplines in healthcare is important in my learning process.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	5.0
	Disagree	0.0	0.0	0.0
	Agree	15.8	10.0	5.0
	Strongly Agree	84.2	90.0	90.0
Total		100	100	100
Q5	I believe using interdisciplinary scenarios would help me gain a better understanding of other healthcare professions.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	5.0
	Disagree	0.0	0.0	0.0
	Agree	31.6	25.0	10.0
	Strongly Agree	68.4	75.0	85.0
Total		100	100	100
Q6	I feel I possess high quality interdisciplinary communication skills.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	26.3	10.0	0.0
	Agree	52.6	45.0	35.0
	Strongly Agree	21.1	45.0	65.0
Total		100	100	100

Similarly, the seven post-experience survey questions varied in content; however, general concepts in the questions were structured around students' perceptions of their current abilities within the healthcare environment and their views on utilizing interdisciplinary experiences within the curriculum after participating in the interdisciplinary exercise.

A significant percentage of students surveyed agreed on the importance and value of implementing interdisciplinary experiences into healthcare education. According to question two, "I believe more exposure to hands-on scenarios would improve my clinical skill levels", 100% of all students surveyed agreed or strongly agreed with the statement. Table 2 represents the comprehensive findings for the post-experience survey results.

Table 2: *2017 Post-Experience Survey Results*

2017 Post-Experience Survey				
Q1	After this exercise, I feel more confident using my skills in the hospital setting	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	15.8	10.0	0.0
	Agree	73.7	65.0	10.5
	Strongly Agree	10.5	25.0	89.5
Total		100	100	100
Q2	I think integrating an interdisciplinary component into a course is a good idea.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	0.0	0.0	0.0
	Agree	10.5	10.0	0.0
	Strongly Agree	89.5	90.0	100.0
Total		100	100	100
Q3	The nature of this experience helped motivate me to perform my role better.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	5.3	0.0	0.0
	Agree	42.1	20.0	5.3
	Strongly Agree	52.6	80.0	94.7
Total		100	100	100
Q4	This experience provided me with skills/knowledge I will be able to use in my career.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	10.5	0.0	0.0
	Agree	47.4	15.0	5.3
	Strongly Agree	42.1	85.0	94.7
Total		100	100	100
Q5	I learned a great deal in this experience.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	5.0

	Disagree	0.0	0.0	0.0
	Agree	31.6	25.0	10.0
	Strongly Agree	68.4	75.0	85.0
Total		100	100	100
Q6	I feel my interdisciplinary communication skills have improved because of this hands-on scenario.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	26.3	10.0	0.0
	Agree	52.6	45.0	35.0
	Strongly Agree	21.1	45.0	65.0
Total		100	100	100
Q7	Overall, I was very satisfied with the quality of this learning experience.	Nursing Student Percentage	Radiology Student Percentage	Respiratory Student Percentage
	Strongly Disagree	0.0	0.0	0.0
	Disagree	26.3	10.0	0.0
	Agree	52.6	45.0	35.0
	Strongly Agree	21.1	45.0	65.0
Total		100	100	100

When comparing the data from the pre- and post-experience surveys, the results of the first question, determining the students' confidence in the use of their skills within the hospital setting (see Table 3), found a significant difference between the means of the pre-survey (M = 0.72) and the post-survey (M = 0.90), (t [59] = 3.09, p < .01). According to the data results, students had more confidence is using their skills within the hospital setting after participating in the interdisciplinary exercise.

Table 3: *t-Test: Paired Two Sample for Means of pre and post-experience surveys of students' confidence in their use of patient care skills in the hospital setting*

	Q1 Pre Confidence	*Q1 Post Confidence*
Mean	0.728814	0.898305
Variance	0.201052	0.092928
Observations	59	59
Pearson Correlation	0.425447	
Hypothesized Mean Difference	0	
df	58	
t Stat	-3.0886	
P(T<=t) one-tail	0.001542	
t Critical one-tail	1.671553	
P(T<=t) two-tail	0.003085	
t Critical two-tail	2.001717	

When comparing the data from the pre- and post-experience surveys, the results of the sixth question, evaluating the students' perceptions regarding their use of high quality interdisciplinary communication skills (see Table 4), found a significant difference between the means of the pre-survey (M = 0.88) and the post-survey (M = 0.97), (t [59] = 2.32, p < .05). According to the data results, students believed they possessed more high quality interdisciplinary communication skills after participating in the interdisciplinary exercise.

Table 4*: t-Test: Paired Two Sample for Means of pre and post-experience surveys of high quality interdisciplinary communication skills*

	Q6 Pre Communication	*Q6 Post Communication*
Mean	0.881356	0.966102
Variance	0.106371	0.033314
Observations	59	59
Pearson Correlation	0.510541	
Hypothesized Mean Difference	0	
df	58	
t Stat	-2.31741	
P(T<=t) one-tail	0.012016	
t Critical one-tail	1.671553	
P(T<=t) two-tail	0.024032	
t Critical two-tail	2.001717	

Similar to the findings of the literature review, the results of the statistical analysis for the research study found students believed they gained better understanding, knowledge, and confidence regarding the use of their patient care skills and interdisciplinary communication skills after participating in the interdisciplinary simulation experience. After reviewing the quantitative data, it was imperative to evaluate the qualitative data regarding participating students' views, thoughts, and perceptions of the interdisciplinary simulation activity.

