IN-SITU CLINICAL SIMULATION PROGRAM: IMPROVING EDUCATION OUTCOMES THROUGH RESEARCH FEEDBACK

D. Shumaker¹, T. Auguste², Y. Millo¹, A. Libin¹

¹ SiTEL at MedStar Health (UNITED STATES)
² MedStar Washington Hospital Center (UNITED STATES)
daria.shumaker@email.sitel.org, tamika.c.auguste@medstar.net, yuri.millo@email.sitel.org, alexander.v.libin@email.sitel.org


Abstract

Introduction: In-situ simulations are widely used for medical training. MedStar Obstetric Safety Training (MOST) was developed as a multi-disciplinary in-situ clinical simulation program focused on enhancing patient outcomes and improvement of teamwork in emergency response situations in the perinatal area. MOST is a component of the culture of safety initiative at MedStar Health.

Methods: Obstetricians, neonatologists, anesthesiologists, midwives and perinatal nurses participate in this program that focuses on mastering decision-making and communication skills. The scenarios are ones that are rare but catastrophic. Departments select scenarios based on current needs and preferences. Participants of this particular training included midwives, resident physicians and nurses. The Clinical Simulation Center (CSC) provided the technical and educational support for the training.

Intervention: Maternal code blue on the postpartum unit (scenario one) and a precipitous delivery of a preterm fetus on the antepartum unit (scenario two) were used for the simulation-based training. MOST trainers and participants completed the State Obstetric and Pediatric Research Collaboration’s (STORC) Clinical Teamwork Scale (CTS). CTS is a validated tool that measures key factors in teamwork: communication, situational awareness, decision making, role responsibility and patient friendliness. Two teams participated in the training, each undergoing a standard cycle of training procedures. The multi-disciplinary teams listened to a didactic presentation on effective teamwork and then participated in the simulated scenarios. The team performed scenario one and then completed the tool. Next the faculty conducted a debriefing. The team then participated in scenario two and completed the CTS for a second time.

Data collection and analysis: Responses collected from 52 team members across participating hospitals were entered into an Excel spreadsheet and imported into SPSS 19.0 (Statistical Package for Social Sciences, IBM). Recognizing the small sample and preliminary nature of the research inquiry, it was decided to analyze the data using a non-parametric comparison by Wilcoxon Signed Rank Test for pre- and post-debriefing assessment. Research feedback was then implemented to inform team leaders and members on tendencies in evaluation.

Results: It was observed utilizing Wilcoxon test of pre-post debriefing comparison that there were statistically significant positive changes (p < 0.01) for the entire group (N=52) from the first evaluation to the second one (following the debriefing) on all communication items such as improved team oriented (Z=2.5, p=0.013), transparent thinking (Z=2.7, p=0.008), direct communication (Z=0.017, p=0.003), and
closed loop communication ($Z=2.5$, $p=0.003$), as well as with regard to overall situational awareness interpreted as a positive trend ($Z=1.9$, $p=0.052$). Similar significant pre-post changes were observed for the overall decision making ($Z=2.4$, $p=0.018$), and role responsibilities such as role clarity ($Z=2.3$, $p=0.021$).

As the research feedback and study findings were discussed with the clinical director an interesting hypothesis was formulated for further investigation involving the team leaders. The first leader was an experienced midwife with more than 5 years in her current position, while the second leader was a less experienced midwife who had only been in practice for approximately four months. It is suggested that the education research outcomes should include the measurement of team leadership that can mediate the effect of the in-situ clinical simulation training.

Keywords: Experiential learning, clinical simulation, safety training, education, research

Introduction

In-situ simulations are widely used for medical training [1,2]. There is increasing evidence that simulation improves teamwork and patient outcomes [2,3]. The American College of Obstetricians and Gynecologists (ACOG), the Institutes of Medicine (IOM), and The Joint Commission (TJC) strongly support the use of simulation-based team training in obstetric emergency drills to reduce communication-related errors and improve interdisciplinary teamwork [3,4,5]. In obstetrics, simulation-based team training should include all personnel who care for mothers and their infants. This team is large and complex, and depending on the simulated event, is likely to include many clinical providers (such as physicians, nurses, and certified midwives) from multiple specialties (such as obstetrics, anesthesia, and pediatrics), as well as ancillary staff. In the time-sensitive context of actual patient care, it is extremely challenging to encourage teamwork with such a diverse professional group.

