



Perceived benefits of simulation-based training among nursing students of the University of Hail



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ABSTRACT

This study aimed to explore the benefits perceived by nursing students at the University of Hail on a simulation-based training (SBT) for selected procedures in Critical Care Nursing Practice. Sixty-two nursing students underwent SBT using low- and high-fidelity manikins and accomplished the SBT Perception questionnaire that provided there: (1) demographic profile; (2) level of satisfaction on the SBT; (3) perceived SBT outcome in terms of their improvement in nine nursing skills; (4) perceived quality of the SBT; and (5) perceived strengths and weaknesses of the SBT for this descriptive, correlational, comparative and normative study. The student respondents were very satisfied with the SBT sessions conducted ($m = 4.84$, $SD = 0.43$). They strongly agreed with the quality of the SBT ($m = 4.83$, $SD = 0.45$). They perceived that the SBT improved their skills in performing nursing procedures ($m = 4.87$, $SD = 0.42$) and their patient teaching skills ($m = 4.84$, $SD = 0.49$). A significant high positive correlation existed between the student respondents' total score for the perceived quality of the SBT and their total score for perceived outcomes of the SBT ($p = 0.00$, $r = 0.82$). Improvement of nursing skills through the repetition of procedures was identified as the SBT's principal strength. This study demonstrated that the inclusion of simulation technology to the Critical Care Nursing course was viewed as a positive learning experience by the student respondents and that it is an effective method for the development of their technical and non-technical nursing skills.

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1. Introduction

Simulation is a technique that can be formulated to mimic real-life situations that furnishes the liberty to operate in environments that closely resemble real settings (Eyikara and Baykara, 2017). It acts out or imitates an actual or probable real life event for varied purposes such as finding its cause or predicting its outcome. Generally, the use of simulation in the field of nursing permits nurses to develop their skills and make every conceivable mistake in the absence of harming actual clients (Lavoie and Clarke, 2017).

As a training methodology, simulation has proliferated in higher education institutions because of the following reasons: (1) the plethora of quality

simulation resources that are readily available through the internet, new devices and systems; and (2) the ever-increasing emphasis on outcomes in education that not only intends to provide learning, but more importantly, provides assessment of a wider spectrum of student competencies in a more rigorous manner (Damassa and Sitko, 2010).

Nursing education has embraced simulated practice learning as an adjunct to clinical nursing skills acquired in various health care settings for the past forty (40) years (Nehring and Lashley, 2009). The use of simulation in higher education institutions offering the nursing program includes a wide range of delivery methods and modes that include low-fidelity elemental simulators (i.e., a simulated wound site) to high-fidelity interactive manikins with life-like characteristics, role play, case studies, and virtual online settings.

The value of simulation in nursing education stems from its capacity to provide nursing students the opportunity to practice nursing skills and apply nursing knowledge to problem-solve a real-life scenario, all in the context of a safe environment

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(Piscotty et al., 2011). Student-centered teaching methodologies utilizing high-fidelity human patient simulators give nursing students unlimited opportunities to practice different skills such as problem solving, decision-making and esprit-de-corps in an environment that does not threaten the patient, their significant others, the student, the clinical instructors and the hospital staff (Billings and Halstead, 2009). Clinical skills laboratories that integrate simulation strategies enhance nursing students' critical thinking skills in a highly controlled and safe environment (Shepherd et al., 2010). As a result, simulation is recognized to be an important teaching strategy in learning which positively influences the clinical effectiveness of nursing students as they progress toward becoming registered nurses (McCaughy and Traynor, 2010).

Low-fidelity simulation as applied in the practice courses in nursing programs uses role play, non-computerized manikins or task-trainers like intravenous arms. The use of low fidelity simulation has resulted in an increase in positive expectations among students and an increase in their self-confidence (Sharpnack and Madigan, 2012).

On the other hand, high-fidelity simulators use a human mannequin interfaced with a computer program to generate physiologic responses to nursing interventions including changes in vital signs, heart rhythm and heart sounds (Schiavenato, 2009). As such, nursing students learn from the mannequin's response and outcomes as a form of immediate feedback different from those given by the clinical instructor and fellow students (Benner et al., 2010).

High-fidelity simulation offers unlimited opportunities to practice life-threatening scenarios in a safe and controlled environment (Decker et al., 2008). The utilization of high fidelity human simulation in nursing education may affirmatively impact the attainment of a high level of both cognitive and clinical skills (Lee and Oh, 2015). Moreover, high-fidelity simulation has been proven to be an effective method for the development of non-technical skills in nursing like interpersonal communication skills, teamwork, leadership, and decision-making.

Simulation, just like any other good thing, has its own share of disadvantages, namely: (1) it is unreal and at best would not on all occasions be able to comprehensively mimic real-life scenarios; (2) it entails high start-up and maintenance costs; and (3) inadequate training among instructors utilizing it as a teaching strategy. Furthermore, there is variability in the level of engagement and seriousness of students for simulations as there are no actual consequences for errors committed in the process of undergoing it (Gray, 2002).

Given these characteristics of simulations, higher education institutions, colleges of nursing included, would do well to prudently design, implement and evaluate the use of simulation as an adjunct for learning acquired in practice nursing courses that would maximize the realization of its advantages and

at the same time address and minimize its disadvantages.

1.1. Background of the study

At the start of the new millennium, a forecast of the future of nursing education was made by identifying ten trends to watch for (Heller et al., 2000). Although these ten trends have already been observed mostly in the United States, the first two trends predicted are currently being felt in higher education institutions of nursing in the Kingdom of Saudi Arabia (KSA), including the College of Nursing at UOH.

