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Integrating Flipped Classroom Technique with High Fidelity Simulation for Teaching Hemorrhagic Shock to EMS Students at Pune, India—A Pilot Study

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ABSTRACT

Introduction: Shock is a state of circulatory collapse leading to decreased perfusion of the tissues which in turn leads to lack of oxygen and nutrients to the cells and thereby hampers the cellular function**.** EMS students are presently taught the concept of shock through traditional lecture and case discussion method. Clinically relevant topics can be alternatively taught via a flipped classroom technique wherein the traditional learning environment is reversed by delivering instructional content outside the classroom. A novel approach to evaluating the effectiveness of flipped classroom would be to integrate it with high fidelity simulation which relies on experiential learning.

Objective: To integrate flipped classroom technique with high fidelity simulation for teaching hemorrhagic shock to EMS students and measuring their satisfaction on a pilot basis.

Methodology: A comprehensive reading material on the subject Hemorrhagic Shock was circulated amongst 200 EMS students two weeks prior to the planned flipped classroom session. 50 students were randomly chosen to participate in High fidelity simulation scenario based flipped classroom session. Students were divided into batches of seven each. The simulation pre-brief involved a brief synopsis of shock in general with special focus on hemorrhagic shock. Each simulation session lasted for approximately 10 minutes followed by structured de-briefing for 20 minutes. A feedback questionnaire was designed to gauge participant response on the high fidelity simulation session as a flipped classroom exercise. The questionnaire was administered to the students immediately after the session.

Result: The students gave extremely high rated feedback on the structure, organization and effectiveness in diagnosing and managing a case of hemorrhagic shock. It is seen that the students were satisfied with the prebriefing and overall preparation and understanding of the scenario.

Conclusion: The study is limited by its sample size and singular event, but offers significant perspective to replicate a long term effectiveness study amongst a larger cohort of EMS students.

Keywords: *Flipped classroom technique, high fidelity simulation, hemorrhagic shock*

Introduction

Shock is a state of circulatory collapse leading to decreased perfusion of the tissues which in turn leads to lack of oxygen and nutrients to the cells and thereby hampers the cellular function**.**[1] Hemorrhagic Shock is caused by blood loss resulting in insufficient blood within vascular system. Hemorrhage can either be external or internal or in some cases both.

Blood loss is the most common emergency in case of Trauma[2]. The Emergency Medical professionals are expected to clinically diagnose and manage the cases of trauma which in most cases can be life threatening.[3] External bleeding can be easily managed as the source of bleeding can be conveniently visualized. The real challenge in the prehospital scenario lies in the assessment and management of internal hemorrhage where it is difficult to pinpoint the source. Hence, the clinical acumen of the EMS professional plays a great role.[4]

EMS students are presently taught the concept of shock through traditional lecture and case discussion method. Clinically relevant topics can be alternatively

taught via a flipped classroom technique wherein the traditional learning environment is reversed by delivering instructional content outside the classroom. The classroom time is then utilized for practical learning via case studies or assignments. A systematic review of the effectiveness of flipped classroom in medical education concluded that it is a promising teaching approach to increase learner's motivation and engagement.[5]

However, conflicting studies have concluded that the flipped classroom technique did not add value or improve student satisfaction[6].

A novel approach to evaluating the effectiveness of flipped classroom would be to integrate it with high fidelity simulation. Simulation focuses on hands on practical training in a realistic environment based on experiential learning, where greater time is spent in reflection by debriefing.[7]

Objective

To integrate flipped classroom technique with high fidelity simulation for teaching hemorrhagic shock to EMS students and measuring their satisfaction on a pilot basis.

Methodology

A comprehensive reading material on the subject Hemorrhagic Shock was circulated amongst 200 EMS students two weeks prior to the planned flipped classroom session. 50 students were randomly chosen to participate in High fidelity simulation scenario based flipped classroom session. Students were divided into batches of seven each. The simulation pre-brief involved a brief synopsis of shock in general, with special focus on hemorrhagic shock.

