

Perceived Benefits of Pre-Clinical Simulation-based Training on Clinical Learning Outcomes among Omani Undergraduate Nursing Students

*Girija Madhavanprabhakaran,¹ Esra Al-Khasawneh,¹ Lani Wittmann²

نظرة طلبة التمريض العمانيين إلى فوائد تدريب المحاكاة السريرية على مخرجات التعلم الإكلينيكي

جيريجا مادهافان براهكاران، إسراء الخصاصنة، لاني ويتمان

ABSTRACT: Objectives: This study aimed to explore the benefits perceived by Omani undergraduate maternity nursing students regarding the effect of pre-clinical simulation-based training (PSBT) on clinical learning outcomes. **Methods:** This non-experimental quantitative survey was conducted between August and December 2012 among third-year baccalaureate nursing students at Sultan Qaboos University in Muscat, Oman. Voluntary participants were exposed to faculty-guided PSBT sessions using low- and medium-fidelity manikins, standardised scenarios and skill checklists on antenatal, intranatal, postnatal and newborn care and assessment. Participants answered a purposely designed self-administered questionnaire on the benefits of PSBT in enhancing learning outcomes. Items were categorised into six subscales: knowledge, skills, patient safety, academic safety, confidence and satisfaction. Scores were rated on a four-point Likert scale. **Results:** Of the 57 participants, the majority (95.2%) agreed that PSBT enhanced their knowledge. Most students (94.3%) felt that their patient safety practices improved and 86.5% rated PSBT as beneficial for enhancing skill competencies. All male students and 97% of the female students agreed that PSBT enhanced their confidence in the safe holding of newborns. Moreover, 93% of participants were satisfied with PSBT. **Conclusion:** Omani undergraduate nursing students perceived that PSBT enhanced their knowledge, skills, patient safety practices and confidence levels in providing maternity care. These findings support the use of simulation training as a strategy to facilitate clinical learning outcomes in future nursing courses in Oman, although further research is needed to explore the objective impact of PSBT on learning outcomes.

Keywords: Education; Patient Safety; Nursing; Maternal-Child Nursing; Clinical Competence; Middle East; Oman.

المخلص: الهدف: تهدف الدراسة إلى اكتشاف الفوائد التي يتوقعها طلاب تمريض الأمومة العمانيون من تأثير تدريب المحاكاة السريرية (PSBT) على مخرجات التعليم السريري. **الطريقة:** هذا المسح الكمي غير التجريبي أجري على طلبة بكالوريوس التمريض في السنة الثالثة في جامعة السلطان قابوس بين شهري أغسطس وديسمبر 2012. ولقد حضر المشاركون المتطوعون جلسات PSBT المعدة من قبل أعضاء هيئة التدريس باستخدام دمي منخفضة ومتوسطة الدقة، سيناريوهات موحدة وقوائم المهارات على ما قبل الولادة، أثناء الولادة، وبعد الولادة ورعاية وتقييم الأطفال حديثي الولادة. لقد قام المشاركون بالإجابة على الاستبانة المصممة خصيصاً لدراسة فوائد تدريب المحاكاة السريرية على مخرجات التعليم السريري. تم تصنيف العناصر إلى ستة مستويات فرعية وهي المعرفة والمهارات وسلامة المرضى والسلامة الأكاديمية والثقة والرضى. وتم تصنيف النتائج على مقياس ليكرت لأربع نقاط. **النتائج:** اشتملت الدراسة على 57 مشاركاً حيث أن الغالبية العظمى (95.2%) اتفقوا على أن تدريب المحاكاة السريرية عزز المعرفة لديهم. كما أن معظم الطلبة (94.3%) يشعرون بأن ممارسات سلامة المرضى تطورت عندهم و86.5% صوتوا على أن تدريب المحاكاة السريرية أفادهم في تعزيز كفاءة مهاراتهم. كل الطلبة الذكور ونسبة 97% من الطالبات وافقوا على أن تدريب المحاكاة السريرية عزز ثقتهم بالقيام بالإجراءات الآمنة لحديثي الولادة. علاوة على ذلك 93% من المشاركين كانوا راضين عن تدريب المحاكاة السريرية. الخلاصة: طلبة التمريض العمانيون يعتبرون أن تدريب المحاكاة السريرية يعزز المعرفة والمهارات وممارسة سلامة المرضى والثقة في توفير رعاية الأمومة لديهم. وهذه النتائج تدعم استخدام تدريب المحاكاة كاستراتيجية لتيسير مخرجات التعليم الإكلينيكي في مواد التمريض مستقبلاً في عمان، إلى جانب أن هناك حاجة لمزيد من البحوث لاكتشاف التأثير الموضوعي لتدريب المحاكاة السريرية على مخرجات التعليم.

