Original Article

Simulation-Based Training to Improve Obstetric/Perinatal Nurses Competency in Managing Obstetric Emergencies in Saudi Arabia (KSA)

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Abstract

Background: The insufficiency of traditional training to develop and maintain the competencies needed to manage adverse events in Obstetric emergencies, in addition to country specific cultural, religious and taskforce related issues prompted the adoption of simulation-based training (SBT) in the management of obstetric emergencies for Obstetric/Perinatal Nurses.
Aim: To evaluate the effectiveness of SBT program on the level of nurses knowledge and confidence in the management of obstetric emergencies and their retention of the acquired competencies
Methods: Quasi-Experimental methodology was used for this study. The study adhered to the reporting guidelines for healthcare simulation research where appropriate.
Results: The acquisition and retention of knowledge and confidence of participants was statistically significant (P< 0.001) after the simulated training.
Conclusions: In clinical settings where nurses presenting from different backgrounds and thus their skills, experience and qualifications are highly variables and instances wherein nurses are expected to perform expanded clinical roles, simulation-based training can be a method of choice for healthcare educators to upskill their nursing staff.

Key words: Simulation based training, Obstetric emergencies, continuous professional development, Saudi Arabia.

Introduction and Back ground

Simulation is widely used in many industries and has gained increasing popularity in the area of Health Care education. In hospital settings, simulated experiences provide the health care providers with the opportunity to be involved in realistic patient care experiences they may otherwise not experience in actual clinical settings.

These patient situations may be of low frequency or high impact cases or competencies (Ameh and van den Broek, 2015; Farrar Highfield, Scharf-Swaller and Chu, 2017) like shoulder dystocia, cord prolapse, postpartum hemorrhage and uterine inversion in Labor and Delivery Unit (LDU).

As a teaching methodology, simulation experience is an active event in which students are immersed

into a realistic clinical environment. The objective is to create situations that are as similar to real life as possible. Depending on closeness to reality, simulation can be either low or high fidelity, or a combination of both. This is crucial in linking didactic content to a simulated clinical environment (Shields and Veile, 2009). A recent literature review identified ample evidence supporting the use of simulation-based training in the management of medical education especially when related to the medical emergencies. The most prominent benefits of such training according to the review were on the improvement of knowledge gained, skill performance, team coordination, and retention of the competency by the participants. However the same review indicated the weakness of evidence on the effect of simulation training on the patient's clinical outcomes and also the need for more robust clinical trials investigating the effectiveness of the simulation training (Fransen *et al.*, 2015).

LDU is one of the vital units in the hospital where the management of obstetric (OB) emergencies of women in labor, neonates and postpartum mothers is critical and requires special expertise. The issue of mismanagement of OB emergencies is a worldwide concern. Inadequate staff training was identified as the most common cause of adverse events affecting the management of these emergencies (Lentz *et al.*, 2001; Macedonia, Gherman and Satin, 2003; Gjeraa, Møller and Østergaard, 2014; Ameh and van den Broek, 2015; Fransen *et al.*, 2015).

Although fortunately uncommon, life-threatening obstetric emergencies require skill and prompt action. Training and refreshment programs are therefore a common practice in LDU units. However despite these active educational programs (using traditional teaching strategies), there were a number of reported harm events related to substandard care practices. As such, given the international evidence supporting the benefits of simulated training in these situations and in various medical emergency educators identified the LDU as a potential priority area for the provision of simulation based training on obstetric emergencies, situations (Lentz *et al.*, 2001; Gjeraa, Møller and Østergaard, 2014; Ameh and van den Broek, 2015; Fransen *et al.*, 2015).

For example, simulation-based training of delivery room teams in the management of obstetric emergencies, such as in eclamptic parturient or postpartum hemorrhage has shown to improve clinical performance and reduce the incidence of medical negligence (Lentz *et al.*, 2001; Gjeraa, Møller and Østergaard, 2014). Additionally, simulation-based training has been associated with improved neonatal outcomes during shoulder dystocia and improved performance during post-partum hemorrhage (Macedonia, Gherman and Satin, 2003). In Saudi Arabia (SA) the healthcare system is shaped by Islamic principles and values that inform health care practices (Amatullah, 2008). As such, the childbirth process is affected by culture which in turn is affected by religion, race, economic status, level of education and environmental factors (Oakley, 1980; Al-Shahri, 2002; Al-Yateem, AlYateem and Rossiter, 2015). Within the cultural context of SA most women prefer to be treated by a female healthcare practitioners especially during pregnancy and delivery (Al-Shahri, 2002; Al-Yateem, AlYateem and Rossiter, 2015). To this end the Midwifery role has been considered crucial and has expanded to fill the gap when female doctors are not readily available. To support this expanded role for midwives, they must be trained and provided with the needed competencies especially those related to management of emergency situations.