Seven group of students participated in seven different case scenarios portraying hemorrhagic shock. The students were also oriented to the features of the high fidelity manikin to ensure smooth flow during the scenario. A facilitator was present during the simulation session to answer any student queries. Students were expected to perform patient assessment and emergency management on a high fidelity manikin, Apollo, as per the ITLS patient assessment algorithm. Each simulation session lasted for approximately 10 minutes followed by structured de-briefing for 20 minutes. The debriefing involved reflection of the experience and sharing of feedback regarding the simulation. This was followed by recapitulation of the concept of hemorrhagic shock in relation to the simulated case. A feedback questionnaire was designed to gauge participant response on the high fidelity simulation session as a flipped classroom exercise. The eight item questionnaire was administered to the students at the end of the session. Six items required response on a five point Likert scale (1 indicating Do not agree and 5 indicating Strongly agree). Two items required descriptive response on the satisfaction with the new technique. The questionnaire was administered to the students immediately after the session. The data was tabulated and analyzed. Content analysis was conducted on the descriptive responses.

Result

The scores obtained on each item of the questionnaire is given below:

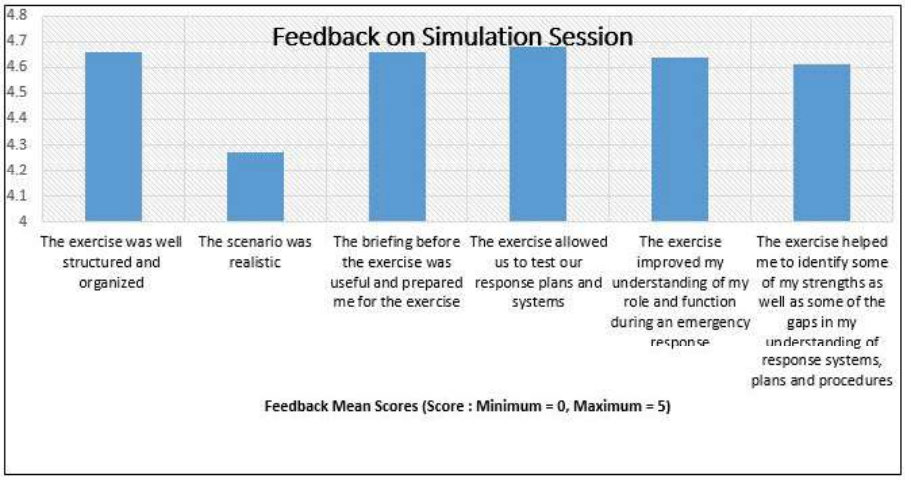

Figure 1

As depicted in Figure 1, it is seen that the students were satisfied with the prebriefing and overall preparation and understanding of the scenario. The realism of the scenario had lowest rating as compared to other statements. This may probably be due to the fact that they were all not exposed to learning conceptual topic like shock through high fidelity simulation and hence had difficulty adjusting to the same.

Discussion

The students gave extremely high rated feedback on the structure, organization and effectiveness in diagnosing and managing a case of hemorrhagic shock. The students appreciated the helpfulness of the pre-briefing as well as the hands-on approach provided by the simulation to test the emergency response. The descriptive questions yielded interesting perspectives on the effectiveness of flipped classroom technique. Majority students found the reading material provided in advance very useful during the actual case scenario. Most students appreciated the physiological fidelity offered by the manikin in mimicking key physiological parameter changes in a hemorrhagic shock event. Few students found the simulation environment challenging, being their first encounter. Nevertheless, they requested for greater exposure and more sessions with the new flipped classroom high fidelity simulation technique.

Flipped classroom technique offers an exciting opportunity to change the way clinical cases are taught. With increasing scope of syllabus and restricted time available for covering the vast subject, flipped classroom saves valuable classroom time for practical learning. Combining the technique with high fidelity simulation is a synergistic approach offering deliberate experiential learning opportunity to the student. The student, comes prepared with the background on the subject and has greater situational awareness during the classroom session.

Conclusion

The study is limited by its sample size and singular event, but offers significant perspective to replicate a long term effectiveness study amongst a larger cohort of EMS students. Flipped classroom by high fidelity simulation has shown high degree of student satisfaction in a single event model. Long term studies can throw more light on its effectiveness as an andragogy.

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