The first trend predicted in the future of nursing education is changing student demographics and increasing diversity (Heller et al., 2000). The gradual realization of this trend in the KSA may have been brought about by various earlier efforts implemented by the Ministry of Higher Education to stir public awareness and interest in nursing education, to increase the number of enrollees in nursing programs with the end view of increasing the percentage of Saudi nurses in the nursing workforce. These efforts include: (1) the initiation of the first BSN program in 1976 in King Saud University; (2) the introduction of a Master of Science in Nursing program in 1987, again in King Saud University; (3) the initiation of BSN programs at King Abdulaziz University in Jeddah in 1997 and at King Faisal University in Dammam (Tumulty, 2001).

Since its inception in 2009, the College of Nursing at UOH has been experiencing a gradual but steady rise in the number of enrollees in its BSN program. The increase in student enrollees has been accompanied by an increase in the number of nursing students who come from other nearby regions like Al-Madinah, Tabuk, Dammam, and Qassim. Thus, the changing demographics among nursing students enrolled at the College of Nursing at UOH increased its ethnic and racial diversity. It likewise has students who have enrolled in the BSN program at an older age (i.e., bridging students) who are typically employed in full-time work while raising their own family. They carry with them more work experience and sophisticated expectations for the delivery of nursing instruction. This trend poses the following minor challenges that have relatively more available solutions: (1) the need for more competent instructors in both theory and practice courses to teach these students; (2) the need for more quality classrooms and laboratories to facilitate effective teaching for these students; and (3) the need for greater flexibility in scheduling to address the educational constraints full-time work and raising a family places on their educational experience. However, the biggest challenge this trend poses is in the development of clinical nursing skills and competencies of these increasing number of culturally diverse students for certain nursing and emergency procedures which they can only perform as often as there is a patient admitted in the clinical

area requiring these procedures. The chance that a student will be able to perform procedures (i.e., in-hospital cardiopulmonary resuscitation, emergency manual resuscitation, central venous pressure monitoring, etc.) during their clinical exposure, let alone develop competency for it becomes more remote with an increase in the number of students.

The second trend predicted in the future of nursing education pertains to the technological advancements' effect on the education of nurses (Heller et al., 2000). The rapid growth in technology necessitates that nurses of the 21st century be skilled in the use of computer technology. As a response to this challenge, technically sophisticated pre-clinical simulation laboratories are available in the College of Nursing at UOH that are intended to develop nursing students' critical thinking and mastery of skills in a safe and controlled environment. Thus, the advent of the second trend predicted by Heller et al. (2000) at the College of Nursing at the UOH serves as a viable solution to the challenge of development of clinical nursing skills and competencies brought about by the current realization of the first trend of changing student demographics and increasing diversity.

As administrators and instructors in the College of Nursing of the UOH, the researchers recognize that no less than a careful, timely and gradual inclusion of a well-structured SBT in the practice courses offered in the BSN program will result into the development and mastery of clinical nursing skills and competencies of its diversified students. This awareness coupled by the lack of published research in this field from the Hail region and in various other regions of the KSA makes it more important to gain a thorough understanding of the perceptions of nursing students on the benefits of SBT in order to successfully and effectively integrate it as a strategy for teaching and learning in its nursing curriculum.

2. Methods

2.1. Research design

This study utilized a quantitative, descriptive, research design. More specifically, this study sought to determine the perceptions of nursing students on the benefits of an SBT. The study had a correlational component that indicated the strength and direction of a linear relationship between the student respondents' total score for the perceived quality of the SBT and their total score for the perceived outcomes of the SBT, as well as, between the student respondents' total score for perceived quality of the SBT and their total score for level of satisfaction on the SBT. Moreover, the investigation likewise compared the perceptions of groups of nursing student respondents (i.e., gender and student type) on the quality and outcomes of the SBT. Furthermore, the study is also normative in nature as it aimed toward future development and planned

an approach toward carrying out necessary improvements.

2.2. Population

The population of student respondents that the study utilized was composed of all full-time nursing students who are officially enrolled in the course Critical Care Nursing Practice for the second semester of the academic year 2016 – 2017. This consisted of forty (40) female and twenty-five (25) male nursing students.

2.3. Sampling

Convenience sampling was utilized to generate student respondents from the study population. The sample of student respondents was composed of sixty-two (62) nursing students present in their Critical Care Nursing Practice class on specific dates scheduled for the SBT and data gathering.

2.4. Research instrument

The study utilized a five-phase SBT Perception questionnaire developed from a literature review in gathering the necessary data.

The first phase of the SBT Perception questionnaire provided the demographic profile of the student respondents. More specifically, it generated information on the study respondents' age, gender, student type, and grade point average.

The second phase of the SBT Perception questionnaire determined the level of satisfaction of the student respondents on the SBT. It had twelve (12) items rated using a five-point Likert scale. The rating of items was as follows: 5 with a verbal interpretation of very satisfied; 4 with a verbal interpretation of satisfied; 3 with a verbal interpretation of neutral; 2 with a verbal interpretation of dissatisfied; and 1 with a verbal interpretation of very dissatisfied.

The third phase of the SBT Perception questionnaire determined the student respondents' perceived SBT outcome in terms of their improvement in nine (9) nursing skills, namely: (1) critical thinking; (2) problem solving; (3) decision-making; (4) application of the nursing process; (5) performance of nursing procedures; (6) teamwork; (7) communication; (8) recording and reporting; and (9) patient teaching. The rating of perceived outcomes of the SBT in terms of improvement of their skills was as follows: 5 with a verbal interpretation of strongly agree; 4 with a verbal interpretation of agree; 3 with a verbal interpretation of neutral; 2 with a verbal interpretation of disagree; and 1 with a verbal interpretation of strongly disagree.

The fourth phase of the SBT Perception questionnaire determined the student respondents' perceived quality of the SBT. It had five (5) subscales, four of them representing the different

phases of the SBT, namely: (1) Orientation with six (6) items; (2) Demonstration with six (6) items; (3) Return Demonstration with four (4) items; and (4) debriefing with four (4) items. The last subscale is on Resources with three (3) items. The rating of perceived quality of the SBT was as follows: 5 with a verbal interpretation of strongly agree; 4 with a verbal interpretation of agreeing; 3 with a verbal interpretation of neutral; 2 with a verbal interpretation of disagreeing; and 1 with a verbal interpretation of strongly disagree.