Data Analysis – Qualitative

The researchers wanted to determine students' perceptions regarding the simulation exercise and if they found value in the experience as preparation for clinical work and communication between other disciplines. Students responded to multiple open-ended questions on both the pre- and post-experience surveys, and the data were coded and analyzed for themes. Please see Figure 1, Pre-experience survey Open-ended Question 1 for sample statements and Figure 2, Post-experience survey Open-ended Question 2 for sample statements.

Pre-experience survey Open-ended Questions, Spring 2017

Question 1, "What do you hope to gain most from this lab experience?" yielded multiple themes: confidence, hands-on experience, communication, interdisciplinary teamwork, and to learn the roles of each discipline.

Confidence

Overwhelmingly, nursing and radiology students noted they hoped to increase their "confidence in skills" (31 comments among 39 students). It should be noted these two disciplines had no clinical experience in the semester this event was held; therefore, students were unsure of their current emergency patient care skills. Three of 20 respiratory therapy students mentioned increased confidence even though they had already had some exposure to the clinical setting.

Hands-on experience

Students within all three disciplines wanted the hands-on experience these scenarios afforded them. Across the three disciplines, there were 22 comments regarding the expectation of hands-on experiences. Although it was not unexpected that nursing and radiology students desired hands-on experience, this theme also emerged among respiratory therapy students who had some prior clinical exposure.

Communication

Although communication developed as a theme, it was not the overwhelming concern for working as an interdisciplinary team (nine total comments from 59 respondents), and the majority of the comments regarding communication came from the respiratory therapy students who were in clinical (six comments). The researchers pondered communication may not have developed among the radiology and nursing students, because from the Likert scale questions, they felt very confident in their communication abilities.

Interdisciplinary teamwork

This theme developed as the most commented on area between the disciplines. There were a total of 39 comments from the 59 students who wanted to learn how to work with other disciplines more effectively. Two radiology students responded from an emotional standpoint of both excitement of the experience itself and truly caring for the patient. Multiple students commented they wanted to truly understand how to work in an emergency situation with the other disciplines involved.

Roles of each discipline

This theme developed from the respiratory therapy and radiology students who were the two disciplines to admit they were unfamiliar with the other disciplines' roles. These responses were unusual from respiratory therapy and may have been based on not knowing these

specific groups of radiology and nursing students. A total of eight comments (four from each discipline) was noted.

Summary of findings

The student comments that resulted in these five themes, confidence, hands-on experience, communication, interdisciplinary teamwork, and the roles of each discipline, were not completely unexpected. The researchers did note some unusual findings, especially among the respiratory therapy students who had some clinical exposure prior to this event. Because of this prior exposure, the researchers were not surprised they had limited comments regarding confidence. There were five comments from respiratory therapy students reporting excitement about the hands-on experience of the scenario, six communication concern comments, 12 comments regarding concern of cohesive teamwork, and four comments related to being unsure of the other disciplines' roles. For future interdisciplinary events, faculty should check their own biases about how each discipline will respond to these open-ended questions.

Table 5: *Pre-experience survey Open-ended Question 1*

Question 1: What do you hope to gain most from this lab experience?	
Confidence	"Increase confidence in skills." (Nursing) "I hope to gain more confidence or see how much I lack." (Nursing) "I hope to gain experience in an emergency situation so that I can gain confidence in my abilities to perform for when I encounter this scenario in real life." (Nursing) "Confidence in an emergency situation I my abilities to provide safe and appropriate interventions." (Radiology) "Become confident in myself in an emergency situation." (Radiology)
Hands-on experience	"A feel for what it would feel like to be in an emergency setting…" (Nursing) "I hope to gain more hands-on experience before we go into clinical" (Nursing) "The experience, and a better feel for hospital scenarios." (Radiology) "More experience in hands-on interdisciplinary communication." (Respiratory Therapy)
Communication	"How to better communicate with other healthcare professions during an emergency situation." (Respiratory Therapy) "To learn how to interact with other medical professionals." (Respiratory Therapy) "Be able to communicate better with all other hospital staff." (Nursing) "I hope to be able to communicate better with other disciplines." (Radiology)

Interdisciplinary teamwork	"Hands-on training with other disciplines." (Nursing) "Experience work with healthcare disciplines" (Nursing) "I hope to gain knowledge on working as a team." (Respiratory Therapy) "I hope to gain team building skills from this experience." (Respiratory Therapy) "I hope to learn to work as a team" (Respiratory Therapy) "I hope to gain high quality interpersonal skills with other healthcare professionals." (Respiratory Therapy) "…hands-on training with other disciplines." (Nursing) "Experience gained from working as a team." (Nursing) "A feel for what it would feel like to be in an emergency setting with everyone being involved." (Radiology) "…understanding how we can all come together for the patient." (Radiology)
Roles of each discipline	"I hope to gain a better understanding of the other disciplines." (Respiratory Therapy) "…to see how the other departments work." (Respiratory Therapy) "I hope I that I can gain a better understanding of how different healthcare workers work together and the roles that they play to make a hospital function." (Radiology) "…understanding how each group function as one." (Radiology)

Question 2, "What do you believe will be the most difficult aspect of working together as an interdisciplinary team?" yielded several themes. It should be noted some comments crossover themes, such as unfamiliarity with the students in the group and communication.

Communication

This was by far the most common theme across all of the disciplines (32 comments out of 59 surveys), and students provided unique insights to the difficulties of communicating in a high-pressure situation. Some students were anxious about teammates "being on the same page" to get the job done efficiently and effectively. Several others across the disciplines expressed trepidation about trying to explain what they had to accomplish without confusing their teammates.

