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Evaluation of satisfaction and change in knowledge following use of high fidelity simulation based teaching for obstetric emergencies among nursing students

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Abstract
Simulation based education is an educational method that utilizes simulation aides to replicate clinical scenarios. Our study aims at evaluating the satisfaction and change in knowledge following the use of high fidelity simulation based teaching for obstetric emergencies among nursing students.
Method: Following ethical approval, a prospective study was conducted in the simulation centre of a private medical college on 45 final year nursing students posted in OBG chosen by convenience sampling.4 obstetric emergency scenarios, namely, eclampsia, shoulder dystocia, cord prolapsed and PPH were created on the maternal fetal birthing manikin. Prior to this exercise, the students had received didactic lectures regarding the same topics. The students were divided into 4 batches. Each batch was given an opportunity to perform all 4 scenarios. On the day of the session, the students were given a pre-test to assess the baseline understanding of the topic followed by pre-briefing. After allocating roles for the scenario, each scenario was run for all the teams followed by debriefing. Finally a post-test and feedback form was filled to assess simulation as a teaching learning method and to evaluate the satisfaction of the students towards simulation.
Result: Standard deviation(mean) for pretest scores was lowest for cord prolapse module and highest for PPH module. Standard deviation (mean) for post test scores was lowest for shoulder dystocia module and highest for eclampsia module. There was a significant increase in post test scores in all the modules except for PPH module where there was no difference. The thoughts of the students about their simulation experiences were examined and suggestions which came forth were accepted.
Conclusion: The use of high-fidelity simulation to train nursing students in obstetric emergencies has greater satisfaction scores, provides and improves students's clinical reasoning, knowledge and skills. Hence simulation teaching needs to be incorporated in the regular curriculum.

Keywords: Nursing students, satisfaction, simulation

Introduction

Acquiring clinical skills is important for undergraduate nursing students during their training periods in obstetrics and gynaecology [1]. However, all training methods are not effective in providing this experience, probably due to lack of opportunity in a busy clinical environment or preference for training of medical students over nursing students or owing to the rarity of certain conditions.

Lack of skills and knowledge on how to recognize and manage obstetric emergencies contributes to substandard institutional care and majority of preventable maternal deaths [2].

Simulation is an educational process that substitutes real patient encounters with artificial models created by screen-based computer simulations, partial-task simulators and high-fidelity whole body mannequins. Simulation bridges the gap between "theory to practice", as knowledge learnt in a classroom can be practiced on simulators prior to real patients.

Simulators replicate patient case scenarios in a realistic environment and have the benefit of being able to repeat the same scenario in a controlled environment allowing practice without risk to the patient thereby minimizing chances of medical error. Furthermore, recording and feedback options in modern simulators make them a useful tool for student assessment [3, 4]. Simulation-based learning (SBL) can also provide an ideal background for improving teamwork and behavioral skills which are essential for trainees as health care system has increasingly become multidisciplinary [5, 6, 7].

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Simulation-based obstetric emergency training can improve students' knowledge and skills, and increase their ability to detect and appropriately manage relatively rare life-threatening cases that can affect women during pregnancy, labor or the post-partum period [5, 8, 9].

These benefits have been reported when simulation was used in educating midwifery students, where it aided in the development of integrated and global clinical skills [10].

However, despite the evidence of its benefit, simulation hasn't been formally introduced into the teaching curriculum. Our study aims at evaluating the satisfaction and change in knowledge following the use of high fidelity simulation based teaching for obstetric emergencies among nursing students.

Objectives

1. To train the nursing students to recognize and manage obstetric emergencies on high fidelity simulators.
2. To evaluate the satisfaction of simulation by the students by using a satisfaction questionnaire.
3. To record the change in knowledge following training.

Methods

Following ethical approval, a prospective interventional study was conducted in the simulation centre of a private medical college in Mangalore on nursing students posted in OBG.

Sample size: 45 final year nursing students chosen by convenience sampling

4 obstetric emergency scenarios, namely, eclampsia, shoulder dystocia, cord prolapsed and PPH were created on the maternal fetal birthing manikin.