MedStar Obstetric Safety Training (MOST) is a multi-disciplinary in-situ clinical simulation program focused on enhancing patient outcomes and improvement of teamwork in perinatal emergency response situations. MOST was developed out of a combination of well-known and studied simulation programs across the country. Programs like Kaiser Permanente’s Critical Event Team Training and the simulation program from Harvard University- Center for Medical Simulation were used to model the MOST program. It takes place at six hospitals within the MedStar Health system that employs more than 27,000 allied health professionals. MedStar Health hospitals are located in the Maryland-Washington, D.C. region.

The MOST course focuses on teams who need to complete a set of tasks in rapid order in an effort to save obstetrical patients’ or neonates’ lives. The course trains obstetricians, anesthesia, neonatologists, nurses, and ancillary staff to work together to deliver patient care in emergent situations. Participants complete pre-course modules on an on-line learning management system, SiTELMS, participate in an in-situ simulation program with facilitated debriefing, and complete post course assessments. The ultimate goal of the program is to have participants understand the rationale for team training, fundamentals of teamwork (with emphasis on cooperation and communication), where it fits into a quality patient safety program, and the importance of practice. The simulated scenarios will be tailored to the needs of the organization as well as to the types of participants who are scheduled for participation.

Besides providing a platform for learning and rehearsal, simulation-based training can be used to analyze interdisciplinary team performance. This process can identify the performance strengths and weaknesses of the team, and through immediate, facilitated, non-judgmental debriefing, help improve their knowledge, skills, communication, and other teamwork behaviors. The use of the State Obstetric and Pediatric
Research Collaboration (STORC) Initiative’s Clinical Teamwork Scale (CTS) from Portland, Oregon, has allowed us to evaluate the team’s communication and teamwork skills.

Study Methods

Research Design

The study used a mixed methodology design including 1) a repeated measures research design with pre- and post-assessment (before and after the debriefing) of team communication skills, and perceptions of and attitudes toward knowledge gain in health care personnel involved with the in-situ training; and 2) an in-depth analysis of the team interactions through the post-training debriefing of the both trainers and researchers.

Participants

52 health care personnel of various backgrounds and professional experience took part in the MOST training during the study period.

Settings

The study took place at six hospitals within the MedStar Health system. The training at each hospital was organized following a standard intervention procedure described below.

Intervention

Two rare obstetrical emergency scenarios were used for the simulation-based training. MOST trainers and participants completed the State Obstetric and Pediatric Research Collaboration’s (STORC) Clinical Teamwork Scale (CTS). CTS is a validated tool that measures key factors in teamwork: communication, situational awareness, decision making, role responsibility and patient friendliness. Two teams participated in the training, each undergoing a standard cycle of training procedures. The multi-disciplinary teams listened to a didactic presentation on effective teamwork and then participated in the simulated scenarios. The team performed scenario one and then completed the tool. Next the faculty conducted a debriefing. The team then participated in scenario two and completed the CTS for a second time.

Procedure

Obstetricians, neonatologists, anesthesiologists, resident physicians, certified midwives and perinatal nurses participate in the MOST program that focuses on mastering decision-making and communication skills in high risk, low volume obstetrical emergency situations. Departments select scenarios based on their identified needs and preferences. SiTEL (Simulation and Training Environment Lab) provides educational support to MOST and its Clinical Simulation Center (CSC) provides the complex operational support for the trainings.

The multi-disciplinary participants are introduced to the concepts of teamwork and communication in a presentation prior to taking part in two simulated scenarios. After each scenario there is a faculty-lead debriefing. The debriefing focuses on how the group members communicated with each other, performed as a cohesive team, and identification of any system issues which arose.

After each scenario, and prior to the debriefing, participants and trainers complete the Clinical Teamwork Scale (CTS). This tool is a critical aspect of the MOST program, It is assisting the organizations in improving maternal and neonatal health outcomes.
SiTEL was given permission to use STORC’s CTS which has been tested for both validity and reliability [6]. It was designed to be used in both simulated and clinical settings and measures key factors in teamwork in five clinical domains (communication, situational awareness, decision making, role responsibility and patient friendliness) [6]. STORC was developed by a multidisciplinary organization that seeks to improve maternal and neonatal health outcomes. The tool has 15 questions and uses a 0-10 scale with a “not relevant” option if the evaluator believes that the item was irrelevant to teamwork in the specific scenario. The scale values have qualitative descriptors to facilitate the ease of use [3]. It was designed to be used with or without formal training.

**Data collection**

Responses collected from the 52 team members across participating hospitals were entered into an Excel spreadsheet and imported into SPSS 19.0 (Statistical Package for Social Sciences, IBM). Recognizing the small sample and preliminary nature of the research inquiry, it was decided to analyze the data using a non-parametric comparison by Wilcoxon Signed Rank Test for pre- and post-debriefing assessment. Research feedback was then implemented to inform team leaders and members on tendencies in evaluation.