Unfamiliarity with other students/Collaboration

This was an unexpected development and was noted a total of 11 times across all three disciplines. Students in each of the disciplines expressed apprehension about trusting/working with students they had never met. Related to this theme was that of collaboration. Five students across all three disciplines felt collaboration would be an issue related to the lack of knowing the other students and being unfamiliar with their work habits.

Role ambiguity

Eleven of the 59 students across all three disciplines noted they were concerned about not understanding what the roles of the other disciplines. Many of the comments were not knowing what the other disciplines' roles would be, not knowing what the process for each discipline would be, and not understanding how tasks would be delegated.

Summary of findings

Three of the themes which emerged from this question, communication, collaboration, and role ambiguity, were not unusual; however, unfamiliarity with other students was an interesting development. As unfamiliarity with other students emerged as a theme, the researchers considered how the students divided into their own disciplines prior to the experience and began to consider how to address this issue in the future.

Table 6: *Pre-experience survey Open-ended Question 2*

Q2: What do you believe will be the most difficult aspect of working together as an interdisciplinary team?	
Communication	Communication would be the most challenging aspect of working together." (Nursing) "Making sure everyone is on the same page and that no one assumes anything." (Nursing) "Everyone being on the same page and agreeing on each step of the process."(Nursing) "I think the most difficult aspect of working with an interdisciplinary is going to be communication…" (Radiology) "I think the most difficult aspect would be communicating with each other to achieve our one common goal." (Radiology) "Difficulty communicating with team across room." (Radiology) "Speaking respectfully to the other students on a work healthy level." (Radiology) "Getting everyone on the same page to get the task done." (Respiratory) "Communication with other team members." (Respiratory) "Communicating duties." (Respiratory)

Unfamiliarity with students	"Not knowing others and how they work." (Nursing) "Not having a familiarity with the other team member, and quickly being required to work efficiently together." (Nursing) "Not knowing each other and being thrown into a situation having to trust each other." (Nursing) "We have not worked together before so that will make it more difficult." (Nursing) "How others will react in an emergency situation." (Radiology) "I don't want to 'step on anyone's toes'. (Radiology) "We do not know the other people and their skill level." (Respiratory) "Not knowing the other students in nursing and radiology and feeling comfortable with them…" (Respiratory) "…and work with people we are not familiar with." (Respiratory)
Collaboration	"…not overstepping boundaries." (Nursing) "We have not worked together before so that will make it more difficult." (Nursing) "…making sure everyone can do their job without getting in each others way." (Radiology) "I think if one interdisciplinary team does not realize that even though we are different group we must work together." (Radiology) "Sharing leadership role with someone." (Respiratory)
Role ambiguity	"Figuring out everyone's role." (Nursing) "Getting to know what everyone is supposed to be doing. And more especially what I will need to do." (Nursing) "Distribution of roles." (Nursing) "Understanding the roles for each individual." (Nursing) "…understanding our roles in providing health care." (Radiology) …"when to switch roles, knowing who does what and when." (Radiology) "Not knowing what each of their jobs are during the process…" (Radiology) "Learning what roles each discipline will use to work together as a team." (Radiology) "I am not sure what the other disciplines roles would be." (Radiology) "…let them do what they need to do while still doing what I need to do." (Respiratory) "Delegating tasks appropriately…" (Respiratory)

Post-experience survey Open-ended Questions, Spring 2017

Upon completion of the activity and prior to the debriefing sessions, students were asked to fill out the post-experience survey; it should be noted only 58 students answered the open-ended questions. Please see Figures 1-4, Post-survey Open-ended Questions for sample statements.

Question 1, "What did you learn most from this lab experience?" resulted in themes of communication, teamwork, confidence, and skills/knowledge acquisition.

Importance of Communication

Although only 19 comments related to communication as what students learned most, this was an overall goal for this experience. These comments emphasized how important communication between the disciplines was to the success of the entire experience.

Teamwork

Teamwork developed as the most detailed theme from the students. Forty of the comments across all three disciplines reported students appreciated working with other disciplines, teaching other students, learning to be patient with others, and participating in a variety of ways to achieve successful outcomes. Several participants noted being part of the team maximized the process.

Confidence

Confidence emerged as a theme among the nursing and radiology students, with three and five comments recorded, respectively. Several students reported when they were assertive during the event, they felt much more confident in their job duties. Because the respiratory therapy students have experienced clinical rotations, this could be why confidence was not reported as an issue.

Skills/knowledge acquisition

Comments related to skills/knowledge acquisition across all three disciplines were recorded. Ten comments from the 58 students reported skills and knowledge gained in the areas of time management, working with other professionals, focusing on the situation, and performing resuscitation skills. One nursing student recognized deficiencies in performance.

Summary of findings

The four themes of importance of communication, teamwork, confidence, and skills/knowledge acquisition actually reflected the pre-experience survey concerns of what the students perceived to be the most difficult aspect of working with others. The researchers felt increased confidence (nursing and radiology) and increased skills acquisition (all three disciplines) reported by students were evidence of a successful interdisciplinary event.