At the time of this exercise, the students had already received didactic lectures regarding the topics selected for simulation based learning.

The students were divided into 4 batches, comprising 11 students in 3 batches each and 12 in the 4th batch. Each batch was given an opportunity to perform all 4 scenarios.

On the day of the session, the students were given a pre-test to assess the baseline understanding of the concepts related to the topic. This was followed by pre-briefing where the students were given a brief history of patient details with vitals and lab investigations. Next, each team was asked to allocate roles for the scenario. Each scenario was run for all the teams. This was followed by debriefing where the students and facilitators sat together to reflect on the actions taken during the scenario. Plus-beta method was used for de-briefing. The final step was a post-test and closure where take home message was given and a feedback form was asked to be filled to assess simulation as a teaching learning method and also to evaluate the satisfaction of the students towards simulation.

Evaluation

To evaluate the entire training program, the Kirkpatrick four level training evaluation model was used.[11]

Level 1 (measures Reaction): the degree to which participants find the training favourable, engaging and relevant to their job (measured using post training questionnaires, interviews, printed or oral reports).

Level 2 (measures Learning): the degree to which participants acquire the intended knowledge, skills, attitude, confidence and commitment based on their participation in the training (measured using Pre-test post-test assessment, observation by peers/instructors, having a control group).

Level 3 (measures Behaviour): The degree to which participants apply what they learnt during the training when they are back on their job (measured using 360 degree feedback, workplace based assessment tools, direct observation of procedural skills, observable change in behaviour, interviews).

Level 4 (measures Results): the degree to which targeted outcomes occur as a result of the training and the support and accountability package (measured by calculating patient safety/ reduction in litigations following this educational intervention).

To evaluate the second level of Kirkpatrick model for change in knowledge pre-test and post-test multiple choice questions (MCQs) were used. These questions were validated for content and relevance to the prepared scenario by two other faculty from OBG not involved in simulation teaching.

Statistics

The reliability of questionnaire to record the resident satisfaction was analysed using the Cronbach's alpha and the average of pre-test and post-test scores were compared using the Student's T-test.

Results

The following study was conducted in Father Muller Simulation centre among 45 nursing students. All belonged to the age group of 19-22 years.

22.2% of the students were males and 77.8% were females.

Only 8 students (17.7%) had previously heard of simulation as a novel teaching method.

Table 1: Comparison of pretest and post test results

	N	Mean	Std. Deviation	Mean (%)	Mean difference (%)	t test p value	
Pre	45	8.67	3.59	34.67	59.49	.000	HS
Post	45	13.82	4.17	55.29			

Table 2: Pre and Post Test Mean for All Modules

		Standard Deviation
Eclampsia	Pretest	1.34
	Posttest	1.48
Pph	Pretest	1.48
	Posttest	1.44
Cord prolapse	Pretest	0.73
	Posttest	1.07
Shoulder dystocia	Pretest	0.83
	Posttest	0.99

Standard deviation(mean) for pretest scores of 45 students was lowest for cord prolapse module and highest for PPH module.

Standard deviation (mean) for post test scores of 45 students was lowest for shoulder dystocia module and highest for eclampsia module.

There was a significant increase in post test scores in all the modules except for PPH module where there was no difference.

Average change in score was 10.81% for eclampsia, -2.63% for PPH, 47.25% for cord prolapsed and 19.15% for shoulder dystocia.

The thoughts of the students about their simulation experiences were examined in the study.

82.2% students identified simulation as an innovative form of learning. 88.9% concluded that simulation significantly contributed to skill development and is an alternate method of learning to bedside clinics. 86.67% found debriefing very useful and noted that it helped reinforce the didactic method of teaching. 17.7% students felt stressed during the scenario.

