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Using high fidelity simulation to impact occupational therapy student knowledge, comfort, and confidence in acute care

Debra M. Gibbs
Belmont University, debra.gibbs@belmont.edu

Mary Dietrich
Vanderbilt University, mary.dietrich@vanderbilt.edu

See next page for additional authors

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Debra Gibbs, EdD, MHS, OTR/L,CAPS, FAOTA; Mary S. Dietrich, PhD; Emmy Dagnan, OTD, OTR/L, CLAT, CPAM

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Using high fidelity simulation to impact occupational therapy student knowledge, comfort, and confidence in acute care

Abstract

Background: As the demand for occupational and physical therapists in acute care settings is increasing, students are reporting a need for increased educational preparation to handle the complexities they may face in this setting. This pretest/posttest study examines the impact of an inter-professional high fidelity simulation experience on perceived levels of knowledge, comfort, and confidence among occupational therapy doctorate students when handling an acutely ill patient in an ICU setting.

Methods: Two cohorts of occupational therapy students participated in an inter-professional acute care scenario with high fidelity simulation mannequins (Cohort 1, n = 19; Cohort 2, n = 27). Before and after the simulation, the students rated their perceived level of knowledge, comfort, and confidence with handling acutely ill patients.

Results: A two-tailed Wilcoxin Signed-Ranks indicated that posttest ranks were statistically significantly higher than pretest ranks with $\alpha = .05$ indicating improvement in students' perceived levels of knowledge, comfort, and confidence after participating in an acute care simulation.

Conclusion: High fidelity simulation can positively impact students' perceptions of their knowledge, comfort, and confidence in handling acutely ill patients.

Keywords

acute care, education, occupational therapy, simulation

Cover Page Footnote

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Complete Author List

Debra M. Gibbs, Mary Dietrich, and Emmy Dagnan

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The use of high fidelity simulation in curricula is emerging and gaining attention as an experiential learning strategy for preparing students for the complex environments they may be faced with in their clinical fieldwork placements (Knecht-Sabres, Kovic, Wallingford, & St.Amand, 2013; Ohtake, Lazarus, Schillo, & Rosen, 2013; Shoemaker, Riemersma, & Perkins, 2009; Smith, Prybylo, & Conner-Kerr, 2012). Students and fieldwork educators suggest there is a need to improve student preparedness to deal with the "complexities of practice" in clinical fieldwork placements (Knecht-Sabres et al., 2013; Lindstrom-Hazel & West-Frasier, 2004, p. 236) and to identify effective teaching strategies to best fulfill this need. While there is a growing body of literature reporting the use of high fidelity simulation in occupational therapy, there are few studies that address its "potential value" (Bethea, Castillo, & Harvison, 2014; Bradley, Whittington, & Mottram, 2013; Shea, 2015, p. 2; Shoemaker et al., 2011; Van Oss, Perez, & Hartmann, 2013). The primary objectives of this study were

- to examine the impact of a high fidelity human patient simulation on students' perceived levels of knowledge, confidence, and comfort when handling an acutely ill patient in an intensive care unit (ICU) and
- to examine student perceptions of the value of simulation as an experiential learning strategy.

In addition, the literature suggests that there is a shortage of therapists willing to work in intensive care environments. Therapists cite inadequate preparation for the demands of the intensive care setting (Stockert & Brady, 2011). Therefore, a secondary objective was to identify whether the exposure to a realistic experience may influence students' perceptions regarding their interest in pursuing future employment in the acute care setting.

Theoretical Underpinnings

Experiential Learning

Schaber (2014) describes experiential learning as one of the signature pedagogies of occupational therapy education requiring "highly contextualized, active engagement" or "learning through doing" (p. S42). This pedagogy is founded in the work of Dewey, Knowles, and Kolb and is defined as "constructing knowledge and meaning from real-life experience" (Yardley, Teunissen, & Dornan, 2012, p. 161). Student reflection is considered an essential component of experiential learning (Hickcox, 2002). Characterized by providing hands-on experiences that allow students to practice skills and apply knowledge learned in the classroom in a realistic clinical setting, experiential learning creates opportunities to build knowledge "through the transformation of experience" (Coker, 2010; Knecht-Sabres, 2013; Kolb & Kolb, 2015, p. 194). In addition, experiential learning has been identified as an important teaching strategy for students to "learn to practice as healthcare professionals" (Yardley et al., 2012, p. 161).