Table 7: *Post-experience survey Open-ended Question 1*

Question 1. What did you learn most from this experience?	
Importance of	"The importance of effective communication between disciplines and

communication	having roles determined prior to receiving the client." (Nursing) "Speak louder." (Nursing) "It is important to communicate and verbalize throughout the process." (Nursing) "…sometimes you have to be assertive to get things done." (Radiology) "I learned to not be shy when the doctor or other disciplinaries talked to Radiology." (Radiology) "That communication is so so so important." (Radiology) "Without communication no one knew what anyone else was doing." (Radiology) "How to delegate tasks and be patient with healthcare workers in other fields." (Respiratory) "How to communicate with others." (Respiratory) "How to explain things to others who are not familiar." (Respiratory)
Teamwork	"I learned in this experience how to work with other discipline. I helped to do the compressions and bag the baby" (Nursing) "Working as a team…acting fast in emergency situation." (Nursing) "What it looks like to work with other disciplines." (Nursing) "Get a better idea of the whole process." (Nursing) "It is easy to panic in an emergency situation. Keeping calm and assisting where possible whether I know how to or not is important." (Radiology) "When you're not doing anything actively, you need to find ways you can help." (Radiology) "Patience is key when working with others. Team work is always key." (Respiratory) "How to move around people." (Respiratory) "Teamwork can make a code situation go smooth." (Respiratory) "Being able to work as a team and be able to help teach other students." (Respiratory) "…utilize all available hands to maximize efficiency." (Respiratory)
Confidence	"The skills to work with a group effectively and efficiently." (Nursing) "How to efficiently interact and communicate with other disciplines." (Nursing) "…communication is key and when faced with an emergency, ask for help. That taught me how to be confident in myself." (Radiology) "…sometimes you have to be assertive to get things done." (Radiology) "I learned that working with other discipline students is not as intimidating as I had thought." (Radiology)

Skills/knowledge acquisition	"I helped do the compressions and bag the baby." (Nursing) "The skills to work with a group effectively and efficiently." (Nursing) "I learned the correct way to coordinate breaths with compressions, which I didn't know before." (Nursing) "I learned that being in an emergency setting is different in every aspect more than I expected." (Radiology) "How to pay attention to the other interdisciplinary while in a emergency situation." (Radiology) "I learned to give the baby…compressions." (Radiology) "I learned how to work with the other med. professionals & how to utilize them." (Respiratory) "Time management." (Respiratory) "That if one person takes over and is the leader and stays calm everyone else will stay calm." (Respiratory)

Question 2, "What aspect did you enjoy the most?" yielded three major themes: the simulation interaction, teamwork, and skills acquisition.

The simulation interaction

Twenty of the students across the three disciplines reported they most enjoyed the simulation experience itself. Several students noted the scenario felt "real" and "live", even experiencing a "rush of adrenaline." They enjoyed the intense "blind-sided" aspect of the event. It should be noted of the 20 comments, seven came from nursing, 12 were reported from radiology, and one was from respiratory therapy. The researchers assumed the low report rate from respiratory therapy was because of their clinical interactions prior to this event.

Teamwork

This theme by far yielded the most comments among all of the disciplines. A total of 32 comments were recorded that students appreciated being able to work with others outside of their disciplines. Some students reported their teams worked well together, and some reported they were able to share their knowledge with the other disciplines. Related to teamwork was learning the skills of other disciplines. Three nursing students specifically commented they learned what the other professions do and appreciated the roles the other disciplines have in patient care.

Skills acquisition

Radiology and respiratory therapy students reported they learned skills during the event. Some comments were generalizations about learning "new things"; other students noted they learned how to perform resuscitation maneuvers properly (radiology), and others reported they learned how to use equipment they will use in their professions (radiology). One respiratory therapy student reported learning what to do when the radiology students came to take a portable radiograph. It was unexpected the nursing students did not report skills

acquisition from this event. The researchers assumed because some of the nursing students felt underprepared (as noted in some of the pre-experience results), they might not have felt as though they acquired the emergency skills they will eventually need in the clinical setting.

Summary of findings

The three major themes, simulation interaction, teamwork, and skills acquisition provided much insight to what the students need to feel prepared for clinical and where each discipline must focus part of their didactic teaching efforts in a more interdisciplinary manner. While patient care and equipment are taught in each of the disciplines, more emphasis on the equipment used in each discipline should be considered.

Table 8: *Post-experience survey Open-ended Question 2*

Question 2: What aspect did you enjoy the most?	
The simulation interaction	"I enjoyed how we all rushed knowing it was an emergency situation." (Nursing) "The chance to actually seen a scenario like this before getting thrown into a real thing." (Nursing) "I appreciated the intense, chaotic, and surreal situation in which we were placed." (Nursing) "I actually enjoyed the scenario as a whole." (Nursing) "The whole blind-side scenario aspect…the constant emergent action." (Nursing) "I appreciated being able to participate." (Radiology) "The hands-on experience and practicing with other disciplines." (Radiology) "Real hands on experience." (Radiology) "That we got to work with other majors before clinical." (Radiology) "It being a live scenario. It made me feel a little nervous but I wanted to help in any way possible." (Radiology) "The entire experience was amazing." (Radiology) "Getting to be in a situation similar to situations we may face in the hospital without it being a true life or death situation." (Radiology) "The adrenaline rush of a good situation." (Respiratory)

Teamwork	"Working with a team." (Nursing) "I enjoyed working with the students from the different disciplines." (Nursing) "Working w/ other disciplines, although we didn't have enough preparation to be active participants." (Nursing) "The teamwork and group thought." (Nursing) "…seeing how respiratory care intubated the baby." (Nursing) "I appreciated seeing the actions of other disciplines in action." (Nursing) "Learning what other disciplines do." (Nursing) "I liked that my team worked well together & confirmed all issues before proceeding." (Nursing) "Cooperating with others." (Radiology) "The fact that the disciplines were all very willing to work with each other." (Radiology) "I appreciated being able to participate…It helped me to realize…other healthcare prof. roles." (Radiology) "I enjoyed that we were somewhat running the whole emergency on our own as a team." (Radiology) "I enjoyed being able to introduce the other programs to resuscitation of a newborn." (Respiratory) "I enjoyed being able to work w/ the other disciplines. It is always helpful to have extras hands & knowledge." (Respiratory) "Coordinating…enjoyed that we were able to work as a team." (Respiratory) "My team wanting to jump in." (Respiratory) "Seeing how rads comes in to do xray after intubation." (Respiratory)
Skills acquisition	"I enjoyed the fact that I learnt new things." (Radiology) "It helped me realize my role…" (Radiology) "I got to learn to give a newborn chest compressions which I haven't done before." (Radiology) "I enjoyed the experience and knowledge of maneuvering of the machine." (Radiology) "I enjoyed how the nurse made us participate in the beginning w/ the baby." (Radiology) "Learning that you can delegate tasks to other workers to do your job better while still being professional." (Respiratory) "What to do when rads comes in." (Respiratory)