Table 3: Responses based on feedback form

Parameter	Strongly agree (no, %)	Agree	Neutral	Disagree	Strongly disagree
This experience will improve my performance in actual clinical setting	40 (88.88%)	5 (11.11%)	-	-	-
This simulation was a valuable learning experience	38 (84.44%)	5 (11.11%)	2 (4.44%)	-	-
Debriefing was a valuable learning experience.	42 (93.33%)	3 (6.66%)	-	-	-
The program goals and objectives were clearly met.	38 (84.44%)	5 (11.11%)	2 (4.44%)	-	-
This training is vital and needs to be included in the nursing curriculum.	41 (91.1%)	-	4 (8.88%)	-	-
It helped fill gaps in present skill/attitude.	40 (88.88%)	5 (11.11%)	-	-	-
Satisfied with teaching tools and faculty.	40 (88.88%)	5 (11.11%)			

Some suggestions which came forth were
- The setting must be made more realistic.
- Active participation of all students must be ensured.
- More information about scenarios must be given.
- More scenarios must be created with simulation.

Discussion

The use of simulation integrated into nursing education curriculum provides an experience-based learning opportunity for the students, increases student's knowledge and self-confidence, and supports the development of clinical decision-making skills [12].

In a study involving 151 medical and nursing students, positive attitudes of the simulation model were reported on learning by Ker *et al*. [13] In Southeastern University, Bambini *et al*. evaluated the efficacy of HFS model related to postpartum examination on 112 nursing students during their initial clinical course in a prelicensure program and detected a significant increase in overall self efficacy of the students [14].

Feingold *et al*. (2004) conducted a study to examine 65 nursing student perceptions about high fidelity simulator using a 20-item tool. In their study, findings revealed that the majority of students agreed that simulation was realistic and valuable [15].

Schoening *et al*. (2006) reported the importance of simulation as an effective means of providing a realistic and practical environment [16].

In a study by Robertson *et al*. (2009), however, no statistically significant improvement in knowledge on obstetric crisis was found, but there was a positive change in team attitude and team performance [17]. On the contrary, an RCT reported a change in knowledge and skill after training emergency obstetric including eclampsia, shoulder dystocia, breech delivery, and postpartum haemorrhage ($p < 0.001$) [18].

In a study carried out with nursing students, Pınar ve Doğan reported that the majority of students suggested the integration of HFS into curriculum reduced learning time, developed a sense of confidence and motivation, and showed possibilities as a nursing student [19].

Guhde determined that nursing education performed by HFS model among 134 participants increased their satisfaction level and developed critical thinking skills of undergraduate students. [20] Childs and Sepples conducted a study using complex patient care scenarios in simulation practice. In their study, it was notified the students have found that learning opportunities are versatile and rich through simulation practice application, and they wanted simulation practice to be included in the curriculum [21]. Findings in a study by Ardic *et al*. [22] also noted similar results and support the finding that simulation improves clinical skills.

Clinical experiences can also be a significant source of stress and anxiety for students which may have a deleterious effect on their learning [23, 24]. In a study by Ardic *et al*, 95.2% of the students expressed that the simulation applications facilitate learning and 33% stated that simulation can cause anxiety [22]. In a study on nursing students by Pinar *et al*, a higher levels of anxiety were noted after the simulation experience [19].

Limitations

We have used convenience sampling and included only students from our nursing college hence our sample size is small to generalize the findings. Hence, a larger study with students from different regions would be ideal to confirm our findings. In the present study, we recorded the participant's reaction and change in knowledge to this educational intervention. We have not tested the change in behaviour (Kirkpatrick level 3) and result on patient care (Kirkpatrick 4). A longer period of follow-up and recording of the observations is required to get the whole effectiveness of this program. The present study also did not incorporate interdisciplinary team work i.e., including obg residents or medical students/interns etc. hence the holistic team dynamics was lacking. Future studies incorporating these features would be ideal.

Conclusions

Simulation as an educational tool compliments clinical exposure. It is an effective teaching learning tool for our adult learners. Teachers need to be trained to use this tool for education. However, future research with a larger number of participants is required to document the positive participant's response and record the change in behaviour or improvement in patient's outcome.

The use of high-fidelity simulation to train nursing students in obstetric emergencies has greater satisfaction scores, provides and improves students's clinical reasoning, knowledge and skills. Hence simulation teaching needs to be incorporated in the regular curriculum. A long-term follow-up is required to observe for change in behaviour and benefits for nurses and patients.

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