



Simulation Training For Emergency Teams

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ABSTRACT

Introduction: Resuscitation of the critically ill in the emergency department can be stressful and at times, chaotic. We believe that simulation training for emergency teams (STET) will help improve team performance during actual resuscitation, thus synonymously leading to better patient outcomes. We aim to evaluate the effectiveness of STET for resuscitation team training. **Method:** Eight sessions of STET using low fidelity simulation were conducted during March to April 2015. Doctors and nurses participated in the sessions, as they would work together in teams on a day to day basis. The participants evaluated the effectiveness of the training after the sessions on a 5-point Likert Scale. The following were assessed: benefits of simulation training; realism and appropriateness of scenarios; enhancement of medical knowledge and practical skills, thereby improving patient outcomes; and teamwork, with a focus on leadership and communications. **Results:** Twenty doctors and 13 nurses participated in STET. The doctors were residents (Emergency Medicine, Internal Medicine, Family Medicine, Orthopaedics) in their first to third year of training. STET received a mean score of 4.3 across all domains. Participants scored the benefit of STET with a mean of 4.5. Though the scenarios were appropriate (mean score = 4.4), the low fidelity simulation lacked realism (mean score = 3.8). With the right training objectives, STET could enhance both medical knowledge and practical skills (mean score 4.4 versus 4.3 respectively). Participants believe that learning points from STET could improve patient outcomes (mean score 4.4). Finally, STET provides an avenue for team training (mean score = 4.4) with development of team leadership and communication. **Conclusion:** STET was effective for the purpose of resuscitation team training. However, the limitation of this educational intervention was that we do not know the directness and extent of its impact on actual patient outcomes. This would be the subject of a future follow-up study of this nature.

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Introduction

Resuscitation of the critically ill in the emergency department can be chaotic. Baker et al defined a team as two or more individuals, with specialized knowledge and skills who perform specific roles, and complete

interdependent tasks to achieve a common goal or outcome [1]. Medical teams often function with a high workload of critical tasks that are frequently evolving, and thus, teams must adapt dynamically to achieve their goals. However, there are numerous barriers to achieving and maintaining team-level expertise [2]. The

Institute of Medicine Report ‘To Err is Human’ highlighted that 60–80% of medical errors are primarily a result of human errors such as ineffective communications and teamwork [3]. Therefore, repeated, effective methods of teamwork training for providers responding to emergencies are necessary. Simulation has become a primary strategy to improve teamwork skills [4,5]. Simulation is an ideal opportunity for the deliberate practice of critical, nontechnical skills such as teamwork by exposing teams to high-risk patient encounters [6,7]. Interaction and communications within the teams are critical to both quality and safety of patient care, as well as the establishment of a shared mental model and education of the team members [8]. This form of interprofessional education allows healthcare professionals to learn their respective practices in an integrated way, leading to positive outcomes including improved emergency department culture and patient satisfaction [9], and collaborative team behaviour and reduction of clinical error rates resulting in enhanced patient safety [10].

In this work, we explored a simulation-based education for both doctors and nurses within the emergency department, in an attempt to understand more how this training impact team performance. We believe that simulation training for emergency teams (STET) will help improve team performance during actual resuscitation. This will translate to better patient outcomes as teams are better prepared for crisis management.

Method

Setting

This study was conducted in the Department of Emergency Medicine of Singapore General Hospital.

Design

Each session of STET involved training with low fidelity simulation. This was conducted within the department. Each 1-hour session consisted of two scenarios (Table 1). Time allocation was provided for conduct of scenarios and feedback. Doctors and nurses participated in the sessions as teams. The participants evaluated the effectiveness of the training on a standardized

form (Figure 1), using a 5-point Likert Scale. Participants also filled in a self-evaluation form (Figure 2), using a 5-point Likert Scale before and after the training session.

Table 1: Scenarios used for STET training

Scenarios
ST-elevation myocardial infarction with papillary muscle rupture
Status epilepticus from pyridoxine overdose
Intracranial haemorrhage in a patient on warfarin
Torsades de pointes with prolonged QTC
Septic shock from Fournier’s gangrene
Polytrauma following road traffic accident

STET Evaluation Questions
1. The presented case scenarios were appropriate for my level of training.
2. The experience of live simulation was beneficial.
3. The simulation felt real.
4. The session enhanced my medical knowledge.
5. The session enhanced my practical skills.
6. I believe that what I learned in simulation will improve patient outcomes.
7. The simulation offered team building experience.
8. I feel that my participation in all the roles in today's scenarios has helped solidify my leadership skills.
9. I have learned to communicate better with my team of doctors and nurses during resuscitation.