Current occupational therapy research indicates that experience-based learning has a positive impact on clinical reasoning and critical thinking (Coker, 2010; Peloquin & Osbourne, 2003). Knecht-Sabres (2013) concluded that, in addition to improving clinical reasoning skills, experiential learning in occupational therapy is an effective teaching methodology to "(a) enhance the understanding and application of course material [and] (b) improve the personal and professional attributes and skills needed to be an effective clinician" (p. 22). Knecht-Sabres (2013) studied the impact of an experiential learning task on occupational therapy students' perceived preparedness to perform occupational therapy related skills. In the qualitative analysis, confidence and skill level grew through the experiential learning task, resulting in students becoming more "autonomous" in the tasks being performed (Knecht-Sabres, 2013, p. 30).

Self-Efficacy

Student education involves "affecting student attitudes, and actively engaging with students" (Schaber, 2014, p. S43) as educators prepare students to deliver "real-life services" (Yardley et al., 2012, p.161). Occupational therapy student preparation includes developing their attitudes about their abilities or confidence in the tasks they will be required to demonstrate in their clinical fieldwork placements. Bandura (1977) provided a framework to understand how experiential learning may impact a student's confidence or self-efficacy. While the student may know what actions need to be taken (knowledge from course lecture and content), self-efficacy is the belief or confidence in his or her ability to perform those actions successfully (Parker, 2006). A high level of self-efficacy in a student results in the student's perseverance in the face of challenging situations and may influence the student's performance in his or her clinical fieldwork placements (Parker, 2006).

According to Bandura (1977), the most influential source of developing self-efficacy is successful performance accomplishments. Other sources of developing self-efficacy are verbal persuasion, emotional arousal, and vicarious experience. Verbal persuasion involves social interaction and conversation that is intended to shape or enhance the attainment of specific performance abilities (part of the reflective process in experiential learning). Bandura states that individuals may judge their capabilities as ineffective if they experience high levels of physiological responses, such as stress or pain. Vicarious experience can impact self-efficacy if an individual observes others with similar abilities performing successfully and through the competent role modeling that occurs in the students' clinical fieldwork placements.

Simulation

The use of simulation "for the practice of skills, problem solving, and judgment" has its roots in medical simulation, which is defined as "'an imitation of some real thing, state of affairs, or process'" (Rosen, 2008, p. 157). While simulation has a long history in the military and aviation industry, its use in the medical field has been more recent and is becoming a standard component in the training of many health care professions (Bradley, 2006; Bradley et al., 2013; Rosen, 2008; Shoemaker et al., 2009). Simulations can take several forms, and each may mimic reality at varying levels, referring to the fidelity or perceived realism of the simulation by the learner (Bradley, 2006; Shea, 2015). The goal of simulation as described by Shoemaker et al. (2009) is "to provide students a context in which clinical decision-making and procedural skills can be practiced without risk to actual patients" (p.14). Key principles in the design of simulations include providing clear objectives, a sense of realism, a real time opportunity for problem solving appropriate to the learner's level of preparation, support to the student, and reflection.

Shea (2015) outlined several steps in the process of designing simulation experiences. The preparation steps begin by identifying objectives for the experience that are in alignment with the level of the learner's preparedness. The objectives are then used in drafting a case scenario, including determining the clinical environment to replicate an authentic experience and the steps in the scenario that will facilitate the participant to meet the learning objectives. Once the student participant has engaged in the simulation, a postsimulation debriefing occurs between the learner and the faculty facilitator. The debriefing is thought to be the most important element of the learning process. It is in this stage that "the facilitator guides students to reflect on their performance during a clinical simulation, to identify what went right and what went wrong and how they would change their practice in the future" in a safe environment (Mariani, Cantrell, & Meakim, 2014, p. 330).

The use of highly sophisticated computerized human simulators is referred to as high fidelity human simulation (Bradley, 2006; Stockert & Brady, 2011). High fidelity simulations can provide "authentic, clinically relevant opportunities for experiential learning" (Ohtake et al., 2013, p. 217). The computerized full body human simulators can mimic physiological responses of heart rate, pulse, and oxygen saturation. The human simulator is controlled through a computer and can talk and respond, simulating an actual patient. The degree to which the "consequences of actions (or failure to act) in the simulation experience mirrors real life consequences" is referred to as social realism (Kozmenko, Kaye, Morgan, & Hilton, 2008, p. 141). Perceptual realism refers to designing the environment to imitate the real-life situation of the simulation scenario with actual equipment. For example, if the scenario is a patient in an intensive care setting, the room should include a hospital bed and realistic medical equipment and would require the participant to wear the appropriate attire for the setting (Kozmenko et al., 2008). To enhance student learning, the students need to be "engaged within their surroundings if they are to gain applied knowledge" (Yardley et al., 2012, p. 163).