The majority of the nursing and medical staff within the Saudi Arabian health system is recruited from all over the world (i.e. Philippines, India, South Africa, Malaysia, Europe, and other Arab countries) with variable qualifications, different training backgrounds, and different skill sets (Altaweli, McCourt and Baron, 2014). There are no statistics on the skill level of providers attending childbirth, however, for the purposes of this study it should be noted the requirement for employment of midwives, nurse-midwives and nurses are specialty certification and at least 2 years recent clinical experience in obstetric/perinatal nursing care. Generally there is scarcity of official academic training programs for midwives to their specialized roles in SA (Altaweli, McCourt and Baron, 2014). Therefore, upskilling these staff depends mainly on the professional development programs offered within

the workplace settings. Robust professional training programs are very important.

Simulation training was introduced recently in one of the biggest tertiary hospital in KSA by establishing The Inter-professional Simulation Training Center (IPSTC). The mandate for the establishment of this training center is to utilize simulation training to improve health care training and professional development, and also to conduct studies to establish the effectiveness of simulation training strategy in health care field. The LDU was chosen to implement the first simulation training programs due to the significant increase in the incidence of maternal and neonatal morbidity and mortality related directly to mismanagement of obstetric emergencies. For the purposes of this project the SBT program was designed to cover 3 priority obstetric emergencies experienced at our facility: shoulder dystocia, postpartum hemorrhage and uterine inversion.

Study objectives: The specific objectives for this study would be to evaluate the effectiveness of SBT program on the level of nurses knowledge and confidence in the management of obstetric emergencies and their retention of the acquired competencies

Methods- Study Design: A quantitative quasi-experimental methodology was used for this study to measure the effect of simulation-based training program in obstetric emergencies on nurse's knowledge and confidence in managing these emergencies. On reporting the study process, the reporting guidelines for healthcare simulation research where adhered to as appropriate (Cheng *et al.*, 2016).

Participants : This study was conducted in a large tertiary hospital conglomerate in KSA. The total number of population working in LDU in this hospital was 30 nurses and midwives. Of note, staff nurses (SN)and midwives (MW) who were planning to leave the hospital at any time during the 6 months duration of the training program were excluded from the study (n=0).

Intervention: Simulation-Based Training Program

The program was constructed utilizing The International Nursing Association for Clinical Simulation and Learning (INACSL) Standards of

Best Practice in Simulation (Durham, 2013).Pre assessment was conducted three weeks prior commencement of the course to measure participant's knowledge and confidence regarding the identified obstetric emergencies. The program began with a simulation preparatory phase in which a simulation preparatory reading package was distributed to all participants three weeks prior to the course for review and request for demonstrations if necessary. The preparatory package contained program outline, reading material covering knowledge content and skills check lists to be used during the program to assess the individual skills, the expected learning outcomes.The training program covered the 3 priority obstetric emergencies separately across one training day. The program schedule included the following activities:

- Welcoming and Briefing on the program learning objectives, used simulator and related equipment
- Individual skills testing station and remediation if needed.
- Simulation session on team management of obstetric emergencies using Noel high fidelity birthing simulator in a simulated L&D patient room with all necessary equipment & supplies. This was accomplished following a brief demonstration on how to manage the scenario by the simulation facilitator.
- Post-Course Assessment of participant's knowledge and confidence after participating in each scenario.

Outcomes : Participant's knowledge and confidence on management of obstetric emergencies were the main outcomes measured in this study. These outcomes were measured before and after the simulation intervention using the NursOB Scale (Farrar Highfield, Scharf-Swaller and Chu, 2017).

- This tool was used in a similar study to measure obstetric/perinatal staff nurses' self-assessed knowledge and confidence in managing five high-risk, low-frequency situations (Farrar Highfield, Scharf-Swaller and Chu, 2017). Content Validity of this tool was checked and piloted by the tool authors. Using the NursOB scale, subjects could self-report on a scale from 0 to 10, their knowledge

and confidence in dealing with each of the three priority obstetric emergencies: shoulder dystocia, postpartum hemorrhage and uterine inversion. Each item on the scale was scored individually from 0 to 10, and then the three knowledge items and the three confidence items were totaled for two subscale scores ranging from 0 to 50. Higher scores suggested higher perceived knowledge and confidence.Cultural adaptation was demonstrated by review of the content of the NursOB scale by the clinical experts in the hospital Labor and delivery unit. No change on the scale was required.

Sample size: Total population sampling was used to include the maximum number of LDU nurses and midwives due to small population size.