Question 3, "What suggestions would you have for change or improvement?" yielded three themes: more time to practice, pre-scenario instructions, and more scenario experiences.

More time to practice

Thirteen of the 58 surveys across all three disciplines remarked having more time to practice prior to the event would improve the overall experience. Some of the comments were related

to equipment practice, and some comments were related to having some time with the student group to prepare roles and discuss what was about to happen.

Pre-scenario instructions

Related to practice time was the theme of more instruction prior to the scenario. Seven comments across nursing and respiratory therapy expressed they would have felt more prepared had they received more information about the scenario itself. Most of the comments were reported in the nursing students' surveys: they did not know what their roles would be during the experience. Two of the comments from respiratory therapy noted all students should have the same level of knowledge before being involved in the scenario.

More scenario experiences

All three disciplines' students requested more interdisciplinary scenarios such as the NICU experience, with radiology having the most requests (6), then nursing (5), and respiratory (1). Many of the students across all three disciplines reported with more interdisciplinary events, their confidence would be higher going into the clinical setting. Several students noted the experience was educational and fun.

Summary of findings

The three themes of more time to practice, pre-scenario instructions, and more scenario experiences were not unexpected developments. Anecdotally, several of the researchers had heard students say they were very nervous about the event because they had not really prepared for it. These verbal sentiments were expressed in the surveys; they wanted to be more prepared so there was no perception by other disciplines that they were "clueless". Conversely, even though many were frustrated with not feeling prepared, they reported wanting more of these hands-on experiences so they would be prepared for clinical and get to know the other disciplines.

Table 9: *Post-experience survey Open-ended Question 3*

Question 3: What suggestions would you have for change or improvement?	
More time to practice	"…more training than we had going into this." (Nursing) "Nursing students need to go over the lesson about coding NBs before this experience." (Nursing) "Maybe we should illustrate what we are doing so other disciplines will learn, so they can be familiar." (Radiology) "Get a newer portable xray machine and a little more extra practice because I felt lost going into the situation." (Radiology) "Maybe a little more pre-practice before hand so we know more of what to do and it can actually go like a real code would." (Radiology) "I would have liked to have more hands on time before the scenario. I did not know exactly what I needed to be doing during the scenario." (Radiology)

	"As the first group we didn't have any time to discuss w/ our four other partners what we would do. I think just having 5 minutes to sort stuff out would have made it go a lot smoother." (Respiratory) "Everyone have the same amount of practice." (Respiratory)
Pre-scenario instructions	"More preparation and instruction of what we should do and what the other teams would be doing." (Nursing) "Better instruction/information on what exactly the scenario was." (Nursing) "Better prepare nursing & allow them to do their parts." (Nursing) "More education and training for the nurses." (Nursing) "I would suggest other programs get a introduction to clinicals before the interdisciplinary." (Respiratory) "Every discipline being on the same knowledge." (Respiratory)
More scenario experiences	"Do it more often. It will help us better." (Nursing) "I would do more scenarios like this in the program…" (Nursing) "It would be great to have more codes in other classes with a variety of scenarios." (Nursing) "Not only have one a semester. This was educational and fun." (Nursing) "Would love more of this interdisciplinary interactions." (Radiology) "More interdisciplinary simulations so that we can gain more confidence." (Radiology) "I thought this interdisciplinary activity was really good for learning and preparing us for hospitals." (Radiology) "Maybe do this more than once in the spring? Allowing us to become more confident working/talking with student outside our major." (Radiology) "I guess for improvement I would say implementing more interdisciplinary scenarios like this into the program in the future." (Radiology) "To do this more often. I would feel more comfortable at the hospital if I practiced a "mega code" maybe twice every semester." (Respiratory)

Question 4: "What did you find to be the most difficult aspect of working together as an interdisciplinary team?" yielded the three themes of poor communication, need for teamwork, and knowledge/experience.

Poor communication

Twenty-one recorded comments indicated frustration with the communication among the student group members. Some students noted their group members were so focused on their own jobs there was no communication, while other students felt the lack of a group leader led to a breakdown in communication and no clear direction of getting things accomplished. These comments were spread fairly evenly: radiology and nursing students recorded six such comments, and respiratory therapy recorded nine.

Need for teamwork

Nursing and respiratory therapy students specified a lack of teamwork among their student groups, with eight comments coming from nursing and seven reported from respiratory therapy. Only three comments regarding a lack of teamwork were reported among the radiology students. The radiology students reported they felt as though they "were in the way", while some of the respiratory therapy students were frustrated by having more than two people work the code and/or having to step aside so others could help. Nursing students reported issues with respect and trust, with one student noting not following a more assertive student's directions led to some difficulty in the group.