Students born in the 1980s and 1990s have been labeled Generation Y students and have different expectations of education from previous generations. Characteristics identified with this group of students include a preference for hands-on experiential activities, a desire for immediate feedback, being tech savvy, and expecting that technological advances are integrated into the curricula (Bradley et al., 2013; Hills, Ryan, Smith, & Warren-Forward, 2012). Consistent with these features, clinical simulation may be an appropriate teaching strategy for students to develop the technical, psychomotor, and clinical reasoning skills required in the complex acute care and intensive care settings (Ohtake et al., 2013).

Benefits of using clinical simulation have included the improvement of student confidence, comfort, and clinical reasoning abilities (Bambini, Washburn, & Perkins, 2009; Ohtake et al., 2013). Ohtake et al. (2013) found that physical therapy students reported a statistically significant increase in perceived confidence levels in their technical, behavioral, and cognitive skills with the greatest influence in the cognitive measures. Bambini et al. (2009) reported a statistically significant increase in nursing students' reported levels of confidence in performing a postpartum exam after participating in a simulation experience. There are a growing number of studies supporting the use of high fidelity simulation in physical therapy curricula related to teaching the skills needed for acute care and cardiac patient management. These studies indicate that the physical therapy students report an increase in confidence and comfort with acute care knowledge and skills as well as satisfaction with the use of simulation as an educational strategy (Ohtake et al., 2013; Silberman, Panzarella, & Melzer, 2013; Smith et al., 2013). In contrast, while the use of high fidelity simulation in occupational therapy is discussed in the literature as having a growing presence (Bethea et al., 2014; Bradley et al., 2013; Shea, 2015; Van Oss et al., 2013), there is little research regarding the value of high fidelity simulation in occupational therapy and student learning outcomes.

Acute Care as a Complex Environment

Hospital settings care for individuals who have had a recent critical medical condition and a decline in function (American Occupational Therapy Association, 2012). Of the individuals requiring hospitalization, those with life threatening or unstable conditions who need close monitoring by medical staff are cared for in specialized areas, such as ICUs. The growth and use of ICU beds has increased with more than five million patients being admitted to ICUs in the United States annually (Society of Critical Care Medicine, n.d.). Due to the higher medical acuity of the conditions seen in the ICU, the patients in this unit typically require various types of medical supports and treatment interventions, such as urinary catheterization; ventilator support; intravenous (IV) medications; and physiological monitoring, including oxygen saturation (SaO2), blood pressure (BP), and pulse rate (PR) (Popovitch, 2011). As a result, the ICU patient may be immobile and at greater risk for developing further complications that may have long-lasting effects (Holme, 2011). Research supports early mobilization programs using

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occupational therapy personnel for ICUs to prevent and/or minimize the effects of immobilization and help restore function to the patient (Adler & Malone, 2012; American Occupational Therapy Association, 2012).

Stockert and Brady (2011) reported a shortage of physical therapists willing to work in ICUs. They cited students reporting inadequate preparation for the skills needed in the ICU environment and "a dissatisfaction with their professional skill and training related to working in an ICU" (p. 112). Similarly, occupational therapy fieldwork supervisors and students report a need to improve academic preparation, as students are expected to "hit the ground running" and deal with the "complexities of practice" in student fieldwork placements (Lindstrom-Hazel & West-Frasier, 2004, p. 236). In addition, fieldwork opportunities in acute care settings have grown more difficult to attain due to student supervision guidelines, productivity guidelines and standards, and patient safety regulations (Bethea et al., 2014; Bradley et al., 2013; Knecht-Sabres et al., 2013; Lindstrom-Hazel & West-Frasier, 2004). These factors support the need to explore alternative educational strategies, such as simulation, to prepare students to feel ready and actually to be ready to work in complex environments, such as acute care and ICUs, both as fieldwork placements and future settings for employment.

Methods

Design

In this quasi-experimental study, the researchers used a mixed methods design with both quantitative and qualitative research methods of data collection and data analysis. A non-randomized method was used since this research was completed as a component of a course and the simulation experience was required for all students. Quantitative and qualitative methods of data collection and analysis were used in an attempt to get a more complete and holistic view of the results. Including the qualitative data allows the researchers to concentrate on the meanings attached to the experience of the participants (Kielhofner & Fossey, 2006). The university's Institutional Review Board granted approval of this study, and each participant provided informed consent prior to participation.

Participants

Entry-level occupational therapy doctoral students in their second semester of an 8-semester curriculum were invited to participate in this study over a 2-year period. There were 64 eligible students with 32 in each cohort. Forty-six occupational therapy students across 2 years participated in this study (n = 46). In the first cohort, 19 of the 32 occupational therapy students, or 59%, agreed to participate and completed the pre/post surveys. In the second cohort, 27 of the 32 students, or 81%, participated and completed the pre/post surveys. The procedures and surveys were uniform with both cohorts.