Statistical methods: Descriptive statistics were calculated to identify levels of knowledge and confidence of participants in management of different obstetrical and gynecologic emergencies before and/or after the simulated training.

To explore if the difference between participants knowledge and confidence of the management of various obstetrical and gynecological emergencies before and/or after the simulation and in the follow up session was statistically significant, Wilcoxon Signed Rank Test was conducted. The decision to use this test was made after assessing the normality of the collected data which was found to be non-normally distributed. Participants were categorized into categories (i.e. low, medium and high) in relation to their gained knowledge and confidence after the training, Chi squared test was done to compare the proportions of participants in each knowledge and confidence category.

Finally, the differences in knowledge and confidence in managing obstetric and gynecological emergencies among different staff categories (SN and MW) were explored. Due to the small sample size comparing staff categories in terms of their knowledge and confidence could not be done through tests of differences (ANOVA or equivalent non- parametric test). Chi square test was considered more appropriate as it would compare the proportions of participant's subgroups in three categories only (low, medium and high).

Results

30 participants took part in the study, 15 midwives and 15 staff nurses. The results revealed that majority of participants categorized themselves in the low to medium knowledge and confidence categories before the simulated training session. This categorization changed after the training, where majority of participants listed themselves in the high knowledge and confidence categories. The mean score of participant's knowledge in shoulder dystocia for example was 6 (out of 10 maximum score) before simulated training and this increased to 9 after the training. Similarly, participant's confidence scores in the management postpartum hemorrhage increased from 6 to 9 after the simulation. The pattern of knowledge and confidence change in the other obstetric and gynecological (OB/GYN) emergencies followed the same pattern. The results revealed that the change in knowledge and confidence of participants after the simulation training was statistically significantly (P< 0.001), also the proportion of participants in the high knowledge and confidence categories increased. Moreover, in the follow up assessment, participant's knowledge and confidence remained almost similar to that of the post training levels, the test of difference revealed no significant difference between the two. The mean scores for participant's knowledge and confidence in different OB/GYN emergencies are detailed below in Table 1. While, Table 2 shows the proportions of participants in different knowledge and confidence levels pre and post SBT. Finally, in terms of the differences in knowledge and confidence in managing obstetric and gynecological emergencies among different staff categories, the Chi squared test revealed that there was no significant difference (e.g. P= 0.47, 0.543) between the participants subgroups in terms of their knowledge and confidence of managing obstetric and gynecological emergencies pre and post simulated teaching experience. For example participant responses in the different subgroups were distributed similarly among the knowledge categories.

Table 1: The mean scores for participant's knowledge and confidence in different OB/GYN emergencies

	Pre-simulated	Post-simulated	2 months Follow up on
	M	M	M
Knowledge			
Shoulder Dystocia	6	9	9.3
Post-Partum Hemorrhage	7	10	9.3
Uterine inversion	5	9	9.2
Confidence			
Shoulder Dystocia	6	9	9.1
Post-Partum Hemorrhage	7	10	9.4
Uterine inversion	5	10	9.1

Table 2: Proportions of participants in different knowledge and confidence levels pre and post SBT

		Pre-simulated training		Post-simulated training		2 months Follow up on	
		n	%	n	%	n	%
Participants reported Knowledge levels							
Shoulder Dystocia	Low	8	27.6%	0	0.0%		
	Moderate	18	62.1%	3	10.3%		
	High	3	10.3%	26	89.7%	18	62%
	Missing					11	38%
Post-Partum	Low	6	20.7%	0	0.0%		
	Moderate	16	55.2%	1	3.4%		
Hemorrhage	High	7	24.1%	28	96.6%	18	62%
	Missing					11	38%
Uterine Inversion	Low	15	51.7%	0	0.0%		
	Moderate	13	44.8%	3	10.3%		
	High	1	3.4%	26	89.7%	18	62%
	Missing					11	38%
Participants reported Confidence levels							
Shoulder Dystocia	Low	10	34.5%	0	0.0%		
	Moderate	16	55.2%	2	6.9%		
	High	3	10.3%	27	93.1%	18	62%
	Missing					11	38%
Post-Partum	Low	9	31.0%	0	0.0%		
	Moderate	14	48.3%	1	3.6%		
Hemorrhage	High	6	20.7%	27	96.4%	18	62%
	Missing					11	38%
Uterine Inversion	Low	14	48.3%	0	0.0%		
	Moderate	14	48.3%	3	10.3%		
	High	1	3.4%	26	89.7%	18	62%
	Missing					11	38%

Discussion

The aim of this study was to evaluate the effectiveness of simulation training program on the level of nurse's knowledge and confidence in the management of obstetric emergencies and their retention of the acquired competencies. Recently, there has been recognition in KSA of the plethora of literature recommending the adoption of simulation-based training of healthcare professionals. The willingness to utilize SBT was triggered by an increasing awareness that the current traditional training process is less efficient than what is clinically required. Teaching students and healthcare professionals to be competent in clinical skills and practice is a major goal of undergraduate nursing education as well as the in-service professional development programs and teaching activities. However, traditional learning strategies have been shown to be less successful for this purpose than simulated based education especially when it comes to the retention part of the learning process (Shin *et al.*, 2014).

