

# Obstetric Emergency Drill: Does it Change our Knowledge and Skill?

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## ABSTRACT

**Introduction:** Obstetric emergencies are unpredictable and inappropriate management of such events can result in serious maternal and neonatal morbidity and mortality. Simulation and drill provides obstetric emergency training in a safe environment with an aim of improving clinical outcome. The aim of this study was to evaluate the impact of obstetric emergency training on the change in the knowledge, clinical skill and teamwork performance of the participants in the management of common obstetric emergencies: eclampsia, shoulder dystocia and post-partum haemorrhage.

**Methods:** A hospital based interventional study was conducted amongst 11 residents, 4 medical officers and 45 interns. Pre-training and post-training assessment of the knowledge by using Multiple choice questions (MCQs), clinical skills by using Objective Structured Clinical Examination (OSCE) and teamwork performance by using Mayo High Performance Teamwork Scale (MHPTS) was undertaken in each of the modules: Eclampsia, Shoulder dystocia and Post-partum haemorrhage. Training intervention was undertaken by using standardized lectures and simulated clinical emergency scenarios. The changes in MCQs, OSCE and MHPTS scores were analyzed.

**Results:** There was a significant improvement in the mean MCQ score (p-value <0.001) and OSCE score (p-value <0.001), overall and individually, in each module. After the training, a greater number of participants could perform the clinical skill components. There was also a significant improvement in post training MHPTS score (p-value<0.001).

**Conclusions:** Obstetric emergency drill and training significantly increased the knowledge, clinical skills and teamwork performance of participants in the management of important obstetric emergencies.

**Keywords:** eclampsia; obstetric emergency; post-partum haemorrhage; shoulder dystocia; simulation.

## INTRODUCTION

Obstetric emergencies are unpredictable and sudden. Inappropriate management of such events with negligence and by unskilled person can result in substantial maternal and neonatal mortality and serious morbidity.<sup>1</sup> Most child-birth related complications allow time for prompt diagnosis and proper management while there are few obstetric emergency conditions like post-partum

haemorrhage, eclampsia, shoulder dystocia, cord prolapse, obstetric shock and maternal collapse, where successful outcome depends upon prompt action and systematic rapid management.<sup>2</sup>

Simulation and drill provides obstetric emergency training in a safe environment with an aim of improving clinical outcome.<sup>3</sup> Simulation based training has been shown to improve not only knowledge and clinical skills, but also improve teamwork performance during the management of obstetric emergencies.<sup>4-7</sup>

In view of the importance of drills and

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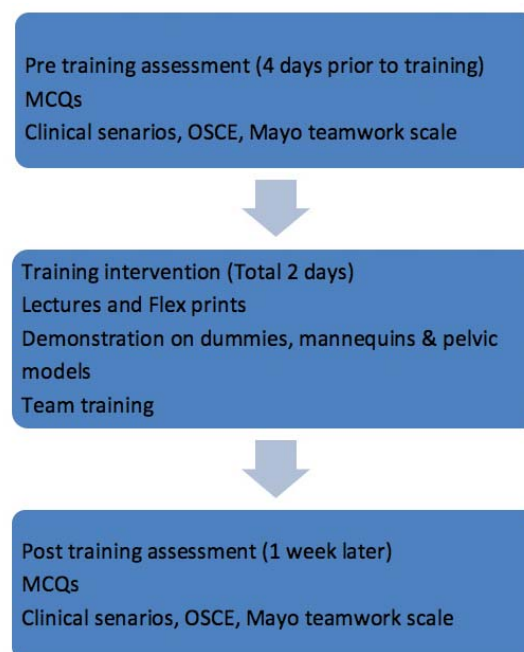
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trainings for better obstetric outcome, the aim of this study was to evaluate the impact of obstetric emergency training on change of the knowledge, clinical skills and teamwork performance of the participants in the management of three common obstetric emergencies: eclampsia, shoulder dystocia and post-partum haemorrhage.

## METHODS

A hospital based interventional study was conducted in the Department of Obstetrics and Gynaecology, Kathmandu Medical College from December 2017 to March 2018. Kathmandu Medical College is a private medical college affiliated to Kathmandu University with tertiary level health care with Maternal High Dependency Care Unit and both Maternal and Neonatal Intensive

care facility. The delivery rate ranges from 2500 to 3000 per annum and caters 4500-5500 Obstetrics and Gynaecology clients in out-patient clinic and approximately 1500 clients in in-patient department per month. The study was conducted on 11 residents (Post-graduate Obstetrics and Gynaecology trainees), 4 medical officers (junior doctors) and 45 interns (undergraduate trainees) posted in the department of Obstetrics and Gynaecology over the study period. Participants who have obtained the Obstetric emergency management course within 12 months, who have already booked to attend a training course within the duration of the study, who was involved in the delivery of the training interventions or evaluation and who participated in the pilot phase of the study were excluded from the study.