Instrumentation

A researcher developed pre/post survey instruments for this study due to the lack of any existing standardized questionnaire addressing the stated objectives. The surveys were not pilot tested; however, faculty with recent acute care and ICU experience validated the surveys as representing appropriate content required for students in the ICU setting. Knowledge, comfort, and confidence were selected as domains that are reflected in the nursing and physical therapy literature and appear to be related to the student interest in pursuing future employment in these settings (Smith et al., 2012).

The pre/post survey asked the students to rate their perceived level of knowledge, confidence, and comfort (domains) in handling an acutely ill patient with an IV, urinary catheter bag, and a heart monitor (skills) using a 5-point Likert scale ranging from 1 (*lowest*) to 5 (*greatest*). The specific skills that the students rated themselves on included:

- Physically assisting an acutely ill patient with IV's move about in the hospital room.
- Physically assisting an acutely ill patient with a urinary catheter bag move about in the hospital room.
- Physically assisting an acutely ill patient with a cardiac monitor move about in the hospital room.

The survey provided an open-ended question to gather qualitative data regarding the students' perceptions of the simulation experience. In addition, the presimulation survey asked the students about their previous experiences in an acute setting (as a patient, volunteer, or observer), if they were interested in working in an acute environment, and whether they felt clinical simulation was a good teaching experience. The pretest and posttest surveys were completed electronically using survey software to collect the data.

Procedure

Preparation tasks included the identification of student objectives for ICU preparation, faculty training in the use of simulation equipment and debriefing techniques, and the development of a simulation scenario (see Appendix A) using a high fidelity mannequin (Laerdal SimMan G3, Laerdal Medical, Wappingers Falls, NY). Occupational therapy faculty with acute hospital and ICU experience developed a realistic case scenario requiring the students to apply classroom concepts and techniques while practicing clinical reasoning skills in response to a planned critical event with the patient (significant changes in heart rate, blood pressure, or oxygen saturation rate). Supporting materials were developed for faculty observations of student performance and feedback (see Appendix B). Occupational therapy students were prepared in their adult interventions course with lectures and labs focusing on acute care and ICU settings prior to the simulation experience. Class content included common diagnoses in the ICU, infection control and safety in an acute care environment, tubes and lines found in this setting, and relevant precautions for consideration by the occupational therapist. Patient handling and mobility techniques were reviewed, demonstrated, and practiced. In addition, safe patient handling guidelines were incorporated into the instruction.

Prior to the day of the simulation, the students were paired into teams. The students were provided with their scheduled simulation time, a general orientation to the simulation lab, and a handout of the observations that would be addressed during the simulation consistent with classroom instruction content (see Appendix A). The students were informed that the simulation would involve entering the room with the treatment goal of mobilizing the patient to the edge of the bed. Following the organization of the simulation, an email request to complete the pre survey was launched to each student.

On the day of the simulation, the students met in a separate area where they reviewed the simulation patient medical chart before entering the simulation lab. Each simulation lasted approximately 7 to 10 min with one faculty member controlling the human simulator and one faculty member observing the students. Following the active simulation, the students engaged with the faculty observer in a 15-min debriefing.

Data Analysis

SPSS Version 23 was used for the quantitative data analyses. Median and 25th to 75th inter-quartile (IQR) were used to summarize the ordinal ratings of knowledge, comfort, and confidence in each of the skill areas (assisting an acutely ill patient with an IV, a urinary catheter, and a heart monitor for each cohort on the pre and posttests). To control for Type I error, a generalized linear model with the gamma log link function (to account for the skewed ordinal distributions) was used to test for interaction effects of cohort (first, second), domain (knowledge, comfort, confidence), skills (IV, catheter, heart monitor), and time of assessment (pre, post). Subsequent posthoc tests were conducted using Mann-Whitney tests for between cohort (first, second) differences. Changes in the values from pre to posttest assessments in the cohorts, domains, and skills were tested using Wilcoxon Signed-Ranks tests. This is a “nonparametric test for repeated measures on the same individuals using an ordinal scale of measurement for the dependent variable” (Payton, 1994, p. 174). Given the initial overall test of statistical significance conducted, the alpha for the individual tests was not corrected. Thus, an alpha of 0.05 ($p < 0.05$) was used for determining statistical significance. Frequency distributions were used to summarize responses to questions related to the use of simulation as a teaching tool and to determine if the student would be interested in working in an acute care environment.

Two faculty members reviewing the students’ comments from the open-ended question in the survey coded qualitative data independently. Triangulation was performed to increase the trustworthiness of the data gathered (Lysack, Luborsky, & Dillaway, 2006). Each faculty analyzed the student comments for identified recurring themes. Faculty then compared their themes and rationale for selection of each reaching a consensus for the final selected themes.