مفتاح الكلمات: التعليم؛ سلامة المرضى؛ التمريض؛ تمريض الأمومة والطفل؛ الكفاءة الإكلينيكية؛ الشرق الأوسط؛ عمان.

¹Department of Maternal & Child Health, College of Nursing, Sultan Qaboos University, Muscat, Oman; ²Perinatal Services British Columbia, Vancouver, British Columbia, Canada

*Corresponding Author e-mail: girija@squ.edu.om and km_girija@yahoo.com

ADVANCES IN KNOWLEDGE

- In order to effectively utilise simulations in education, the perspective of the learner must first be understood. This study addresses the perceptions of Omani undergraduate nursing students with regards to the benefits of simulation.
- There is limited published literature on the usefulness of pre-clinical simulation-based training (PSBT) in undergraduate maternity nursing education. To the best of the authors' knowledge, this is the first study addressing the use of this strategy in a Middle Eastern nursing student population.
- The results of this study indicated that PSBT enhances Omani maternity nursing students' knowledge, skills and confidence.

APPLICATION TO PATIENT CARE

- Pre-clinical exposure to simulation provides a safe and supportive environment that allows students to develop knowledge, psychomotor skills, critical thinking and decision-making skills that aid the achievement of clinical learning outcomes. As was noted in this study, these improved the nursing students' ability to provide safe and competent patient care.
- An added benefit of promoting simulation-based teaching in the Arab world is the opportunity for male students to develop hands-on maternity clinical skills which otherwise might not be possible due to cultural reasons.

THE ULTIMATE GOAL OF UNDERGRADUATE clinical nursing education is to create competent and safe entry-level practitioners. In order to do this, educators must provide students with the opportunity to learn in a safe environment. The use of simulation as an effective educational methodology is well-recognised and its use is now widespread in the training of health professionals worldwide, including nursing.¹⁻⁴ A recent systematic review and meta-analysis by Cook *et al.* concluded that, when used among healthcare professionals, technology-enhanced simulation training yields consistently positive outcomes with regards to the improvement of knowledge, skills and behaviours.⁵ Within the framework of nursing theory, Benner's novice to expert model and Kolb's experiential learning theory have provided support for the use of simulation in the nursing curriculum.^{6,7}

Jeffries developed a framework for designing, implementing and evaluating simulations used as teaching strategies for nursing students while highlighting the importance of understanding student factors, including their comfort level.⁸ Well-structured simulation-based training (SBT) permits the creation of a safe, convenient and comfortable learning environment that is student-centred, promotes active learning and supports deliberate practice.⁸ Simulation is a supportive non-threatening teaching strategy that allows students to master new skills sequentially and incrementally according to their stage of learning. It allows repetitive practice, debriefing and the correction of errors without risk to patient safety.^{4,5,9-11}