**Figure 1. The study design**

The training and the assessment were conducted in 4 batches (15 participants in each batch). As shown in Figure 1, pre-training assessment of the knowledge, clinical skills and teamwork performance was taken 4 days prior to the training course. Training intervention was conducted in 2 days and post-training assessment was taken a week later.

Pre-training assessment of the knowledge was taken in the form of Multiple Choice Questions (MCQ). Fifteen MCQs were included in each module: eclampsia, shoulder dystocia and post-partum haemorrhage; a total of 45 MCQs were used for testing the knowledge. Questions related to incidence, etiology, risk factors, complications, emergency management and drug treatment were included. A total of 30 minutes was given to

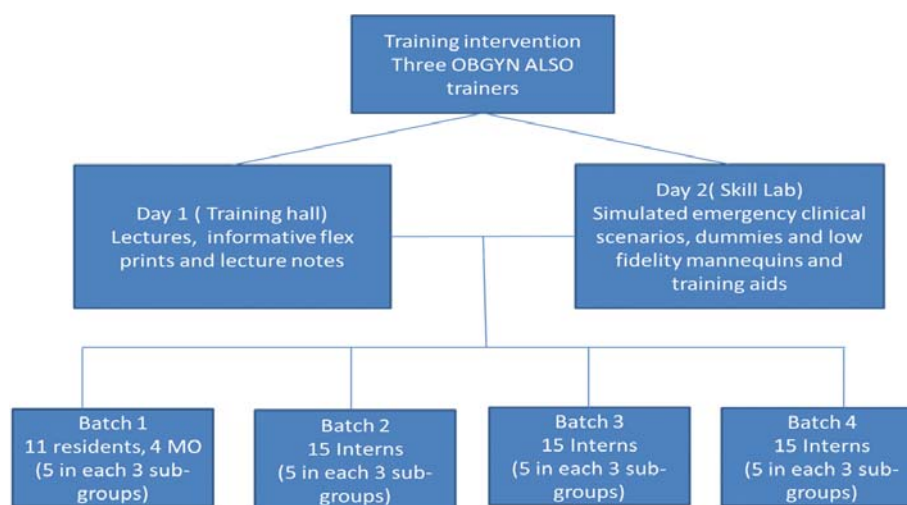
complete the whole set. The correct answer was given a score of one and no negative markings were given. The questionnaires were produced by an expert panel of Obstetricians and Gynaecologists and validation of the questionnaires was done during the pilot phase of the study.

Pre-training assessment of the clinical skill was taken in the form of Objective Structured Clinical Examination (OSCE) by using clinical scenarios and practical demonstration on dummies, mannequins and pelvic models. Assessment of clinical skill was done by validated check-lists which were used during the pilot phase of the study, in three sub-groups in each batch, and assessment was done by a team of Obstetricians and Gynecologists. The participants would gain full score only if they were able to demonstrate the correct procedure or manoeuvre in sequence or administer a drug with correct dosing and route of administration.

Pre-training assessment of the teamwork performance was done by using standard Mayo High Performance Teamwork Scale (MHPTS) in a team based manner. MHPTS is an observational rating scale used to evaluate the teamwork performance in a simulation-based training session. This tool was developed by Malec et al<sup>8</sup> in 2007 to assess the reliability and validity of the tool in a crisis resource management (CRS) training which contains 16 items to assess

the teamwork performance. We used first 8 items for assessment of the teamwork in our study; the last 8 items were not applicable and are optional. Each batch was divided into 3 sub-groups with 5 participants in each. It would assess each participant's role and responsibility as a team member, identification and leadership quality of the team leader, response towards the other members and prompt action within a desired timeframe by the team.

The clinical content of the training interventions (courses) included standardized lectures, informative flex prints and lecture notes mostly based on Advanced Life Support in Obstetrics Courses (ALSO)<sup>9</sup>, conducted in the training hall on Day 1. Simulated clinical emergency scenarios' using dummies, mannequins and pelvic models was conducted in each sub-group, for the improvement of clinical skills, in the skill lab on Day 2. Emergency boxes for relevant medications and equipment's for the management of eclampsia and PPH were used to simulate the real time scenarios. Team work training was also included during practical session. Training was given upon their roles and responsibility in a team, attitude towards the co-members and desired outcome from a team. The training course was conducted by a team of three Obstetricians and Gynaecologists who are certified ALSO trainers as shown in Figure 2.