Knowledge/experience

A total of nine comments were recorded across nursing and respiratory that not knowing the other disciplines' roles made accomplishing the common goal difficult. One nursing student pointed out some frustration came in not wanting to seem unprepared. There were seven comments from the respiratory therapy students, with some students making it clear that having to correct/teach classmates about certain skills was difficult.

Summary of findings

Poor communication, need for teamwork, and knowledge/experience were reported as problems during the experience. Students in all three disciplines reported not knowing others and their disciplines' skills, not wanting to "step on others", and no one taking clear command caused a plethora of issues that led to some groups not working well together.

Table 10: *Post-experience survey Open-ended Question 4*

Question 4: What did you find to be the most difficult aspect of working together as an interdisciplinary team?	
Poor communication	"Someone who can distribute roles, so we all know what are doing." (Nursing) "…I think there was uncertainty when communicated because nobody wanted to step on toes or offend." (Nursing) "Communication and organization of tasks." (Nursing) "It was very intensive and everyone talking at the same time." (Radiology) "Communication, because everyone was focused on their job." (Radiology) "Communication. I feel like I'm a little awkward with it right now." (Radiology) "Not enough communicating between the 3 fields. However all of our nerves were on edge because we all wanted to do it correctly." (Radiology) "Better human communication." (Respiratory) "Trying to communicate with the other students and explain what

	steps they need to do." (Respiratory) "Communication, everybody was just too shy." (Respiratory)
Need for teamwork	"Well, to have a leader in the team will be better." (Nursing) "The disciplines in my group were kind of stuck in their own worlds." (Nursing) "Trying to focus on what I'm doing without ignoring others." (Nursing) "Some people were very aggressive and when I did not want to follow her instruction/did not agree with her next step, it was slightly difficult." (Nursing) "Its hard to find the line of control and respect, so that's something I would work on." (Nursing) "Trying to do what we needed to do without getting in the way of what they're doing." (Radiology) "We seemed to kind of get in each other's way a little bit, it was hard to determine when we should take over to get our x-rays done." (Radiology) "I found that I was so used to doing a code by myself or w/ on partner that is was difficult to share the responsibilities." (Respiratory) "Having to step aside to let others help." (Respiratory) "Learning how to incorporate others into a scenario when we're use to only two." (Respiratory) "Coordination." (Respiratory) "Setting roles in the NRP." (Respiratory)
Knowledge/experience	"We did not assign the role of each member which ended up with some team members not knowing what to do." (Nursing) "Not wanting to seem unknowledgeable or unprepared." (Nursing) "The different levels of schooling among the disciplines." (Nursing) "Unsure of the tasks of each discipline." (Nursing) "I didn't know everyones role in the activity so, It was difficult to help out or take action outside must my role." (Radiology) "Helping to do different duties and not really knowing but did it to help." (Radiology) "Not knowing what each departments role is & how we need to make everything run smoothly." (Radiology) "Making sure that the delivered health care was done according to the technique taught in class (e.g. chest compressions being administered in the appropriate location, with proper depth, and rhythm)." (Respiratory) "If there were people who was not sure what to do, it can be hard to try & teach and 'save a baby.'" (Respiratory) "Having to correct teammates throughout the process, i.ed. doses, when to push." (Respiratory)

Discussion

Between pre-survey question 1, "Today, I would feel confident using my patient care skills in the hospital setting" and post-survey question 1, "After this exercise, I feel more confident using my skills in the hospital setting", students reported they gained confidence about using their skills within the hospital setting. Because the results were statistically significant, "H_1: There will be an increase in students' perceptions of their confidence in using their professional skills in a hospital setting after the interdisciplinary communication NICU experience", was accepted. In conjunction with the multiple positive responses gathered from the open-ended questions regarding gaining confidence in using their skills, the researchers felt assured students either acquired skills they had been lacking prior to the interdisciplinary experience or they honed their skills during the experience. The results of this study appear to align with findings in the literature noting interdisciplinary role-play and simulation experiences boost skills knowledge and acquisition (Aebersold and Tschannen, 2013; Boet et al., 2014; Maxson et al., 2011; Simko et al., 2014).

Between pre-survey question 6, "I feel I possess high-quality interdisciplinary communication skills" and post-survey question 6, "I feel my interdisciplinary communication skills have improved because of this hands-on scenario," students reported their interdisciplinary communication skills were higher quality. Because the results were statistically significant, "H_2: There will be an increase in students' perceptions of their ability to communicate with other disciplines after the interdisciplinary communication NICU experience", was accepted. Students' comments regarding how they learned to communicate and/or learned to communicate better with their interdisciplinary teams increased the researchers' confidence that communication skills were learned and/or honed during this event. These results again appear to align with the literature describing interdisciplinary emergency events fostering communication skills acquisition/teamwork (Aebersold and Tschannen, 2013; Chetlen et al., 2015; Desser, 2007; Klein and Neal, 2016).

Although these were the only two questions to be statistically analyzed, it is worth noting the students appreciated participating in the interdisciplinary activity. Many students requested more events such as the NICU simulation, and many students expressed their enjoyment of the high-pressure experience, especially since the "patients" survived; placing students in high-pressure, low stakes environment has been examined in the literature as resulting in positive learning outcomes (Wiecha and Pollard, 2004). One of the most important outcomes for the scenario was students learning about the roles of the other disciplines; this is a critical component for positive outcomes (Aebersold and Tschannen, 2013; King et al., 2016; Maxson et al., 2011).