Since 2003, there has been an increased focus on SBT in nursing education due to a growing emphasis on patient safety and the increasing competition for student clinical placements.^{1,2,4,12,13} A blend of simulated and real-life clinical experiences allows nursing education programmes to prepare competent and safe practitioners. Current research has shown that SBT

in undergraduate nursing programmes consolidates knowledge, facilitates skill acquisition, reinforces safety habits and improves clinical judgment, interpersonal communication and collaboration.^{1,3,5,14-21} Students have described increased self-confidence and satisfaction, as well as decreased anxiety with the SBT learning process.^{1,3,10,15,22-25} According to Ganley *et al.*, a friendly and supportive academic climate is critical to successful simulation, so that students can learn without fear of failure.¹⁰ Traynor *et al.* reported that simulation aids understanding of the relationship between theory and practice and that students valued the experience as a means of improving their knowledge and enhancing their confidence for future clinical practice.²⁴ Research also indicates that SBT is effective for promoting team work and communication in emergency scenarios.²⁶

In an era of highly complex patient care, educators can implement innovative teaching and learning strategies such as pre-clinical simulation-based training (PSBT). The provision of PSBT at the outset of nursing clinical courses can help students to gain requisite competencies prior to working with real patients. However, to the best of the authors' knowledge, there is a lack of published research in this field from Oman or the Middle East. It is important to obtain an understanding of the perceptions of students from these areas in order to successfully integrate simulation as a teaching-learning strategy in the nursing curricula of this region. The purpose of this study was therefore to determine the perceived benefits of PSBT on clinical learning outcomes by Omani undergraduate nursing students enrolled in a maternal health clinical course in Sultan Qaboos University (SQU), Muscat, Oman. Specifically, the study's objectives were to determine perceived benefits of PSBT on enhancing knowledge, skills, patient safety and self-confidence among the nursing students, as well as to identify their overall level of satisfaction with PSBT.

Methods

This non-experimental quantitative study was carried out between August and December 2012. A convenience sample was used comprising all third-year baccalaureate nursing students who were registered for the Maternal Health Clinical Course in the College of Nursing at SQU ($n = 57$). These students were then invited to participate in a four-week course of PSBT (phase one) as part of their preparation for clinical rotations. The PSBT was then followed by 10 weeks of real clinical posting (phase two) and the Objective Structured Clinical Examination (OSCE). Students voluntarily completed a survey questionnaire regarding the perceived benefits of PSBT during their last week of clinical training, after their completion of the OSCE.

The core clinical learning outcomes of the Maternal Health Clinical Course focus on the students' ability to competently provide evidence-based nursing care to women and infants during the ante-, intra- and postnatal periods. This includes the development of knowledge essential to the provision of maternal and newborn nursing care; the demonstration of skills in the clinical assessment and provision of nursing care to women and infants during the ante-, intra-, and postnatal periods; the provision of safe nursing care to both mother and newborn, and effective communication and collaboration with patients, their families and members of the healthcare team.

During phase one, all students underwent an introductory session covering the main concepts of the course. This was followed by 36 hours of PSBT divided into four sessions with students working in groups of 5–7. Simulation sessions were conducted using low- and medium-fidelity manikins in standardised scenarios. The four simulation sessions included the following training activities: antenatal assessment and care (including Leopold manoeuvres and gestational age assessment); conduct of delivery and placental examination; postnatal assessment and management of postpartum haemorrhages; and immediate newborn assessment, initial steps of resuscitation and newborn bathing techniques. Skill checklists on the above practices were also used in PSBT.²⁷ After an initial 45 minutes of demonstration and discussion by faculty at each station, students were able to engage in repetitive hands-on practice of the necessary skills with faculty support. Faculty guided the simulation exercises with direct demonstrations and debriefings, giving an opportunity for reflection at each station. This allowed faculty to correct misconceptions and reinforce clinical reasoning and concepts of safe care. Study tasks and the opportunity to view related

videos were also provided during this phase.