The fifth and last phase of the SBT Perception questionnaire provided information on the student respondents' perceived strengths as well as their perceived weaknesses of the SBT.

The content of the SBT Perception questionnaire was validated via the Delphi technique through a team of experts (Hsu and Sanford, 2007). Furthermore, the SBT Perception questionnaire was pilot tested to one section of male and another section of female nursing students enrolled in the course Advanced Adult Care Nursing Theory who likewise underwent the SBT but were not included as respondents in the study. The computed Cronbach-Alpha coefficient of reliability of the SBT Perception questionnaire was 0.82.

2.5. Data-gathering procedure

The study was conducted in three phases, namely: (1) the practice course instructors' (PCIs) training phase; (2) the SBT implementation phase; and the (3) data gathering phase.

The PCIs' training phase was conducted on week 11 and week 12 of the second semester of the academic year 2016 – 2017. They underwent compulsory extensive training facilitated by a specialist in simulation in order for them to conduct the SBT for the student respondents. A total of eight (8) clinical scenarios were developed by the PCIs for four (4) procedures in the course Critical Care Nursing Practice. Two scenarios each were developed using the low-fidelity Laerdal Nursing Anne mannequin for the following nursing procedures: (1) management of acute severe hypoglycemia; and (2) manual central venous pressure (CVP) monitoring. Similarly, two scenarios each were developed using the high-fidelity LaerdalSimMan® 3G Patient Simulator with SimPad® for the following nursing procedures: (1) hypothermia management; and (2) in-hospital cardiopulmonary resuscitation.

The SBT for the student respondents was implemented on week 13 and week 14 of the second semester of the academic year 2016 – 2017. Written consent was obtained from each student respondent before the conduct of the SBT. The student respondents underwent SBT using the same low- and high-fidelity type simulators for which scenarios were previously developed by the PCIs for the selected nursing procedures in the course Critical Care Nursing Practice. The SBT was composed of four phases, namely: (1) orientation; (2)

demonstration; (3) return demonstration; and (4) debriefing.

The data gathering phase of the study was conducted on week 15 of the second semester of the academic year 2016 – 2017. The student respondents were informed that the data gathered will be anonymous and confidential. The student respondents accomplished the SBT Perception questionnaire for an average period of fifteen (15) to twenty (20) minutes. The researchers collected the accomplished questionnaires and subsequently tabulated and encoded the gathered data in a Microsoft Excel program.

2.6. Ethical consideration

The study was approved by the UOH Research Ethics Committee and was designated as Project No. H-2016-014. The purpose of the study and its voluntary nature was explained to all the participants. Participants were assured of confidentiality throughout the research process and their freedom to withdraw from the study at any time in the absence of any academic consequences. Written consent was obtained from each student respondent.

2.7. Statistical analysis

Data were coded for analysis through the use of SPSS version 22. The student respondents' demographic characteristics, level of satisfaction on the SBT, their perceived quality of the SBT and their perceived outcomes of the SBT were analyzed and presented using descriptive statistics in the form of frequencies, percentages, means, and standard deviations. Pearson *r* was used to test the relationship between the student respondents' total score for the perceived quality of the SBT and their total score for the perceived outcomes of the SBT, as well as, between the student respondents' total score for perceived quality of the SBT and their total score for level of satisfaction on the SBT. Independent *t*-test (two groups) was used to test the difference in the student respondents' perceived quality of the SBT and perceived outcomes of the SBT, respectively, when they were grouped according to demographic variables (i.e., gender and student type). The significance level chosen was $p < 0.05$.

3. Results and discussion

The 62 nursing students in the convenience sample selected to participate in the study. This sample was composed of 24 male and 38 female students. In terms of student type, 35 study respondents were classified as regular students and 27 were classified as bridging students. The mean age of the study respondents was 23.29 and the mean grade point average (GPA) was 2.43. Table 1 shows the level of satisfaction of the student respondents on the SBT.

Table 1: Level of satisfaction of the student respondents on the simulation-based training (n=62)

| ITEMS | Mean | SD |
|---|------|------|
| 1) The effectiveness of the teaching strategies used in the simulation. | 4.85 | 0.44 |
| 2) The variety of learning materials and activities in the simulation that promote learning in the course. | 4.69 | 0.67 |
| 3) The suitability of the simulation to my style of learning. | 4.85 | 0.36 |
| 4) The simulation's comprehensive coverage of important contents needed to master the course. | 4.85 | 0.40 |
| 5) The ability of the simulation to develop my knowledge and skills to perform necessary procedures in the actual clinical setting. | 4.90 | 0.39 |
| 6) The utilization of updated and helpful resources to teach the simulation. | 4.84 | 0.41 |
| 7) The ability of the simulation to assist me to understand how the actual clinical practice will be. | 4.89 | 0.32 |
| 8) The suitability of the scenarios used in the simulation to promote learning in the course. | 4.79 | 0.48 |
| 9) The ability of the simulation to decrease my level of anxiety in actual clinical settings. | 4.79 | 0.48 |
| 10) The ability of the simulation to increase my confidence to work in actual clinical settings. | 4.89 | 0.37 |
| 11) The ability of the simulation to help me develop conflict management skills. | 4.81 | 0.54 |
| 12) The ability of the simulation to help me collaborate with other members of a team. | 4.92 | 0.27 |
| OVERALL RATINGS | 4.84 | 0.43 |