Figure 1: STET Evaluation Questions

Self-evaluation Questions
1. I am competent in managing a critically ill patient.
2. I am confident in managing a critically ill patient.
3. I know the clinical problems during resuscitation.
4. I know management priorities during resuscitation.
5. I can speak up and give my inputs during resuscitation.
6. I understand clearly what is being communicated during resuscitation.
7. I always practise closed loop communication during resuscitation.
8. There is mutual respect among members in my resuscitation team.

Figure 2: Pre- and post- evaluation questions

Statistical Methods

Statistical analysis was performed using SPSS version 16. Summary statistics were described with mean and standard deviation for parametric variables, and median with inter-quartile range for nonparametric variables.

Result

Twenty doctors and 13 nurses participated in eight sessions of STET conducted during March to April 2015.

Participants Characteristics

The doctors were residents from Emergency Medicine, Internal Medicine, Family Medicine and Orthopaedics (Table 2). They were in their first to third year of training. The nurses were trained in medical and trauma resuscitation courses conducted by the department. This course was to equip nurses with the knowledge and skills required for work in the resuscitation (P1) area.

Table 2: Doctors profile

Specialty	Number of Residents (%)
Internal Medicine	11 (55)
Emergency Medicine	3 (15)
Orthopaedics	2 (10)
Family Medicine	2 (10)
Urology	2 (10)

STET Evaluation

STET received a mean score of 4.3 across all domains (Table 3). Participants scored STET as being beneficial with appropriate scenarios, even though the low fidelity simulation lacked realism. With the right training objectives, STET could enhance both medical knowledge and practical skills, leading to improved patient outcomes. STET provided an avenue for team training with development of team leadership and communication.

Table 3: STET Evaluation Scores

STET Evaluation Questions	Score (Mean ± SD)
1. The presented case scenarios were appropriate for my level of training.	4.37 ± 0.47
2. The experience of live simulation was beneficial.	4.47 ± 0.51
3. The simulation felt real.	3.84 ± 0.72
4. The session enhanced my medical knowledge.	4.42 ± 0.50
5. The session enhanced my practical skills.	4.26 ± 0.70
6. I believe that what I learned in simulation will improve patient outcomes.	4.42 ± 0.51
7. The simulation offered team building experience.	4.42 ± 0.51
8. I feel that my participation in all the roles in today's scenarios has helped solidify my leadership skills.	4.11 ± 0.70
9. I have learned to communicate better with my team of doctors and nurses during resuscitation.	4.26 ± 0.45

Self-evaluation

Self-evaluation of the participants before and after STET showed an improvement in mean score, suggesting that participants felt more confident and empowered (Table 4).

Table 4: Pre- and Post-STET self evaluation results

Self-evaluation Questions	Pre-STET (Mean ± SD)	Post-STET (Mean ± SD)
1. I am competent in managing a critically ill patient.	3.05 ± 0.59	3.42 ± 0.62
2. I am confident in managing a critically ill patient.	3.11 ± 0.63	3.53 ± 0.61
3. I know the clinical problems during resuscitation.	3.53 ± 0.62	3.79 ± 0.51
4. I know management priorities during resuscitation.	3.74 ± 0.47	3.68 ± 0.65
5. I can speak up and give my inputs during resuscitation.	3.42 ± 0.70	4 ± 0.66
6. I understand clearly what is being communicated during resuscitation.	3.74 ± 0.74	4 ± 0.56
7. I always practise closed loop communication during resuscitation.	3.32 ± 0.75	3.63 ± 0.78
8. There is mutual respect among members in my resuscitation team.	4.11 ± 0.68	4.32 ± 0.50

Other benefits

Clinical updates, departmental workflows and patient safety issues (Table 5) were also incorporated into STET. These can be used to further develop the training curriculum to harness the greater potential of STET.

Table 5a: Updates in STET Training

Clinical Updates and Departmental Workflows
Cardiac catheterization laboratory activation
Apneic oxygenation for Rapid Sequence Intubation
Use of Prothrombin Complex Concentrate in warfarin reversal
Extracorporeal Membrane Oxygenation in cardiac arrest
Antibiotics guideline
Trauma activation and massive transfusion protocol

Table 5b: Updates in STET Training

Patient Safety Issues
Patient identifiers
Medication safety

Discussion

The use of simulation in educating and training healthcare professionals enables them to practice the necessary skills in an environment that allows for errors, repetitions and professional growth to take place without risking patient safety. The Emergency Department is a unique healthcare setting with the following characteristics which affect how healthcare providers make decisions [11,12]:

- i. ill-structured or ill-defined acute presentations and problems,
- ii. incomplete or conflicting initial information,
- iii. dynamic situations,
- iv. multiple competing goals,
- v. intense time pressure,
- vi. serious consequences of error.