Results

The two student cohort ratings of their knowledge, comfort, and confidence (domains) in handling an acutely ill patient with an IV, urinary catheter, and heart monitor (skills) are summarized in Table 1. There was a statistically significant interaction effect of cohort and question in content and time of assessment (Wald Chi-Square $_{(df=2)}$ = 6.76, $p = 0.034$). This finding suggested that different patterns of changes existed between the cohorts depending on the question or content area. All of the increases in knowledge, comfort, and confidence in each of the domains for each cohort were statistically significant ($p < 0.05$). As can be seen in Table 1, the second cohort had higher ratings of knowledge in each of the skill areas, as well as comfort and confidence regarding the urinary catheter at pretest than the respective ratings for the first cohort ($p < 0.05$). Thus, the interaction effect observed in the overall generalized linear model analysis can be explained by the observation that the increase in knowledge ratings was statistically significantly greater for the first cohort than for the second cohort ($p < 0.01$), largely because their initial knowledge ratings were lower (see Table 1).

Table 1

Summaries of Each Cohort's Ratings of Knowledge, Comfort, and Confidence

	Cohort 1 (N = 19)			Cohort 2 (N = 27)		
	PreTest	PostTest	Change	PreTest	PostTest	Change
Knowledge						
IV	1 [1-2]	4 [3-5]	2 [2-3] [b]	4 [3-5] [a]	5 [4-5]	1 [0-2]
Catheter	1 [1-3]	4 [3-5]	2 [1-3] [b]	4 [4-5] [a]	5 [4-5]	0 [0-1]
Heart Monitor	1 [1-2]	3 [3-4]	2 [1-2] [b]	3 [2-4] [a]	4 [4-5]	1 [0-1]
Comfort						
IV	2 [2-3]	4 [3-4]	1 [0-2]	3 [2-4]	4 [4-5]	1 [1-2]
Catheter	2 [2-3]	4 [3-4]	1 [0-2]	4 [2-4] [a]	4 [4-5]	1 [0-1]
Heart Monitor	2 [2-3]	3 [3-4]	1 [0-2]	3 [2-4]	4 [4-4]	1 [0-2]
Confidence						
IV	3 [2-4]	4 [3-4]	1 [0-2]	3 [3-4]	4 [4-4]	1 [0-1]
Catheter	3 [2-4]	4 [3-4]	1 [0-2]	4 [3-4] [a]	4 [4-5]	1 [0-1]
Heart Monitor	2 [2-4]	4 [3-4]	1 [0-2]	3 [3-4]	4 [4-5]	1 [0-2]

Note. Values in cells are median [25th-75th inter-quartile range]. All of the changes from pre to posttest in each cohort were statistically significant ($p < 0.05$).
[a] Cohort differences on pretest scores ($p < 0.05$).
[b] Statistically significantly greater change from pre-to-post than that observed in the 2nd cohort ($p < 0.01$).

Additional survey questions sought to examine student attitudes about the acute care environment as a consideration for future employment and whether the student had previous exposure to acute care settings as an employee, patient, or volunteer. The students were asked, "After graduation, are you interested in working in an acute care facility?" The difference in the responses to this question from pretest to posttest indicates a positive change in the students' perception of working in an acute care environment. Approximately 42% of the first cohort and 50% of the second cohort answered this question positively on the pretest. After the simulation, 74% of the first cohort and 76% of the second cohort answered this question positively, indicating the student would consider acute care as a consideration for future employment.

Twenty-four students responded to the open-ended question regarding the simulation experience. Several themes emerged from the qualitative responses, including technology, realism, feedback, learning benefit, and anxiety (see Table 2).

Table 2

Qualitative Themes for Both Cohorts

Theme	Frequency	Supporting Statements
Technology	n = 2/24	"Working with the mannequin was better than working with a fellow classmate because [it] does not know what you are doing and will not assist you."
Realism	n = 4/24	"I was able to learn from my mistakes and know for the future how I will respond." "Wonderful way to learn and apply techniques in a real-life situation." "Simulation lab provided us with a more realistic experience."
Feedback	n = 2/24	"Debriefing helped reinforce the importance of the interaction with the patient." "Debriefing portion was extremely helpful."
Learning Benefit	n = 10/24	"Applying learned knowledge to an applicable situation." "I was able to learn from my mistakes and know for the future how I will respond." "Cemented important protocols and things to be aware of in this setting." "Feel more confident."
Anxiety	n = 3/24	"I was nervous in the beginning." "Need more time to understand what we will be doing to alleviate the anxiety of the process."