Instructional methods have been reported in the literature to have a direct effect on the outcome of the training process, whereby those methods that utilize technology and innovative strategies and blended learning methodologies (Fernández Alemán, Carrillo de Gea and Rodríguez Mondéjar, 2011; Iley *et al.*, 2011; Sherriff, Burston and Wallis, 2012; Hsu, Pan and Hsieh, 2016; Chen *et al.*, 2017) are thought to produce a better experience and outcomes. The results of the current study showed the effect of a simulated learning program on professional midwives competencies and identified its effectiveness in the development and maintenance of these competencies. This is similarly supported by the literature (Masters, 2013; Duane and Satre, 2014; Mills *et al.*, 2014; Shin *et al.*, 2014) which has demonstrated a positive effect of new and alternative educational methodologies in the nursing education and competency development.

In a study to determine the impact of an interactive (Chen *et al.*, 2017), situated and simulated learning (ISST) workshop on novice nurse practitioners clinical competence level, the authors compared two groups one of which received an ISST training and the other did not. At the end of the study the ISST group demonstrated superior nursing competency, reported lower stress levels and increased confidence in clinical skills. Also Cant & Cooper (2017) in a recent comprehensive study reviewed the results of approximately, 700 primary studies in the literature conducted between 2010 and 2015 regarding simulation-based education in undergraduate nursing. Their review indicated that simulation-based education supported psychomotor skills development; improved self-efficacy and reported strong satisfaction among trainee (Cant and Cooper, 2017) .

Measuring the retention of the skills comprised an important component of the learning, and was a main factor for utilizing simulation in this study. The results revealed that the simulated training group retained the competencies that they gained during their training for a period of two months which is the period at which a second assessment session were conducted. The level of knowledge and confidence gained during training at the follow up assessment did not change from the base line assessment done immediately after the training. This is in line with the results of Fernández Alemán et al., (2011) study in which competitive e-learning method was assessed and produced significant cognitive gains for the experimental group students at the immediate follow-up and again after 4 months and 6 months periods (Fernández Alemán, Carrillo de Gea and Rodríguez Mondéjar, 2011).

Finally this study is of local and cultural importance to the KSA as well, it has demonstrated that simulation based training for obstetrical/perinatal nurses can contribute to the production of the desired clinical competence level required to ensure the provision of safe quality obstetric nursing care that can supplement the care provided by inter-professional colleagues, especially with lack of numbers of experienced and appropriately trained LDU staff.

Conclusion:

Simulated training was found in this study to be effective in the training of SN and MW in the management of OB emergencies they encountered in their clinical practice. Simulated training has contributed to the increase of knowledge and confidence of the participants and also the

retention of the knowledge and skills competency for considerable period afterward. Simulation-based training can be a method of choice for healthcare educators to upskill their nursing staff in competent clinical skills in view nurses presenting from different backgrounds and thus their skills, experience and qualifications are highly variables and instances wherein nurses are expected to perform expanded clinical roles.

Study limitations:

The sample size of the study was small when compared with the requirement of quantitative designs; this may have affected the statistical comparisons and limited the generalizability of the results.

The desire of the hospital management to include all the nurses and midwives in the simulated training process due to potential benefits on learning has limited the ability to divide the participants in the study into a control and intervention group to be able to more accurately assess the differences between the groups.

The follow up period when the second assessment has took place was after two months might be considered a not long enough to assess retention, a longer re-assessment period or second follow up assessment exercise could have provided a better idea about knowledge retention if was done, however this was not logistically possible within the current study.

Ethical statement

Ethical approval was obtained from King Abdullah International Medical Research Center (KIMRC) to conduct this study. The participation in this study was voluntary; this was highlighted clearly for participants in the information sheet. The consent form, information sheet and questionnaire were distributed to the LDU nurses, and midwives. Those willing to participate completed and returned the consent form along with the completed questionnaires. Participants were instructed not to write any personal information on the questionnaires to ensure anonymity. Collected data was safely maintained throughout the study period and stored in a secure place accessible only to researchers.

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