During STET scenarios, the participants, as a team, were able to experience the above characteristics of the emergency department. They were allowed to make decisions in a safe environment with immediate feedback on performance. The debriefing sessions of STET focused on the nontechnical dimensions of maintaining team structure and climate; applying problem-solving strategies; communicating with the team; executing plans, managing workload; and improving team skills. For instance, under team communications, team members were encouraged to speak up when they had patient safety concerns. This can be achieved by using assigned critical language for calling a time out, such as 'I'm uncomfortable' or 'I'm concerned'. This allowed patients to be evaluated independently of the chain of command within the team [13]. Acquisition of medical knowledge and procedural skills competency were not emphasized, as the focus of STET was on team performance.

Given the nature of shift work in the emergency department, it is uncommon for members of a resuscitation team to be consistent. The membership of the emergency teams changes constantly and may even include ad-hoc members such as rotating residents from other departments. The composition of the teams

involved in STET was a random assortment of doctors and nurses. Separate hierarchies of power and training add additional layers of complexity, making it difficult to anticipate team members' skills, knowledge and attitudes [14]. Representative examples include knowledge (shared understanding of the situation, familiarity with teammates' abilities); skills (how to communicate effectively, such as 'closing the loop', how to monitor teammates' performance); and attitudes (team cohesion and mutual trust)¹. Teamwork and communications training are even more critical for these dynamic, complex teams to function effectively in achieving timely and safe patient care.

We conducted in situ simulation which was conducted in the actual care environment. Teams were able to train in their typical roles in a familiar setting, using equipment, resources and system processes involved in actual patient care [15]. Clinical updates and departmental workflows were incorporated into STET. For instance, activation of the massive transfusion protocol in the trauma scenario allowed staff to familiarize themselves with the institutional indications and process of activating the blood bank. Latent threats could also be identified. In situ simulation sessions are logistically difficult to organize and schedule [16] due to drawbacks such as the potential to interrupt actual patient care, less time for didactic teaching and debriefing, and difficulty in reaching providers on all shifts.

Patient safety issues were also incorporated into STET as part of a culture of safety within the department. Safety lessons from risk management system records were identified, with the conditions for near misses or errors to occur replicated in the STET scenarios. Through this form of learning, participants were engaged and safety lessons can be disseminated, leading to improved safety attitudes and improved patient safety.

The relatively small sample size of participants (n=33) during our study limits the conclusions made. Our study did not measure Kirkpatrick level 3 and 4 performance on behavior and

results respectively and thus could not conclude whether the satisfaction and knowledge of teamwork gained from STET translated to improved teamwork during actual resuscitation and improved patient outcomes. Teamwork was observed only in a simulated setting as it was difficult to do because of the unpredictable nature of critically ill patients presenting to the emergency department and non-standardized set of conditions with regards to team formation.

Our study adds to the growing body of literature which suggests that simulation can serve as an effective training tool for the interprofessional team by creating a safe learning environment relevant for them to immerse in. STET is unique in that we emphasized on the development of nontechnical skills, and incorporated both departmental protocols and patient safety issues into the training sessions. The positive outcomes observed in this study meant that these are potential areas in which simulation training can be applied, according to the educational needs of participants and department. The educational strategy here is an experiential opportunity to learn and develop under guidance as well. This STET team training offers training that can help improve function in stressful and tension-filled situations. [17]. Simulation as this can help departments evaluate cost-effectiveness of our training programmes, systems-based approach and also iron out inter-discipline workflows.

Future research in this area can incorporate measures of cognitive, motivational and emotion processes in order to gain better insight into the mechanism through which simulation-based training can impact learning and performance

Conclusion

Simulated emergencies provided an excellent opportunity for team performance training. Interprofessional learning can occur without endangering patient safety. The ratings showed that STET was effective for the purpose of improving team performance during actual resuscitation. This learning will inadvertently, translate to actual behaviours and improved patient outcomes as teams are better prepared for crisis management. It shows great potential as a

medium to create highly relevant training contexts and inculcate active learning processes.

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