**Analysis**

The goal of the analysis was to explore change in the main outcome variables (communication skills, perceptions of and attitudes toward observed change) in the context of age (socio-behavioral factor), professional background and education (professional background factor) and job experiences including years worked at the organization and job placement (organizational factor). In Phase I we studied Learner’s Profile using inferential statistics; in Phase II we investigated the change in the values of main outcome variables for the group of learners.

**Results**

**Learner’s profile (Phase I analysis)**

*Note. Demographic data were available for 27 participants (65%) and are representative of the total sample.

The mean age for the group of 27 health caregivers was 39 years, with the age range from 21 to 74 years. 93% of participants were female. The racial composition of the group was as follows: Asian 7.4%, Caucasian 63.0%, Hispanic 3.7%, African-American 22.2%, with 3.7% of responders categorized themselves as “other”. 3.7% of responders had less than a high school education, 11.1% attended some college, 18.5% had an Associate Degree, 29.6% had a Baccalaureate degree, 7.4% had a Master’s Degree and 22.2% had a Doctorate. The group was characterized by the mean of 12 years in performing their current job with the range from 5 months to 35 years.

**Pre and Post Assessment of Behavior Change (Phase II analysis)**

It was observed utilizing Wilcoxon test of pre-post debriefing comparison that there were statistically significant positive changes (p < 0.01) for the entire group (N=52) from the first evaluation to the second one (following the debriefing) on all communication items such as improved team oriented (Z=2.5, p=0.013), transparent thinking (Z=2.7, p=0.008), direct communication (Z=0.017, p=0.003), and closed loop communication (Z=2.5, p=0.003), as well as with regard to overall situational awareness interpreted as
a positive trend (Z=1.9, p=0.052). Similar significant pre-post changes were observed for the overall decision making (Z=2.4, p=0.018), and role responsibilities such as role clarity (Z=2.3, p=0.021).

Discussion

The results show that MOST training designed as an medical educational intervention for the emergency situations in a specific clinical field is effective with regard to two main domains of team performance: communication and role responsibilities. This is consistent with the findings of team training that originated in the commercial and military sectors of the aviation industry. Crew resource management (CRM) was conceived in a National Aeronautics and Space Administration workshop in 1979 and developed to focus on the skills of communication, leadership, and decision-making of flight crews. [7]

Crew resource management has since been adopted by other high-risk industries and organizations (ie, nuclear power and air traffic control).[8] The work environments of the aviation and health care industries share characteristics of complexity, intense stress, time sensitivity, multiple players, and a requirement for teams to function at high levels in which human error can be devastating. [7]

Another well-known team-training program for health care team development is Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS). TeamSTEPPS was developed by the US Department of Defense’s patient-safety program in collaboration with the Agency for Healthcare Research and Quality to extend the military’s research on team performance to health care. [9,10]

As the research feedback and study findings were discussed with regard to two subgroups of the observed sample indicated during key informant interview with the MOST Program Clinical Director, an interesting hypothesis was formulated for further investigation involving the team leaders. In the first group, that can be indicated as group A, the leader was an experienced midwife with more than 5 years in her current position, while the second leader, in subgroup B similar in the demographic profile, was a less experienced midwife who had only been in practice for approximately four months. During preliminary analysis the subgroup A showed an improvement in their teamwork and communication skills under the direction of a more experienced leader. This is part of the results needs to be further investigated to see to what extent a leader's clinical experience affects the team.

If a clear association can be made it has large implications. Specific teamwork and communication skill training could become part of required training in both medical and nursing coursework. Looking ahead to the staffing of teams on a unit, years of experience might then play a role as to who is scheduled with whom and when. It is suggested that the education research outcomes should include the measurement of team leadership that can mediate the effect of the in-situ clinical simulation training. In addition to the known effects of improved patient outcomes with simulation training the aspect of leadership and teamwork and communication may also be able to be attributed to simulation-based team training.

Acknowledgements

SiTEL would like to thank all its operational staff and technicians, Dr. Auguste’s trainers and executive leaders for the support at the MedStar Washington Hospital Center.

Methodological support for this project was provided through the MedStar Health Research Institute, a component of the Georgetown-Howard Universities Center for Clinical and Translational Science (GHUCCTS) and supported by Grant U54 RR026076-01 from the NCRR, a component of the National
Institutes of Health (NIH). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NCRR or NIH.

References