The student respondents agreed that the SBT could help them collaborate with other members of the team ($m = 4.92$, $SD = 0.27$). This finding is supported by a study that revealed that student-centered teaching methodologies utilizing high-fidelity human patient simulators give nursing students unlimited opportunities to skills such as esprit-de-corps (Billings and Halstead, 2009) and by investigations that pointed out that simulation has been proven to be an effective method for the development of non-technical skills in nursing like interpersonal communication skills and teamwork. The student respondents recognized the ability of the SBT to develop their knowledge and skills to perform necessary procedures in the actual clinical setting ($m = 4.90$, $SD = 0.39$). The value of simulation in nursing education emanates from its capacity to provide nursing students the opportunity to practice nursing skills and apply nursing knowledge to problem-solve a real-life scenario, all in the context of a safe environment (Piscotty et al., 2011). The student respondents acknowledged the ability of the SBT to assist them to understand how the actual clinical practice will be ($m = 4.89$, $SD = 0.32$). Furthermore, they concurred that the SBT could increase their confidence to work in actual clinical settings ($m = 4.89$, $SD = 0.37$). A similar study conducted among sophomore nursing students showed how the use of low fidelity simulation has resulted in an increase in positive student expectations and an increase in their self-confidence (Sharpnack and Madigan, 2012). A prospective cohort study revealed an increase in confidence among newly licensed registered nurses who participated in simulation with peers and crisis simulation with a multidisciplinary group while highest scores for satisfaction were recorded for the study respondents involved in the multidisciplinary sessions (Rhodes et al., 2016). Overall, it was revealed that the student respondents were very satisfied with the sessions conducted for the SBT ($m = 4.84$, $SD = 0.43$). Table 2 shows the student respondents' perceived quality of the SBT.

In terms of orientation, the student respondents indicated that sufficient technical information was provided for the safe and effective use of manikins, devices and other equipment in the SBT ($m = 4.87$, $SD = 0.38$). For the demonstration subscale, the

student respondents concurred that all materials and equipment (including manikins, monitors, sensors, etc.) to be used for the procedure in the simulation were presented to the students at the start of the demonstration ($m = 4.90$, $SD = 0.35$). These quality features of the SBT perceived by the student respondents provide knowledge acquisition. The National League for Nursing has created a framework in the design of simulations that can be applied as a teaching method in practice course offerings of baccalaureate programs in nursing. In this framework, outcomes – as the first major component, includes, first and foremost, knowledge acquisition (Jeffries, 2005a, 2005b; Jeffries and Rizzolo, 2006; Jeffries and Rogers, 2007). In the return demonstration component, the student respondents declared that the simulation provided them an opportunity to make a thorough assessment of the situation, prioritize nursing diagnoses, decide on and implement the appropriate intervention and conduct a thorough evaluation ($m = 4.87$, $SD = 0.38$). This quality feature of the SBT perceived by the student respondents runs in line with other literature and findings of other studies that emphasized the development of nursing students' critical thinking (McKeon et al., 2009; Shepherd et al., 2010) and decision-making skills (Billings and Halstead, 2009; Lewis et al., 2012; Loke et al., 2014; Peddle et al., 2016) through the use of simulation. Concerning debriefing, the student respondents signified that the simulation instructors have increased their motivation to complete the nursing program and become an excellent nurse ($m = 4.90$, $SD = 0.35$). This quality feature of the SBT perceived by the student respondents is supported by the study conducted by Wilson and Klein (2012) wherein nursing students confirmed that simulation was motivating (Wilson and Klein, 2012). Verbal debrief was revealed by an experimental study among senior nursing students exposed to human patient simulation as an effective feedback method (Henneman et al., 2014). Moreover, the motivation to become an excellent nurse denotes a new and higher level of self-confidence among the student respondents (Sharpnack and Madigan, 2012). Finally, in terms of resources, the student respondents confirmed that handouts containing complete, easy-to-understand language, and

important information on the procedure and simulation were distributed to each student ($m = 4.85$, $SD = 0.36$). Overall, it was revealed that the student respondents strongly agreed with the

quality of the SBT ($m = 4.83$, $SD = 0.45$). Table 3 shows the student respondents' perceived outcomes of the SBT.

Table 2: The student respondents' perceived quality of the simulation-based training (n=62)

| ITEMS | Mean | SD |
|--|-------------|-------------|
| ORIENTATION | | |
| 1.1) Adequate information was provided before the simulation to encourage me to participate and learn. | 4.85 | 0.40 |
| 1.2) The general goal and specific objectives of the simulation were clearly explained to me. | 4.84 | 0.41 |
| 1.3) Theoretical concepts related to the procedure to be used in the simulation were discussed with the students. | 4.82 | 0.39 |
| 1.4) Sufficient technical information was provided for the safe and effective use of manikins, devices, and other equipment in the simulation. | 4.87 | 0.38 |
| 1.5) Given scenarios contained all the necessary information and were subsequently explained to me to perform the correct intervention/s. | 4.81 | 0.62 |
| 1.6) Questions raised by the students related to the orientation were addressed and answered satisfactorily by the simulation instructor/s. | 4.85 | 0.47 |
| DEMONSTRATION | | |
| 2.1) All materials and equipment (including manikins, monitors, sensors, etc.) to be used for the procedure in the simulation were presented to the students at the start of the demonstration. | 4.90 | 0.35 |
| 2.2) Important physical assessment findings and investigations were emphasized by the simulation instructor/s to the students. | 4.76 | 0.47 |
| 2.3) The simulation instructor/s encouraged the students to raise concerns related to the simulation. | 4.82 | 0.43 |
| 2.4) Questions raised by the students related to the demonstration of the simulation were addressed and answered satisfactorily by the simulation instructor/s. | 4.85 | 0.47 |
| 2.5) The steps of the nursing procedures were demonstrated clearly and according to what I was taught in the lectures. | 4.84 | 0.49 |
| 2.6) The simulation instructor/s verbalized appropriate audible conversations according to the role they play and have demonstrated well-planned actions to capture my attention and emotions. | 4.82 | 0.43 |
| RETURN DEMONSTRATION | | |
| 3.1) Support and encouragement from the simulation instructor/s were available. | 4.84 | 0.41 |
| 3.2) I was given sufficient time to explore various clinical outcomes in the simulation. | 4.77 | 0.53 |
| 3.3) The simulation provided me with the opportunity for critical thinking and identifying problems in the interventions. | 4.76 | 0.47 |
| 3.4) The simulation provided me an opportunity to make a thorough assessment of the situation, prioritize nursing diagnoses, decide on and implement the appropriate intervention and conduct a thorough evaluation. | 4.87 | 0.38 |
| DEBRIEFING | | |
| 4.1) The simulation instructor/s provided me with constructive feedback immediately after the simulation. | 4.81 | 0.47 |
| 4.2) I was given the chance to express my concerns on the way I performed on the procedure. | 4.81 | 0.44 |
| 4.3) Corrective actions were clearly emphasized and made known to me by the simulation instructor/s. | 4.79 | 0.63 |
| 4.4) The simulation instructors have increased my motivation to complete the nursing program and become an excellent nurse. | 4.85 | 0.44 |
| RESOURCES | | |
| 5.1) The simulation utilized high fidelity manikins and equipment that were capable of mimicking real-life scenarios. | 4.84 | 0.41 |
| 5.2) Handouts containing complete, easy-to-understand language, and important information on the procedure and simulation were distributed to each student. | 4.85 | 0.36 |
| 5.3) Sufficient time was provided during the orientation, demonstration, return demonstration and debriefing phases of the simulation to provide student learning. | 4.84 | 0.49 |
| OVERALL RATINGS | 4.83 | 0.45 |