During phase two, all students were exposed to the ante-, intra-, postnatal and gynaecology areas and the operating theatre of their assigned clinics for two weeks each. This was followed by one week of final summative assessment of clinical learning outcomes by the OSCE. The OSCE assessment focused on knowledge, skill competencies and patient safety practices. It is used almost exclusively for the assessment of learning outcomes through simulation and has been shown to satisfactorily evaluate the abilities of undergraduate midwifery students.^{28,29}

After the examination, students completed a purposely-designed 50-item self-administered questionnaire on the benefits of PSBT in enhancing clinical learning outcomes, which was developed based on the available literature.^{10,27} Items in the questionnaire were categorised into six subscales representing knowledge (seven items), skills (four areas with 25 items), patient safety (five items), academic safety (five items), confidence (five items) and satisfaction (three items). Each item on the questionnaire was rated on a four-point Likert scale ranging from strongly disagree (one) to strongly agree (four). Scores of one and two were categorised as 'disagree' and scores of three and four were categorised as 'agree'. The content and face validity of the questionnaire were evaluated by experts and tested during a pilot study to determine the relevance of the items to the concepts. Cronbach's alpha reliability was 0.82, which ensured the reliability of the tool. Gender and age were also noted. The questionnaire took approximately 10–15 minutes to complete.

Data analysis was carried out using the Statistical Package for the Social Sciences (SPSS), Version 16 (IBM Corp., Chicago, Illinois, USA). Both descriptive and inferential statistics were used to analyse the data.

This study was approved by the SQU Research & Ethical Review Committee of (#NURS/Kh/25/2012). The purpose and voluntary nature of the study was explained to all of the participants. Participants were assured of data confidentiality and their freedom to withdraw from the study at any time without academic consequences. Informed written consent was obtained from each participant.

Results

All of the 57 third-year baccalaureate nursing students in the convenience sample elected to participate in the study, comprising 22 male and 35 female students. In the domain of perceived knowledge and skills, the majority (95.24%) of students agreed that PSBT helped them to develop essential knowledge in

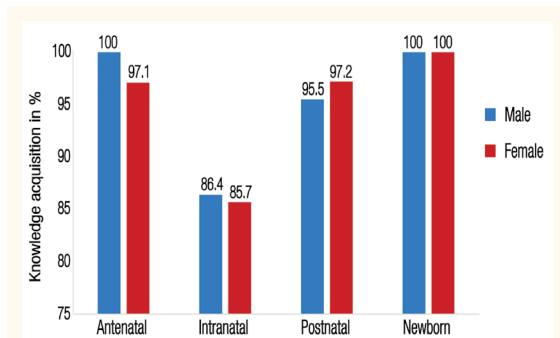


Figure 1: Distribution of perceived knowledge acquisition by gender and learning domain among Omani undergraduate maternity nursing students undergoing pre-clinical simulation-based training (N = 57).

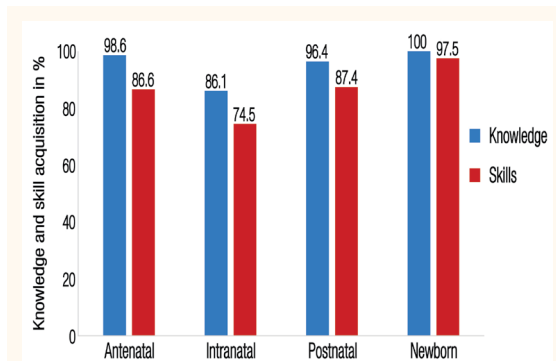


Figure 2: Comparison of perceived knowledge with skill acquisition by learning domain among Omani undergraduate maternity nursing students undergoing pre-clinical simulation-based training (N = 57).

different aspects of maternity care. In addition, 86.48% of the participants were of the opinion that PSBT provided an opportunity for them to practise their skills. More than 97% perceived PSBT as beneficial for developing knowledge of antenatal, postnatal and newborn care; however, their self-rated knowledge of intranatal skills was relatively low (86.4% and 85.7% for males and females, respectively) [Figure 1]. It is important to note that students' perceived enhanced skill competency was significantly positively related to their corresponding improved knowledge ($P = 0.400, 0.384, 0.513$ and 0.646 for antenatal, postnatal, delivery and newborn skills, respectively) [Figure 2].