Discussion

While there have been some reports of occupational therapy educators using high fidelity simulation to teach specific skills (Bethea et al., 2014; Van Oss et al., 2010), no literature could be found that identified the specific benefits of its use with occupational therapy students. There is some evidence that student confidence increases with experiential learning (Knecht-Sabres, 2013). However, this is the first study to demonstrate that the use of high fidelity simulation improves students' perceptions of their knowledge, comfort, and confidence in handling an acutely ill patient while managing the typical medical lines of a urinary catheter, an intravenous line, oxygen, and a heart monitor.

The results of this study indicate that both cohorts of students had statistically significant higher rankings of their perceived knowledge, confidence, and comfort after engaging in the simulation experience. Of note, while the rankings in both cohorts increased, the second cohort had higher mean pretest rankings. This finding may be attributed to the instructors' response to the comments from the first cohort requesting more preparation, content specific to simulation, and adding course materials prior to the simulation.

Consistent with the findings of Smith et al. (2012), the occupational therapy students expressed a preference for the human simulator. The students reported that the human simulator was more realistic, stating that the ability to see the physiologic changes made an impact on their learning. The students recognized that the human simulator (mannequin) was helpful in creating the realism of the simulation event, reporting, "They do not know what you are doing and will not assist you." As explained by Bandura (1977), the most influential factor to impact self-efficacy is successful performance which, in this instance, was the completion of the simulation experience (mobilizing the patient to the edge of bed while also responding to some physiological event). The students' responses in the qualitative data showed that participation in simulation had positive learning benefits.

Verbal persuasion as a factor to develop self-efficacy is evident, as one student reported the debriefing as "extremely helpful." While debriefing allows the students to explore their experience and recognize their strengths or areas for improvement, it also validates their experience and learning as they receive feedback from a faculty member. In addition, the students commented that the debriefing helped to "reinforce the importance of the interaction with the patient." The debriefing reflection has been shown to benefit student learning as it allows students to reflect on their experience and its implications for their future practice and learning needs (Mariani et al., 2014).

Bandura (1977) identified physiological response as a factor that may impact self-efficacy. In this study, the qualitative data theme of anxietyindicated that the simulation experience did raise the students' levels of arousal. This is consistent with reports of other researchers regarding simulation experiences. Ohtake et al. (2013) reported student anxiety as a qualitative theme in their study of physical therapy students in a critical care simulation experience. This anxiety may have been present as a normal tension of new learning.

The students' confidence in their ability to perform acute care tasks (preparedness) influenced their interest in acute care settings for future employment. High fidelity simulation as an educational strategy was strongly supported in this study, with 100% of the students responding affirmatively. Other researchers have identified similar findings supporting students' preference for experiential learning (Knecht-Sabres et al., 2013; Shoemaker et al., 2009; Smith et al., 2012).

Limitations

The students who participated in this experiential study were a convenience sample from two classes at one university; therefore, caution

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should be used in generalizing these results. As the students self-selected to participate in this study, the results are subject to selection bias. In addition, the lack of a control group to compare simulation with other learning approaches is a limitation. Simulation-based teaching was supported in this study for a small portion of the tasks and skills required of occupational therapists. While there are multiple behavioral, cognitive, and psychomotor components that can be included in simulation-based teaching, the limited area of practice that this represents should be considered.

Limitations to the use of high fidelity simulation in an occupational therapy curriculum are the availability of a simulation lab with high fidelity mannequins, the expense of the mannequins, the training to use and operate the mannequins, and the time commitment by faculty members. While each scenario only takes 7 to10 min with a debriefing period of at least 15 min, providing each student with an opportunity to participate in the simulation can require 6 to 8 hr for a typical class size of 32 to 34 students with four faculty members. As class sizes continue to grow, it will become increasingly difficult to provide adequate time for each student to get exposure to the simulation experience. An additional barrier for consideration is the scheduling and coordination of simulation labs, as they are being integrated more across multiple health care educational groups, including nursing, pharmacy, respiratory therapy, and medicine.

Conclusion

The purpose of this study was to determine the impact of a high fidelity clinical simulation experience on occupational therapy students' perceived knowledge, confidence, and comfort in handling an acutely ill patient requiring the medical devices of a urinary catheter, heart monitor, IV, and oxygen. In addition, the researchers were interested in how a simulation of an acute care patient would influence students' interest in this setting for future employment. The results of this mixed methods study indicated that after participating in a simulation of an acutely ill patient, students' ratings of their comfort, confidence, and knowledge increased significantly. In addition, the students' responses indicated an increased interest in the acute care setting for future employment. These results support the use of high fidelity simulation as an experiential teaching strategy to impact students' confidence, comfort, and knowledge in the acute care environment and influence whether the students pursue future employment in these settings.