Table 3: The student respondents' perceived outcomes of the simulation-based training (n=62)

| OUTCOMES | Mean | SD |
|--|-------------|-------------|
| 1) The simulation improved my critical thinking skills. | 4.77 | 0.46 |
| 2) The simulation improved my problem-solving skills. | 4.71 | 0.58 |
| 3) The simulation improved my decision-making skills. | 4.71 | 0.61 |
| 4) The simulation improved my skills to apply to the nursing process. | 4.73 | 0.66 |
| 5) The simulation improved my skills in performing nursing procedures. | 4.87 | 0.42 |
| 6) The simulation improved my skills in working with a team. | 4.81 | 0.54 |
| 7) The simulation improved my communication skills. | 4.32 | 0.92 |
| 8) The simulation improved my recording and reporting skills. | 4.56 | 0.64 |
| 9) The simulation improved my patient teaching skills. | 4.84 | 0.49 |
| OVERALL RATINGS | 4.70 | 0.59 |

It revealed that more than 80% of the student respondents concurred that the SBT improved their nursing skills, namely: (1) application of the nursing process ($m = 4.73$, $SD = 0.66$); (2) working with a team ($m = 4.81$, $SD = 0.54$); (3) patient teaching ($m = 4.84$, $SD = 0.49$); and (4) performing nursing procedures ($m = 4.87$, $SD = 0.42$). Senior nursing students perceived that the utilization of simulation boosted their capabilities for prioritization, delegation, and provision of safe nursing care to a number of clients (Kaplan and Ura, 2010). Esprit de corps and teamwork (Billings and Halstead, 2009;

Lewis et al., 2012; Peddle et al., 2016) as well as interpersonal communication skills (Lewis et al., 2012; Shepherd et al., 2010; Peddle et al., 2016) were developed by nursing students in previous simulation studies and review of simulation studies. Role play, a type of simulation, was seen to be more effective in students' learning in the affective domain, which includes interpersonal, communication and professional nursing skills when compared with the use of manikins and that the difference was statistically significant (Shepherd et al., 2010). Furthermore, more than 70% of the

student respondents agreed that the SBT improved their problem solving skills ($m = 4.71$, $SD = 0.58$), their decision-making skills ($m = 4.71$, $SD = 0.61$), and their critical thinking skills ($m = 4.77$, $SD = 0.46$). Numerous other studies have reported improvement in problem solving skills (Billings and Halstead, 2009; Piscotty et al., 2011), decision-making skills (Billings and Halstead, 2009; Lewis et al., 2012; Loke et al., 2014; Peddle et al., 2016), and critical thinking skills (McKeon et al., 2009; Shepherd et al., 2010)

among nursing students who underwent simulation-based trainings. Overall, the student respondents strongly agreed that the SBT improved both their technical and non-technical skills in nursing ($m = 4.70$, $SD = 0.59$).

The scatter plot in Fig. 1 shows the relationship between the student respondents' total score for the perceived quality of the SBT and their total score for perceived outcomes of the SBT.