Most students (94.3%) reported that the use of PSBT enhanced their patient safety practices [Table 1]. Furthermore, 96.4% agreed that PSBT had helped increase their confidence in the care and assessment of patients, especially with regards to antenatal, postnatal and newborn care. However, only 67.8% of female students and 59.1% of male students reported confidence in intranatal care practices. All male students and 97% of the female students agreed that PSBT enhanced their confidence

Table 1: Distribution of perceived safety practices by gender among Omani undergraduate maternity nursing students undergoing pre-clinical simulation-based training (N = 57)

Safety practice	Percentage	
	Male (n = 22)	Female (n = 35)
Universal precautions	94.0	92.0
High-risk management	94.0	95.2
Prevention of hypothermia in newborns	95.7	98.6
Proper identification of patients	95.5	97.1
Documentation and reporting	91.0	98.3

in holding newborns and providing newborn care. With regards to learner satisfaction, PSBT was rated as a safe academic environment by the majority of students (93.9%). Almost all of the students (98%) rated PSBT as an enjoyable opportunity to practice clinical skills and 95.8% reported that it provided a foundation for learning to work with less fear in a clinical environment. Most students (92.5%) valued PSBT as a convenient method to learn and practice patient care without fear of failure and with enhanced communication and collaboration. Overall, 93% of the students were satisfied with PSBT as it helped them develop antenatal, postnatal and newborn assessment and care skills. In contrast, however, the students' satisfaction in the area of intranatal care was rated comparatively low (67%).

The relationships between perceived knowledge and skills, safety practices and confidence is displayed in Table 2. The findings demonstrated a statisti-

Table 2: Correlation between perceived knowledge and skills, safety practices and confidence among Omani undergraduate maternity nursing students undergoing pre-clinical simulation-based training (N = 57)

Outcome	r value	
	Safety practice	Confidence
Knowledge	0.514**	0.421**
Skills		
Antenatal	0.527**	0.497**
Postnatal	0.620**	0.360**
Conduction of delivery	0.296*	0.336**
Newborn care	0.709**	0.477**
Safety practices	1.000	0.348**
Confidence	0.348**	1.000

*Significant at $P < 0.05$. **Significant at $P < 0.01$.

cally significant correlation ($P < 0.05$) between these variables, indicating that PSBT was effective in enhancing students' perceptions and the achievement of their clinical learning outcomes.

Discussion

In light of limited clinical placements and the increasing complexities of safe patient care, innovative teaching-learning experiences like PSBT have become essential. The provision of PSBT at the outset of nursing clinical courses can help students gain the requisite competencies prior to their exposure to real patients, thereby increasing patient safety and decreasing the requisite learning time in the clinical environment.^{8,11,21,22,24} This study assessed the perceived benefits of a PSBT teaching-learning strategy in enhancing knowledge, skills, patient safety practices and confidence among nursing students at SQU. The results indicated that the students perceived PSBT to be useful in developing and improving their knowledge, clinical skills and safety practices, which were the key clinical learning outcomes of their course. This finding is consistent with previous studies from other regions that have highlighted the benefits of simulation-based education.^{11,14,16,17,19–21,24,25}

It is likely that the students' perceived increase in confidence and competencies reflected their actual perceptions as the students completed the questionnaire following their exposure to real-life situations as encountered during a 10-week clinical posting. The positive correlation between perceived knowledge and skills with safety aspects and confidence indicates that PSBT was beneficial in enhancing perceived patient safety practices and the achievement of the final clinical learning outcomes; this has also been observed in the literature.^{2,24} Furthermore, the non-threatening learning environment of PSBT allowed the students in this study to gain confidence in their ability to care safely for maternity patients and newborns prior to actual patient contact. Overall, participants expressed that they appreciated PSBT as a teaching strategy to facilitate achievement of clinical learning outcomes.