Limitations

The researchers would be remiss if they did not include limitations of the research study. One identified limitation is the researchers did not collect demographic data; the results may have been different had they compared male to female responses, younger college student to second career college student responses, and different ethnic groups' responses. If this study

is repeated, demographic information should be considered. Another limitation was the level of student education, meaning the respiratory therapy students had some actual clinical experience while the radiology and nursing students had not previously experienced clinical environments. The researchers have noted this as a limitation because the respiratory therapy students appear to have had the advantage of experiencing emergency situations. Their comments reflected high levels of confidence and solid interdisciplinary communication skills prior to the event, which may have indicated a high level of preparedness for the event. Many radiology and nursing students noted feeling underprepared or not prepared at all to experience even a simulated emergency. Because of the comments from these two groups of students, the researchers have already implemented a major change for subsequent interdisciplinary communication experience events: adding a pre-briefing for every group of students (Boet et al., 2014).

Another perceived limitation was the small sample size (pre-survey – n=59; and post-survey – n = 58). All 19 accelerated nursing students were included in the event, as were all 20 respiratory therapy students; however, for the radiology student cohort, the other 22 students were in class during some part of the event. If the 51 students could have been involved in the experience, the outcomes of the surveys may have been significantly altered.

Conclusions

The results of this research can be utilized to determine the potential need for growth and development of interdisciplinary simulation experiences within healthcare education course design and standards. The literature and this study in combination continue to support the need for interdisciplinary education in safe environments, where students can either acquire skills or hone their skills to perform effectively in the clinical setting. Communication and teamwork are critical to successful patient outcomes, and when students are able to identify their shortcomings through safe, yet high intensity, interdisciplinary communication experiences, they are better prepared for clinical experiences.

Implications for Future Research

This study certainly lends itself to future research. Research should be conducted to determine if the discipline with more clinical experiences performs at a higher level; does a particular discipline emerge as dominant or the team leader? If so, what traits or training leads the discipline to lead the team? How do students from each discipline translate the simulation based training to real patients in clinical practice?

References

Aebersold, M. & Tschannen, D. (2013). Simulation in nursing practice: The impact on patient care. OJIN: The Online Journal of Issues in Nursing, 18(2) . doi: 10.3912/OJIN.Vol18No02Man06

Berragan, L. (2013). Conceptualising learning through simulation: An expansive approach for professional and personal learning. Nurse Education in Practice, 13, 250-255. Retrieved from http://dx.doi.org/10.1016/j.nepr.2013.01.004

Boet, S., Bould, M. D., Burn, C. L., & Reeves, S. (2014). Twelve tips for a successful interprofessional team-based high-fidelity simulation education session. Medical Teacher, 36(10), 853-857. doi: 10.3109/0142159X.2014.923558

Chetlen, A. L., Mendiratta-Lala, M., Probyn, L., Auffermann, W. F., DeBenedectis, C. M., Marko, J., … Gettle, L. M. (2015). Conventional medical education and the history of simulation in radiology. Academic Radiology, 22(10), 1252-1267. Retrieved from http://dx.doi.org/10.1016/j.acra.2015.07.003

Cho, S. J. (2015). Debriefing in pediatrics. Korean Journal of Pediatrics, 58(2), 47-51. doi: 10.3345/kjp.2015.58.2.47

Datta, R., Upadhyay, K. K., & Jaideep, C. N. (2012). Simulation and its role in medical education. Medical Journal, Armed Forces India, 68(2), 167-172. doi: 10.1016/S0377-1237(12)60040-9

Desser, T. S. (2007). Simulation-based training: The next revolution in radiology education? Journal of the American College of Radiology, 4(11), 816-824. doi: 10.1016/j.jacr.2007.07.013

Dikshit, A., Wu, D., Wu, C., & Zhao, W. (2005). An online interactive simulation system for medical imaging education. Computerized Medical Imaging and Graphics, 29, 395-404. doi:10.1016/j.compmedimag.2005.02.001

Doumouras, A. G., Keshet, I., Nathens, A. B., Ahmed, N., & Hicks, C. M. (2014). Trauma non-technical training (TNT-2): The development, piloting, and multilevel assessment of a simulation-based, interprofessional curriculum for team-based trauma resuscitation. Canadian Journal of Surgery, 57(5), 354-355. doi: 10.1503/cjs.00814

Gordon, M., Fell, C. W. R., Box, H., Farrell, M., & Stewart, A. (2017). Learning health 'safety' within non-technical skills interprofessional simulation education: A qualitative study. Medical Education Online, 22(1), 1-9. Retrieved from http://dx.doi.org/10.1080/10872981.2017.1272838

International Nursing Association for Clinical Simulation and Learning. (2016). INACSL standards of best practice: SimulationSM simulation design. Clinical Simulation in Nursing, 12, S5-S12. https://doi.org/10.1016/j.ecns.2016.09.005

King, J., Beanlands, S., Fiset, V., Chartrand, L., Clarke, S., Findlay, T., … Summers, I. (2016). Using interprofessional simulation to improve collaborative competences for nursing, physiotherapy, and respiratory therapy students. Journal of Interprofessional Care, 30(5), 599-605. Retrieved from http://dx.doi.org/10.1080/13561820.2016.1189887

Klein, K. A., & Neal, C. H. (2016). Simulation in radiology education: Thinking outside the phantom. Academic Radiology, 23(7), 908-910. Retrieved from http://dx.doi.org/10.1016/j.acra.2016.02.013

Liaw, S. Y., Palham, S., Chan, S. W-C., Wong, L. F., & Lim, F. P. (2014). Using simulation learning through academic-practice partnership to promote transition to clinical practice: A qualitative evaluation. Journal of Advanced Nursing, 71(5), 1044-1054. doi: 10.1111/jan.12585

Makary, M. A., & Daniel, M. (2016). Medical error – The third leading cause of death in the US. BMJ, 353(23), i2139. Retrieved from https://doi.org/10.1136/bmj.i2139

Maxson, P. M., Dozois, E. J., Holubar, S. D., Wrobleski, D. M., Dube, J. A., Klipfel, J. M., & Arnold, J. J. (2011). Enhancing nurse and physician collaboration in clinical decision making through high-fidelity interdisciplinary simulation training. Mayo Clinic Proceedings, 86(1), 31-36. doi: 10.4065/mcp.2010.0282

McCoy, S. K., & Gardner, S. K. (2012). Interdisciplinary collaboration on campus: Five questions. Change, November/December, 44-49.