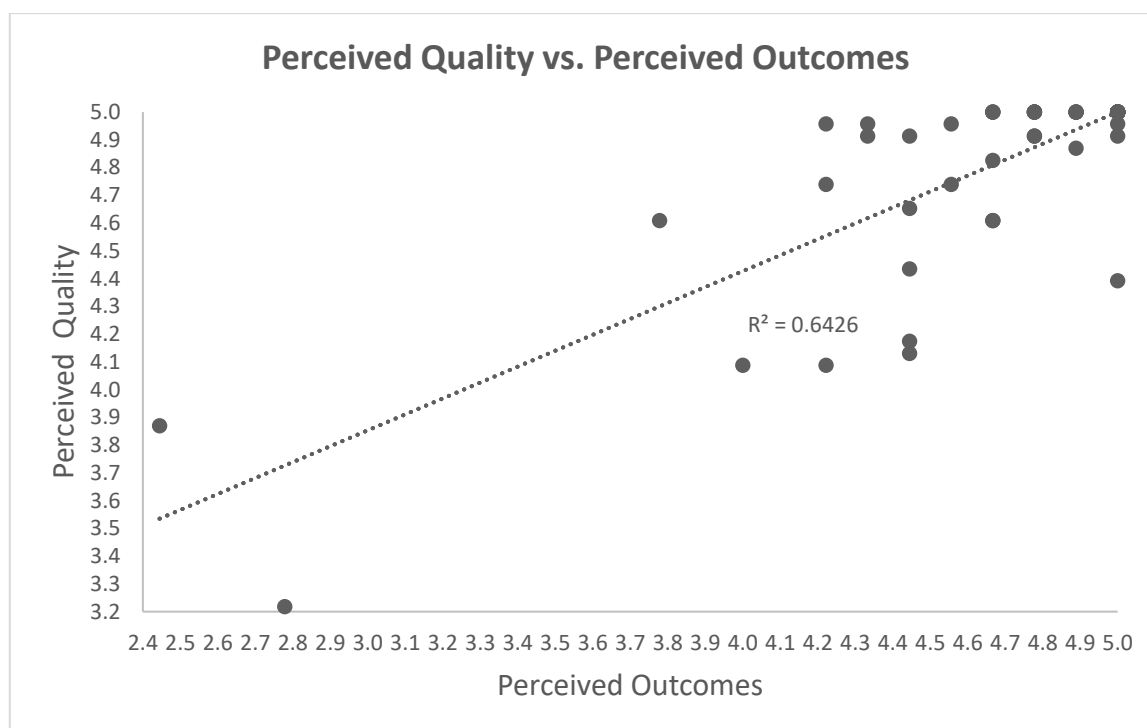


Fig. 1: Relationship between student respondents' total score for perceived quality of the SBT and total score for perceived outcomes of the SBT

The result of the Pearson r test indicates that there is a significantly high positive correlation between the student respondents' total score for perceived quality of the SBT and their total score for perceived outcomes of the SBT ($p = 0.00$, $r = 0.82$). This signified that student respondents with higher perception quality total score likewise had a higher total outcomes score. This finding was similar to a study conducted utilizing simulation in teaching basic skills among female students enrolled in a maternity course (AlFozan et al., 2015). The scatter plot in Fig. 2 shows the relationship between the student respondents' total score for the perceived quality of the SBT and their total score for the level of satisfaction on the SBT.

The result of the Pearson r test indicates that there is a significantly high positive correlation between the student respondents' total scores for perceived quality of the SBT and their total scores for the level of satisfaction on the SBT ($p = 0.00$, $r = 0.702$). This signified that student respondents with higher perception quality total score likewise had a higher total level of satisfaction score. This finding also consistent with the study conducted utilizing simulation in teaching basic skills among female

students enrolled in a maternity course (AlFozan et al., 2015).

The comparative dimension of this study's research design was met by an independent t-test that was conducted to determine if a significant difference existed between the perceived quality of the SBT by male and female student respondents who were enrolled in the course Critical Care Nursing Practice. In terms of orientation, there was no statistically significant difference between the perceived quality of the SBT by the male student respondents ($n = 24$, $M = 4.77$, $SD = 0.42$) and female student respondents ($n = 38$, $M = 4.88$, $SD = 0.45$), $t(60) = -1.278$, $p = 0.206$. In relation to demonstration, there was no statistically significant difference between the perceived quality of the SBT by the male student respondents ($n = 24$, $M = 4.75$, $SD = 0.44$) and female student respondents ($n = 38$, $M = 4.90$, $SD = 0.42$), $t(60) = -1.816$, $p = 0.76$. With reference to the return demonstration, there was no statistically significant difference between the perceived quality of the SBT by the male student respondents ($n = 24$, $M = 4.73$, $SD = 0.45$) and female student respondents ($n = 38$, $M = 4.86$, $SD = 0.44$), $t(60) = -1.282$, $p = 0.205$. In terms of debriefing, there was no statistically significant difference between

the perceived quality of the SBT by the male student respondents ($n = 24$, $M = 4.78$, $SD = 0.43$) and female student respondents ($n = 38$, $M = 4.84$, $SD = 0.52$), $t(60) = -0.521$, $p = 0.604$. In relation to resources, there was no statistically significant difference between the perceived quality of the SBT by the male student respondents ($n = 24$, $M = 4.74$, $SD = 0.45$) and female student respondents ($n = 38$, $M = 4.91$,

$SD = 0.38$), $t(60) = -1.834$, $p = 0.72$. Moreover, another independent t-test was conducted to determine if a significant difference existed between the perceived outcomes of the SBT in terms of improvement in nursing skills by male and female student respondents who were enrolled in the course Critical Care Nursing Practice.



Fig. 2: Relationship between student respondents' total score for perceived quality of the SBT and total score for level of satisfaction on the SBT

In terms of gender, there was no statistically significant difference between the perceived outcomes of the SBT in terms of improvement in nursing skills by the male student respondents ($n = 24$, $M = 4.79$, $SD = 0.41$) and female student respondents ($n = 38$, $M = 4.65$, $SD = 0.66$), $t(60) = 1.098$, $p = 0.276$. Despite the absence of studies that directly assessed how perceptions of simulation as a teaching strategy in nursing practice courses are influenced by gender, a similar outcome was observed in a study conducted on student perceptions and expectations on the photoelectric effect simulation in learning and teaching among Malaysian students that likewise revealed no significant difference among male and female students in terms of the following: (1) their attitudes and initiative of learning and trying out the photoelectric effect simulation; (2) their perception towards the photoelectric effect simulation; and (3) the possible areas of improvement for the photoelectric simulation (Chong et al., 2012).