Debra Gibbs, EdD, MHS, OTR/L, CAPS, FAOTA *received her occupational therapy education from the University of Florida and her doctorate in Organizational Leadership from the University of Sarasota. She has been an OT practitioner for 35 years working in a variety of settings. The American Occupational Therapy Association awarded Dr. Gibbs the distinction of Fellow in 2008 for "Promoting the Development of Occupational Therapy Practice." She is an assistant professor at Belmont University in Nashville, TN. Her research interests include professional behaviors, participation for the aging adult, community service delivery, and the use of clinical simulation in education.*

Mary S. Dietrich, PhD, MS *is a Professor of Statistics and Measurement in the Schools of Medicine and Nursing at Vanderbilt University and adjunct faculty in the School of Occupational Therapy at Belmont University. She is a co-*

investigator or consultant on a diverse array of funded research studies. Examples include the development and validation of multiple self-report measures, the novel application of statistical methods to biomedical research (e.g., group-based trajectory modeling), and the incorporation of cognitive and other self-report measures into the analyses of psycho-neuroimaging data (e.g., BOLD percent signal change and brain region connectivity coefficients).

***Emmy Dagnan, OTD, OTR/L, CLT, C-EP, CPAMs** received a Bachelor of Science in Movement Science from Texas Christian University, a Master of Science in Occupational Therapy and a Doctor of Occupational Therapy from Belmont University. Emmy is an ACSM Certified Exercise Physiologist, Certified Lymphedema Therapist, and is certified in Physical Agent Modalities. Her clinical experience includes adult outpatient rehabilitation, inpatient rehabilitation, and acute care with an emphasis on orthopedic and neurological disorders. Her research interests are health and wellness, the use of simulation labs in occupational therapy education, pet therapy and its implications for test anxiety, and motivation and sports.*

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Appendix A
Simulation Scenario

Scenario	Changes in physiologic factors during transfer
Estimated Scenario Time	15 minute
Estimated Debriefing Time	15 minute
Target Group	OT/PT student

Prerequisite Knowledge *Learners should possess the following competencies prior to participation in this scenario.*	
Knowledge of tubes and lines and their purpose Knowledge of precautions Knowledge of normal HR, O2, and BP values Basic handling skills Basic communication skills	
Cognitive Skills	Psychomotor Skills
Critical thinking Problem solving	Dependent bed mobility skills Body mechanics
Brief Summary	
Students are given the task of getting a patient from supine to sitting on the edge of the bed. They need to be aware of all lines and tubes as well as mobility precautions. Students must be able to monitor physiological changes and respond appropriately to a critical event (drop in O2, spike in HR, or drop in blood pressure). They need to be able to demonstrate appropriate communication skills with the patient and each other throughout the scenario.	

Learning Objectives
1. Demonstrate appropriate infection control (hand washing and gloves).
2. Demonstrate appropriate communication with patient and team.
3. Identify all lines and tubes and be able to cite precautions related to each.
4. Reposition lines and maintain appropriate line position throughout movements of the patient.
5. Demonstrate proper handling of the patient including maintaining appropriate draping of the patient.
6. Maintain good body mechanics for all movements.
7. Recognizes critical event in a timely manner and response appropriately.
8. Appropriately ending treatment based on clinical reasoning.
9. Demonstrate appropriate position of patient at end (side rails, call bell, draping).
10. Demonstrates ability to accurately reflect on performance during debriefing.

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Proposed Correct Treatment Outline		
(EVENT LIST)	Critical Event	Handler
Infection control (washes hands and applies gloves)		Student
Introduction to patient		Student
Explains treatment/service provided		Student
Identify lines and trace them back to origin		Student
Identify precautions		Student
Rearrange tubes/lines appropriately in preparation for movement		Student
Monitors lines throughout the movement and readjusts appropriately		Student
Position/handles the patient using good technique		Student
Maintains good body mechanics throughout movement		Student
Communicates with other team member before /during/after the movement		Student
Critical event occurs as start to move patient from side lying to sit - Drop O2 - Significant increase in HR - Drop in blood pressure	Simulation leader	
Recognize the critical event		Student
Respond to the event - Deep breathing or lay back down and deep breath - Lay them back down - Lay them down and elevate feet - Monitors recovery and communicates to nurse if appropriate		Student
Recognize when patient is safe		Student
Put up bedrails, replace the call bell, and cover patient		Student

Patient Description		
Choose Image	Name	Terry Summers
	Age	72
	Weight	176 lbs.
	Height	5’8”
	Gender	Male/female (whichever is easiest)
Background *History of Present Complaint*	Patient presented to ER with SOB and generalized weakness x2 weeks. ER determined that patient was dehydrated with UTI.	
Setting	Acute care	
Patient Information *History* *Medications* *Allergies* *PCP*	Patient lives independently with family close by. PHM includes COPD, CHF, and DM, MI in 2004, CVA in 2005 with very mild residual weakness on the right. Medications: Coumadin, Coreg, Metformin, HCTZ, Lasix, No allergies PCP: Dr. Jones	