**Figure 2. The training intervention.**

Post-training assessment was taken 1 week after the training intervention. Assessment of the knowledge was done by using same set of MCQs, assessment of skill was done by OSCEs using the same check-lists used during pre-training and the MHPTS was used for assessment of teamwork performance.

Ethical clearance was obtained from the Institutional Review Committee of KMC which is affiliated to National Health Research Council of Nepal. The informed consent was taken from all the participants prior to the study.

The change in MCQ score and OSCE score of each participant in the individual module: eclampsia, shoulder dystocia and post-partum haemorrhage and the MHPTS score in each sub-group was assessed and analyzed.

The data was entered in Excel worksheet and analysis was done by SPSS version 20 by using Paired T test and Chi-square test. The Mean MCQ score and OSCE score were analyzed in two groups: Residents/MO and interns.

## RESULTS

The study showed a significant improvement in the overall mean MCQ score and OSCE score in each group of residents/MO and interns after the training intervention

(p-value <0.001) as shown in Table 1. The mean improvement was  $+12.78 \pm 5.42$  points in MCQs and  $+31.08 \pm 5.18$  in OSCE score. All the 60 participants showed improvement in MCQs and OSCE score after the training.

In an individual analysis of each module, there was a significant improvement in mean MCQ score, in each module, amongst both the residents/MO and interns (p-value <0.001) after the training (Table 1). The improvement in the mean MCQ score was marked amongst the interns in all three modules.

Similarly, the mean OSCE score was significantly improved, in each module, amongst both the residents/MO and the interns (p-value <0.001), with greater score amongst the residents/MO (Table 1).

In the same table, in the analysis of the clinical skill components of individual module, there was a significant improvement in the score of all the components, in each module. (p-value <0.001). However, the score was high amongst the residents/MO in most of the clinical skill components except on the demonstration of 4 "T" and balloon tamponade in the PPH module.

**Table 1. Overall change in mean MCQ and OSCE score with clinical skill components in each individual module**

Total score	Mean pre-training score ±SD		Mean post-training score ±SD		p-value
	Residents /MO (n=15)	Interns (n=45)	Residents/MO (n=45)	Interns (n=15)	
Overall score					
MCQ score (45)	25.27±4.41	23.53±5.1	36±2.0	37±2.43	<0.001
OSCE score (70)	31.6±7.49	28.5±4.62	62.5±3.87	59.6±3.24	<0.001
Module I: Eclampsia					
MCQ score (15)	7.73±2.08	7.02±2.11	11.93±0.70	12.16±1.38	<0.001
OSCE score (18)	10.80±2.33	7.13±2.72	15.13±1.24	14.53±1.27	<0.001
Administration of MgSo4 (4)	3.67±0.61	1.93±1.40	3.93±2.58	3.80±0.45	<0.001
Module II: Shoulder dystocia					
MCQ score (15)	9.47±1.68	8.13±2.40	12.6±1.29	13.02±0.94	<0.001
OSCE score (18)	8.33±2.58	7.49±2.41	16.6±1.59	14.9±1.45	<0.001
Mc Roberts and Suprapubic pressure (4)	3.67±0.90	2.44±0.51	3.93±0.25	3.73±0.44	<0.001
Enter maneuvers (6)	0.80±1.2	0.71±1.03	5.33±0.81	4.98±0.78	<0.001

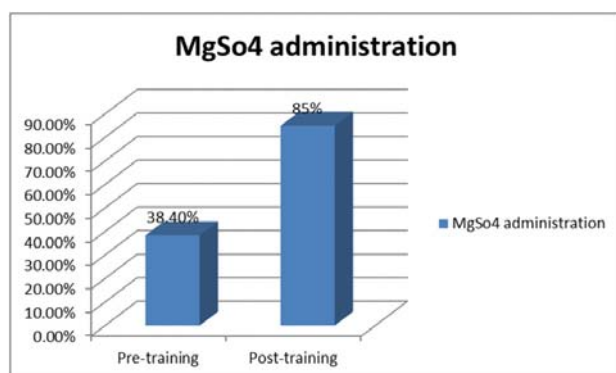
Removal of posterior arm (2)	0.47±0.83	0.31±0.51	1.80±0.41	1.40±0.49	<0.001
<b>Module III: Post-partum haemorrhage</b>					
MCQ score (15)	8.07±2.05	8.58±1.96	11.47±0.64	11.82±0.88	<0.001
OSCE score (34)	12.53±3.62	13.91±3.6	30.80±2.95	30.22±2.84	<0.001
Four "T" (8)	2.0±1.81	2.16±1.97	6.60±1.35	6.93±1.48	<0.001
Use of Oxytocics (6)	3.07±1.66	2.56±1.37	5.67±0.72	5.33±0.97	<0.001
Balloon Tamponade (2)	0.73±0.59	0.80±0.54	1.67±0.48	1.82±0.38	<0.001
Systemic divascularization (2)	0.33±0.48	0.73±0.49	1.93±0.25	1.78±0.42	<0.001
Compressive sutures (2)	0.53±0.51	0.24±0.48	1.67±0.48	1.49±0.50	<0.001