Morey, J. C., Simon, R., Jay, G. D., Wears, R. L., Salisbury, M., Dukes, K. A., & Berns, S. D. (2002). Error reduction and performance improvement in the emergency department through formal teamwork training: Evaluation results of the MedTeams project. Health Service Research, 37(6), 1553-1581. Retrieved from https://doi.org/10.1111/1475-6773.01104

National League for Nursing [NLN]. (2015). Debriefing across the curriculum: A living document from the National League for Nursing. Retrieved from http://www.nln.org/docs/default-source/about/nln-vision-series-(position-statements)/nln-vision-debriefing-across-the-curriculum.pdf?sfvrsn=0

New, S., Huff, D. C., Hutchison, L. C., Bilbruck, T. J., Ragsdale, P. S., Jennings, J. E., & Greenfield, T. M. (2015). Integrating collaborative interprofessional simulation into pre-licensure health care programs. Nursing Education Perspectives, 36(6), 396-397. doi: 10.5480/13-1108

Papamichail, D., Pantelis, E., Papagiannis, P., Karaiskos, P., & Georgiou, E. (2014). A web simulation of medical image reconstruction and processing as an educational tool. Journal of Digital Imaging, 28, 24-31. doi: 10.1007/s10278-014-9689-9

Patel, R., & Dennick, R. (2017). Simulation based teaching in interventional radiology training: Is it effective? Clinical Radiology, 72(3), 266.e7-266.e14. Retrieved from http://dx.doi.org/10.1016/j.crad.2016.10.014

Poirier, T. I., Pailden, J., Jhala, R., Ronald, K., Wilhelm, M., & Fan, J. (2017). Student self-assessment and faculty assessment of performance in an interprofessional error disclosure simulation training program. American Journal of Pharmaceutical Education, 81(3), 1-8. doi: 10.5688/ajpe81354

Rakhudu, M. A., Davhana-Meselesele, M., & Useh, U. (2016). Concept analysis of collaboration in implementing problem-based learning in nursing education. Curationis, 39(1), e1-e13.

Sabir, S. H., Aran, S., Abujudeh, H. (2014). Simulation-based training in radiology. Journal of the American College of Radiology, 11(5), 512-517. Retrieved from http://dx.doi.org/10.1016/j.jacr.2013.02.008

Sahu, S. & Lata, I. (2010). Simulation in resuscitation teaching and training, evidence based practice review. Journal of Emergencies, Trauma, and Shock, 3(4), 378-384. doi: 10.4103/0974-2700.70758

Simko, L. C., Henry, R., McGinnis, K. A., & Kolesar, A. L. (2014). Simulation and mock code: A safe way for nursing students to learn. Journal of Education and Practice, 4(7), 95-103. Retrieved from https://doi.org/10.5430/jnep.v4n7p95

Starkweather, A. R., & Kardong-Edgren, S. (2008). Diffusion of innovation: Embedding simulation into nursing curricula. International Journal of Nursing Education Scholarship, 5(1), 1-11. Retrieved from http://dx.doi.org/10.2202/1548-923X.1567

Stow, J., Morphet, J., Griffiths, D., Huggins, C., & Morgan, P. (2017). Lessons learned developing and piloting interprofessional handover simulations for paramedic, nursing, and physiotherapy students. Journal of Interprofessional Care, 31(1), 132-135. Retrieved from http://dx.doi.org/10.1080/13561820.2016.1251404

Teixeira, C. R. S., Pereira, M. C. A., Kusumota, L., Gaioso, V. P., Mello, C. L., & Carvalho, E. C. (2015). Evaluation of nursing students about learning with clinical simulation. Revista Brasileira de Enfermagem, 68(2), 284-291. Retrieved from http://dx.doi.org/10.1590/0034-7167.2015680218i

Thomas, E. M., Rybski, M. F., Apke, T. L., Kegelmeyer, D. A., & Kloos, A. D. (2017). An acute interprofessional simulation experience for occupational and physical therapy students: Key findings from a survey study. Journal of Interprofessional Care, 31(3), 317-324. Retrieved from http://dx.doi.org/10.1080/13561820.2017.1280006

Turner, S., & Harder, N. (2018). Psychological safe environment: A concept analysis. Clinical Simulation in Nursing, 18, 47-55. https://doi.org/10.1016/j.ecns.2018.02.004

Walsh, R., & Wolf, L. (2012). Engaging student nurses in mock codes. Journal of Emergency Nursing, 38(2), 182-184. Retrieved from https://www.jenonline.org/article/S0099-1767(11)00681-7/pdf

Wiecha, J., & Pollard, T. (2004). The interdisciplinary eHealth team: Chronic care for the future. Journal of Medical Internet Research, 6(3), 1-6. doi: 10.2196/jmir.6.3.e22

Paper Received October 9, 2019; Accepted January 15, 2020; Published May 2, 2020