In the current study, students reported that PSBT sessions were enjoyable, safe, supportive, non-threatening and less likely to cause anxiety. Furthermore, the sessions allowed students the opportunity to learn from their mistakes. Research has shown that students who engage in comfortable and enjoyable activities are more likely to be motivated to learn.¹⁰ Students in the present study reported high levels of satisfaction with PSBT and commented positively on its benefits in confidence-building and facilitating communication

and collaboration between team members. These findings are congruent with previous research focusing on different student populations.^{10,20–22,24}

It is noteworthy that the students in the current study reported lower scores for their knowledge, skills, confidence and satisfaction related to intrapartum care. Despite these low scores, this observation is heartening as it indicates a degree of accurate critical reflection in the students' evaluations of their own competencies. This may be because it takes considerably longer to develop the necessary knowledge and skills to feel competent in conducting a delivery, even at the novice level. Adjustments to this specific skill competency expectation are therefore recommended in future maternity course outcomes.

Interestingly, male students reported equally high levels of satisfaction with the simulation experience as females, despite the fact that PSBT exposed them to female reproductive anatomy, terminology and procedures that would normally be considered outside the comfort zone of an Omani male. While male students do spend clinical time in maternity units, their hands-on skills are realistically limited to newborn care due to the cultural and ethical limitations in place in Oman. Despite these restrictions, they are nevertheless still expected to meet clinical learning outcomes. It is important for male students to develop competent maternity skills since, while they may never permanently work in a maternity unit, they may very well be faced with emergency situations where these skills are needed. In this instance, SBT provides male nurses with an opportunity to gain valuable maternity clinical competencies while remaining respectful of cultural barriers; this is an additional benefit of PSBT in the Arab world.

Despite its benefits as a learning strategy, Laschinger *et al.* stress that simulation tools should only be used as an adjunct for clinical practice, not as a replacement.³ The results of the present study support this principle. The inclusion of PSBT as an integral aspect of the entire clinical course was perceived as helpful by students to prepare them for safe practice in a real-life clinical environment.

Adopting simulation as a teaching strategy requires that standards and guidelines be developed, preferably by a professional organisation. While Oman does not yet have a national regulating body for nursing, other international professional bodies have endorsed simulation as an effective instructional method in nursing.^{30–32} However, the ideal percentage of clinical time that should be allocated to simulation learning has yet to be determined. The National Council of State Boards of Nursing in the USA is currently conducting a national multi-site longitudinal

study of simulation use in American pre-licensure nursing programmes.³³ Phase two of this study will take the form of a randomised controlled study examining the outcomes of various frequencies of simulation education (10%, 25% or 50%) to replace a portion of the hours spent in traditional clinical settings.³³

The findings of the current study are restricted by its setting in a single institution using a small sample. Furthermore, students were not given the option of reporting additional opportunities gained from PSBT, as the questionnaire items extensively covered all aspects under each learning objective in the course. This may have limited the study. A two-group control experimental design would have been ideal; however, in the current context it was not feasible as the clinical course outlines were planned and implemented for the whole cohort. However, the results observed in this study were consistent with the aforementioned previously published studies in a variety of different countries. Thus, in spite of its limitations, the current study's findings serve to support the applicability of SBT research findings to Middle Eastern settings. The results of this study add to the body of research that supports the effectiveness of SBT learning in nursing education by documenting perceived benefits in a previously untested population of students. Nevertheless, there is a need for future research to be conducted regarding the transferability of simulated learning to the practice environment.

Conclusion

This study found that Omani undergraduate nursing students in a maternity clinical course at a Middle Eastern university perceived that PSBT enhanced their knowledge, skill acquisition and safety practices. They rated PSBT as enjoyable and helpful in building their confidence and enhancing their communication and collaboration skills. The findings also suggest that PSBT provides an opportunity for Arab male nursing students to achieve clinical maternity skills which they may otherwise have limited opportunities to practise due to cultural barriers. The observed rate of student satisfaction with this teaching strategy supports the inclusion of simulation as an adjunct to clinical practice in future maternity nursing courses in the Middle East. However, further research is needed to explore the objective impact of PSBT on actual practice.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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