Similarly, an independent t-test was conducted to determine if a significant difference existed between the perceived quality of the SBT by regular and bridging student respondents who were enrolled in the course Critical Care Nursing Practice. In terms of orientation, there was no statistically significant difference between the perceived quality of the SBT

by the regular student respondents ($n = 35$, $M = 4.74$, $SD = 0.56$) and bridging student respondents ($n = 27$, $M = 4.97$, $SD = 0.14$), $t(60) = 1.860$, $p = 0.72$. In relation to demonstration, there was no statistically significant difference between the perceived quality of the SBT by the regular student respondents ($n = 35$, $M = 4.73$, $SD = 0.54$) and bridging student respondents ($n = 27$, $M = 4.97$, $SD = 0.12$), $t(60) = 1.443$, $p = 0.158$. With reference to the return demonstration, there was no statistically significant difference between the perceived quality of the SBT by the regular student respondents ($n = 35$, $M = 4.70$, $SD = 0.55$) and bridging student respondents ($n = 27$, $M = 4.96$, $SD = 0.15$), $t(60) = 1.587$, $p = 0.121$. In terms of debriefing, there was no statistically significant difference between the perceived quality of the SBT by the regular student respondents ($n = 35$, $M = 4.72$, $SD = 0.60$) and bridging student respondents ($n = 27$, $M = 4.94$, $SD = 0.23$), $t(60) = 1.671$, $p = 0.103$. In relation to resources, there was no statistically significant difference between the perceived quality of the SBT by the regular student respondents ($n = 35$, $M = 4.73$, $SD = 0.52$) and bridging student respondents ($n = 27$, $M = 4.99$, $SD = 0.06$), $t(60) = 1.354$, $p = 0.184$. The last independent t-test conducted in this study was to determine if a significant difference existed between the perceived outcomes of the SBT in terms of improvement in

nursing skills by regular and bridging students who were enrolled in the course Critical Care Nursing Practice. In terms of student type, there was no statistically significant difference between the perceived outcomes of the SBT in terms of improvement in nursing skills by the regular student respondents ($n = 27$, $M = 4.62$, $SD = 0.70$) and bridging student respondents ($n = 35$, $M = 4.80$, $SD = 0.35$), $t(60) = 2.156$, $p = 0.39$. Studies that compared full-time regular students with working students were mostly done in terms of academic achievement (Watanabe, 2005; Dundes and Marx, 2006; Katsidas

and Panagiotidis, 2010) and was neither specific to nursing students nor simulation. On the other hand, despite a plethora of studies conducted using simulation in a nursing baccalaureate practice course, no studies directly assessed how perceptions of the simulation are influenced by student type or classification. Thus, there is a need to conduct further investigation to generate information to either support or negate this finding. Fig. 3 shows the five principal strengths of the SBT as enumerated by the student respondents.

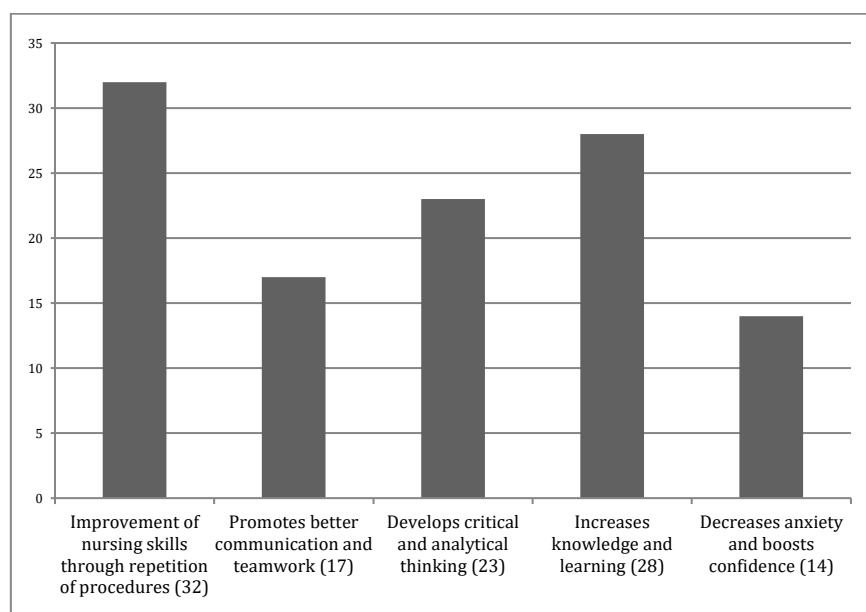


Fig. 3: Student respondents' perceived strengths of the simulation-based training

51.6% or 32 out of the 62 student respondents expressed that the SBT provided improvement of nursing skills through the repetition of procedures. Among the numerous potential advantages of simulation over actual clinical experience is the fact that it allows students to undergo reproducible situations to see to it that student experiences are standardized which, in turn, increases their confidence and reduces their anxiety as they are allowed the chance to commit and learn from mistakes (Walsh, 2010). 45.2% or 28 out of the 62 student respondents signified that the SBT increases knowledge and learning. An experimental study that explored the use of large-group simulation utilizing high-fidelity technology against traditional lecture sessions showed increased knowledge retention among members of the experimental group (Rode et al., 2016). Furthermore, a study that utilized simulation with peers and crisis simulation with a multidisciplinary group revealed that mean scores for knowledge among newly licensed registered nurses had a steady increase over time (Rhodes et al., 2016). 37.1% or 23 out of the 62 student respondents pointed out that the SBT develops critical and analytical thinking. Various studies have supported findings on the improvement of both critical and analytical thinking skills (McKeon et al., 2009; Shepherd et al., 2010) among nursing students who underwent simulation-based training. 27.4% or

17 out of the 62 student respondents suggested that the SBT promotes better communication and teamwork. Numerous investigations utilizing simulation on nursing students have revealed findings related to improved communication (Lewis et al., 2012; Shepherd et al., 2010; Peddle et al., 2016) as well as teamwork (Billings and Halstead, 2009; Lewis et al., 2012; Peddle et al., 2016). Lastly, 22.6% or 14 out of the 62 student respondents declared that the SBT decreases anxiety and boosts confidence. An experimental study conducted to determine the impact of the use of the human patient simulator on first-year nursing students in relation to their anxiety levels that utilized a control group of students who received the usual skills laboratory practice training without the use of a patient simulator and an experimental group that had theirs using a patient simulator one week prior to actual clinical exposure indicated that pre-clinical simulation-based training assisted students in decreasing the stress levels associated with first-time clinical experiences (Bremner et al., 2008). An online survey in the San Francisco area revealed that students' definition of academic safety during nursing simulation is an environment that allows them to function without debilitating anxiety (Ganley and Linnard-Palmer, 2012). Various studies have been previously cited that revealed that simulation, as a mode of teaching, is a confidence-

booster (Sharpnack and Madigan, 2012; Rhodes et al., 2016). Fig. 4 shows the three prominent

weaknesses of the SBT sessions conducted as enumerated by the student respondents.