All the 12 sub-groups showed improvement in the post-training MHPTS score with a mean improvement by  $+4.91 \pm 0.9$  points ( $p$ -value  $< 0.001$ ), as shown in Table 2.

**Table 2. Mean change in the Mayo High Performance Teamwork Scale score**

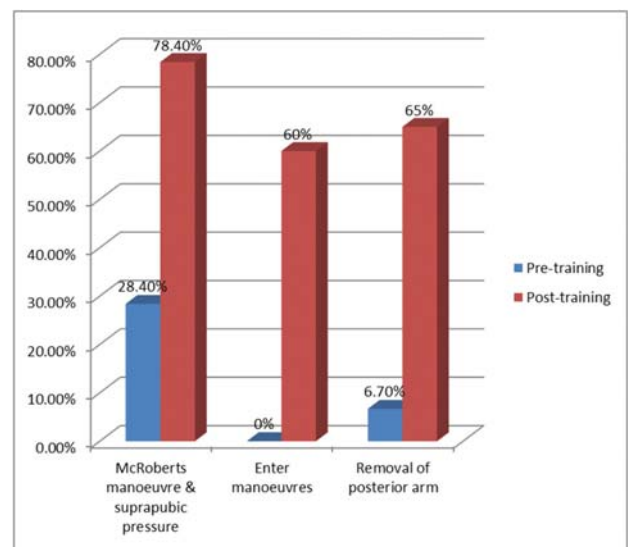
Total score	Mean pre training Score $\pm$ SD	Mean post training Score $\pm$ SD	p-value
Mayo's Teamwork Scale score (8)	2.67±0.65	7.58±0.66	<0.001

A greater number of participants could demonstrate the clinical skill components after the training in each module. As shown in Figure 3, the number of participants who had improved skill on accurate dose and route of administration of Magnesium sulphate increased from 38.4% to 85% post-training.



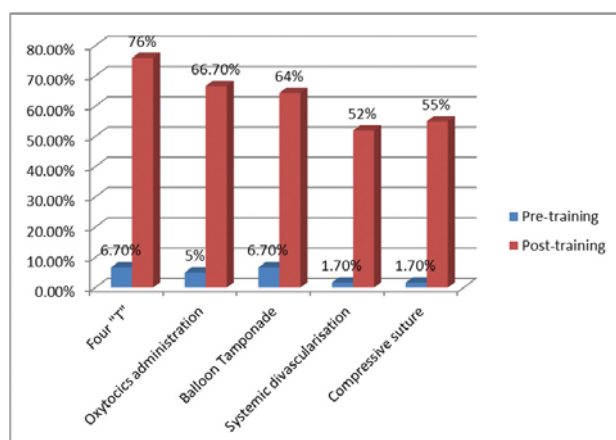
**Figure 3.** Pre and Post-training number of participants who administered MgSO<sub>4</sub> in correct dose and route.

Similarly, as shown in Figure 4, there was improvement in the number of participants who could demonstrate McRobert's manoeuvre, suprapubic pressure and the enter manoeuvres in a correct manner after the training in shoulder dystocia module.



**Figure 4:** Pre and Post-training number of participants who managed shoulder dystocia

As shown in Figure 5, in PPH module, 76% of participants could demonstrate 4 "T" as the cause of PPH and 66.7% of participants could demonstrate the accurate doses and route of administration of oxytocin, methergin and misoprostol or carboprost after the training. In the same figure, the number of participants increased by 50% in the application of balloon tamponade, systemic divascularization (uterine artery ligation) and compressive suture following the training.