Preparation of the Simulator
IV insertion, catheter insertion, set up of heart rate, BP and O2 monitor
Slippers, gloves, arm band/ID
4 chairs in each room for debriefing

Create Physiologic Trends
Trends permit the simulator to physiologically model a number of factors including BP, heart rate, respiration, and other factors. Use the below tables to plan physiological trends.
(Helpful Hint: Use different colors to identify each parameter)

Trend Name: Sitting EOB, Drop in O2						Time: 15 minutes	
Value	Time in Minutes						
	3:00	6:00	9:00	12:00	15:00	:	:
+	97%	97%	85%	91%	96%		
+							
+							
Baseline	97%						
-							
-							
-							

Parameters			
	Heart Rate		Central Venous Pressure
	Respiration Rate		Pulmonary Artery Pressure
X	SpO2		Pulmonary Artery Wedge Pressure
	Blood Pressure		Cardiac Output
	CO2		Absorbed Oxygen
	Temperature		Absorbed Nitrous Oxide
			Absorbed Anesthetic Agent

Trend Name: Sitting EOB, HR increases						Time: 15	
Value	Time in Minutes						
	3:00	6:00	9:00	12:00	15:00	:	:
+	78 bpm	80 bpm	128 bpm	100 bpm	78 bpm		
+							
+							
Baseline							

Parameters			
x	Heart Rate		Central Venous Pressure
	Respiration Rate		Pulmonary Artery Pressure
	SpO2		Pulmonary Artery Wedge Pressure
	Blood Pressure		Cardiac Output
	CO2		Absorbed Oxygen
	Temperature		Absorbed Nitrous Oxide
			Absorbed Anesthetic Agent

Trend Name: Sitting EOB, BP drops						Time: 15	
Value	Time in Minutes						
	3:00	6:00	9:00	12:00	15:00	:	:
+	122/78	130/81	85/40	110/72	122/78		
+							

-							

Parameters			
	Heart Rate		Central Venous Pressure
	Respiration Rate		Pulmonary Artery Pressure
	SpO2		Pulmonary Artery Wedge Pressure
X	Blood Pressure		Cardiac Output
	CO2		Absorbed Oxygen
	Temperature		Absorbed Nitrous Oxide
			Absorbed Anesthetic Agent

Create an Event Handler (Optional)
Events may be customized to initiate an Action such as playing a vocal sound, changing a physiologic value, or inserting a detailed comment in the Debriefing Log. Use the below table to identify events that trigger an action or frame change.
(Helpful Hint: All critical events should be supported with a detailed comment)

Handler Name:	Faculty members will be present to create physiologic changes and provide voice for critical event and interactions.	Number of Frames:	

Debriefing Overview	
Critical Event:	BP, O2 or HR change
Rationale:	Critical thinking is required in response to the critical event and the student should be able to know when the critical event has resolved and when to return patient to supine position. (This should include team communication and rationale for decision: what and when to communicate to nursing team member.)
Critical Event:	Communication
Rationale:	Important for all team members to communicate effectively throughout the scenario

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Year	Reference
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Form adapted from multiple resources by the Simulation Center, Belmont University
Scenario developed by authors with contributions from Renee Brown, PT, PhD

Appendix B
Acute Care Simulation Checklist

Student Name: ____

Satisf	Unsatisf	Task/Skill	Comment
		Follows infection control guidelines:	
		Washes hands before entering room	
		Washes hands on exiting room	
		Gloves to handle patient	
		Communication with patient	
		Confirms patient identify	
		Identifies self name	
		Identifies profession	
		Explains plan for session	
		Responds in professional manner to patient	
		Instructs patient appropriately in treatment process	
		Uses appropriate terms	
		Communication with Team	
		Respectful of team member	
		Collaborates with team member appropriately	
		Communicated effectively during critical event	
		Treatment Session	
		Managing tubes and lines:	
		Identify and trace all lines from patient to origin	
		IV	
		Catheter	
		O2	
		Heart Monitor	
		Rearranges lines in preparation for moving	
		Monitors lines throughout whole movement	
		Positions/handles the patient appropriately	
		Maintain modesty and draping of patient at all times	
		Student maintains good body mechanics	
		Leaves patient in appropriate position (side rails, call bell, draping)	
		Critical Event	
		Recognize critical event in a timely manner	
		Respond appropriately to event	
		Know when event has resolved and is safe to continue or leave patient	

____ ____________

Faculty Observer Signature Date

Developed by authors with contributions from Renee Brown, PT. PhD

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