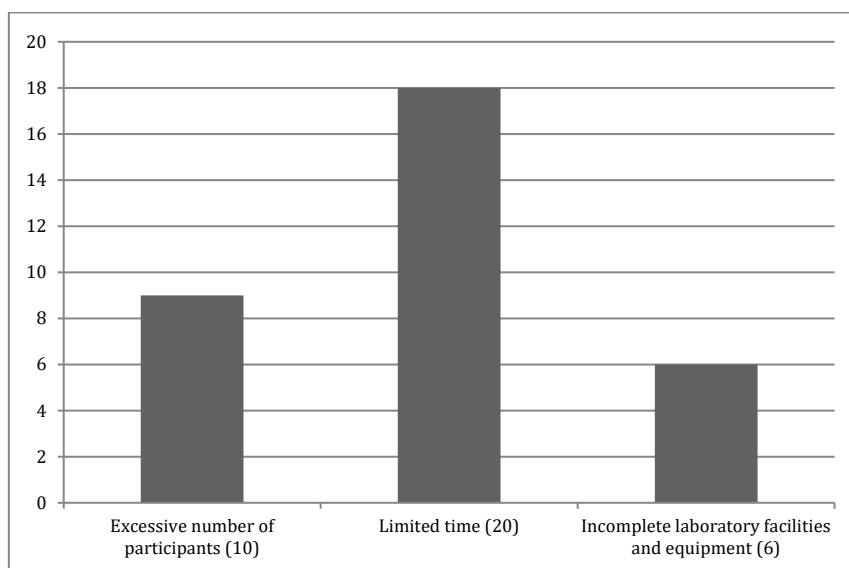


Fig. 4: Student respondents' perceived weaknesses of the simulation-based training

32.3% or 20 out of the 62 student respondents signified that there was limited time. Time constraints had been identified as one of the challenges faced by nursing faculty in the use of simulation in nursing education. 16.1% or 10 out of the 62 student respondents indicated that there was an excessive number of participants. In studying the impact of the use of the human patient simulator on first-year nursing students, the investigators recommended the utilization of small groups of students when working with the simulator for them to gain confidence (Bremner et al., 2008). On the contrary, a pilot study utilizing high-fidelity simulation revealed the effectiveness of large-group simulation as it can reduce the faculty's time to facilitate the simulation sessions (Rode et al., 2016). Lastly, 9.68% or 6 out of the 62 student respondents expressed the use of incomplete laboratory facilities and equipment. A study that exposed both nursing students and clinical faculty members to clinical simulation activities for two months revealed that clinical faculty members noted that added time and resources were prerequisites to the implementation of a simulation-based teaching strategy (Feingold et al., 2004). Furthermore, a study that provided an overview of human patient simulators in nursing education reported the disadvantage of additional costs for space dedicated to the simulation laboratory and store room to house supplies and equipment related to the simulator (Nehring et al., 2001). Based on the results of the study, an action plan was formulated by the research investigators to satisfy the normative component of this study's research design. It is composed of five phases, namely: (1) the training of the Practice Course Instructors in the courses Critical Care Nursing Practice, Advanced Adult Care Nursing Practice and Maternity Nursing Practice who will handle the PSBT for these practice courses; (2) the design of the PSBT

for these practice courses; (3) the implementation of the PSBT for these practice courses; (4) the research studies to be conducted related to the PSBT; and (5) the evaluation of the PSBT for the first semester of the academic year 2017 – 2018. Future research initiatives to be carried out as part of the fourth phase of the formulated action plan – the research studies to be conducted related to the PSBT, could be directed toward the following: (1) an assessment of the preparedness of practice course instructors to deliver the PSBT. Findings from simulation reviews identified the lack of simulation training for faculty and staff as one of the challenges in simulation research (Doolen et al., 2016); (2) an assessment of the perceptions of the practice course instructors toward the PSBT. An article that described a simulation learning experience of students related to isolation precautions and hand hygiene in controlling hospital-acquired infections underscored that the use of feedback, not only from students but more importantly, from the faculty during the evaluation process provides for continuous improvement of the simulation exercise (Pope et al., 2014); (3) quantitative measures of nursing students' learning in practice courses where the PSBT was integrated in terms of the cognitive, affective and psychomotor domains; and (4) effects of fidelity on nursing students' level of skills acquisition to name a few. The output after the five-phase action plan is a new plan for the enhancement of the PSBT integration to be carried out for the second semester of the academic year 2017 – 2018 to involve simulation in the remaining practice course offerings of the College of Nursing at UOH. This action plan likewise serves as a template that signifies the commitment of the administrators of the College of Nursing of the UOH towards the implementation of the philosophy of continuous

quality improvement of its PSBT for future academic years.

4. Conclusion

This research investigation explored the benefits perceived by nursing students of the College of Nursing at the University of Hail on an SBT for selected procedures in the course Critical Care Nursing Practice. The findings are consistent with the expanding literature base that reveals that the inclusion of simulation technology to a nursing practice course was viewed as a positive learning experience by the student respondents and that it is an effective method for the development of both technical and non-technical skills in nursing. Putting into consideration the limitations of the current study, the identified strengths and weaknesses of the SBT as perceived by the student respondents, the evolving demographics and increasing diversity of its students plus the technological advancement being experienced by the College of Nursing of the University of Hail, it behooves its administrators to carry out the formulated action plan toward continuous quality improvement of its PSBT for future academic years. Such initiatives in the formulated action plan will serve as the stepping stone for the creation of a standardized design, implementation and evaluation of a nursing simulation in practice courses for adoption in the curriculum of higher education institutions of nursing in the Kingdom of Saudi Arabia.

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

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