## DISCUSSION

The present study showed a significant improvement in the participant's knowledge, clinical skills and team work performance. There is a growing body of evidence that simulation and drill improves the knowledge,<sup>2,10,11</sup> clinical skill<sup>3,11</sup> and teamwork efficiency.<sup>12,13,14</sup>

In this study, 100% of the participants showed improvement in the knowledge score post-training with increase in the mean score by 12.78. High MCQ score in interns group may be due knowledge acquired by the freshly passed out interns who have recently appeared for the final MBBS examination and also due to their large volume. Similarly, high clinical score amongst residents/MO is likely because of their better clinical involvement. In 2007, Crofts et al reported increase in the knowledge of the midwives' and the doctors' post-training in the management of obstetric emergencies with increase in the mean score by 20.10 Reynolds et al reported similar effect of training with 87% of participants reporting an improvement of their of knowledge and skills during real emergencies one year following simulation training.<sup>15</sup> Ameh et al also demonstrated an increase in knowledge following training with an improved use of the techniques taught, both at an individual level and at an institutional level on recording and reporting.<sup>16</sup>

This study showed a greater number of participants had an improvement in clinical skill acquisition after the training with an

improved OSCE score. Fisher et al evaluated the residents' training in eclampsia management and reported that the performance scores were significantly increased and better in the simulation based training.<sup>17</sup> Andrigetti et al<sup>18</sup>, Deering et al<sup>19</sup>, Goffman et al<sup>20</sup> reported that learners' confidence and skill was increased following simulation-based training in shoulder dystocia management. Bower et al also found that ALSO training, which is a simulation based training, significantly increased residents' skill in managing obstetric emergencies.<sup>21</sup>

Team training by its nature itself is a cooperative interactive activity that would improve personal role awareness, interpositional knowledge, mutuality and leadership.<sup>22</sup> Reports and enquiries about poor outcome on patient management highlight upon failure on teamwork are more frequent than failures of an individual.<sup>12</sup> Our study also showed a significant improvement in post-training teamwork rating score in each individual group at a team level. The SaFE study, which was one of the large-scale randomized controlled trials, evaluated the usefulness of team training in 2007. The authors demonstrated improvement in the knowledge along with the clinical skills at individual and team levels after the training, with the improvement being sustained over 12 month period. Vargese et al also emphasized on the teamwork training for improved confidence level of the participants in management of obstetric emergencies.<sup>11</sup>

Evaluation of the effect of training also remains an important component to see its impact. Training in any healthcare sector should aim at improved patient safety and clinical outcome. Kirkpatrick, described four levels for evaluation of the training: Level 1: Reaction (satisfaction following training), Level 2 Learning (MCQ test, skill acquisition), Level 3 Behavior (patient care) and Level 4 Results (patient outcome) 23. Our study reached only till Kirkpatrick level 2. The gold standard evaluation of any obstetric training would be to demonstrate an improvement in maternal and neonatal outcome which is lacking in our study.

The evidences from the studies demonstrated that the multidisciplinary training increases interprofessional awareness of the roles, capabilities and attitudes towards different members of the teams, highlighting that team training influence the attitudes of the participants in addition to their knowledge and skills.<sup>3,13,22</sup> Effective management of obstetric emergencies includes obstetricians, nurses, midwives, anaesthesiologists and neonatologists. Our study focused only on residents, medical officers and interns rather than multiprofessionals because they are the ones who will have to face a real obstetric emergency, initially, for the initiation of a prompt and effective management.

Varied evidences exist regarding the methods of training: lecture-only based teaching, practical scenarios based training with models and mannequins, training in a simulation centers on high fidelity mannequins and running a “fire drills”.<sup>17,10,24</sup> According Andreson et al, running a fire drill with multidisciplinary team involvement would be one of the good training practice to increase the clinical skill, confidence level, teamwork efficiency.<sup>24</sup> Varghese et al reported that a real time fire drill not only increases the participants’ knowledge and clinical skills but also helps in recognizing the health systems shortcomings like shortage of trained staff and inconsistent availability of drugs and supplies.<sup>11</sup> Ours was only a scenario-based lecture followed by drills involving dummies, mannequins and pelvic models mainly because of the limited training aids and logistic support. And also, running a fire drill with a multi-professional involvement was difficult in our context because it requires a substantial amount of time and energy, planning, resources and logistics. It also requires recruitment of the trainees from various faculties from their busy units that could adversely affect the service provision.

## CONCLUSIONS

Obstetric emergency drill and training significantly increased the knowledge, clinical skills and teamwork performance of the

residents, medical officers and the interns in obstetric emergency management. However, increased knowledge and skill acquisition related to obstetrics emergencies, really does have a direct effect on improved maternal and neonatal outcome is uncertain and requires further study.

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