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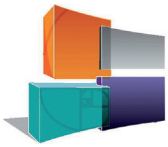

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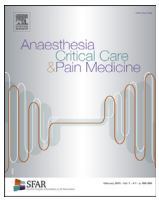

Original Article

Learning crisis resource management: Practicing versus an observational role in simulation training – a randomized controlled trial

Anita Lai [a], Alexis Haligua [b], M. Dylan Bould [c,d], Tobias Everett [e], Mark Gale [f], Ashlee-Ann Pigford [g], Sylvain Boet [c,g,*]

[a] Department of Emergency Medicine, Alberta Health Services, University of Calgary, Room C231, 1403–29 Street, NW Calgary, AB, T2N 2T9, Canada
[b] Department of Emergency Medicine, The Montfort Hospital, University of Ottawa, 713, Montreal Road Ottawa, K1K 0T2, ON, Canada
[c] The Department of Innovation in Medical Education of the Faculty of Medicine, University of Ottawa, Roger Guidon Hall Room 2211, 451 Smyth Rd, Ottawa, ON, K1H 85M, Canada
[d] Department of Anesthesiology, The Children's Hospital of Eastern Ontario, University of Ottawa, 401 Smyth Road, Ottawa, ON, K1H 8L1, Canada
[e] Department of Anesthesiology, The Hospital for Sick Children, University of Toronto, Room 2303, 555 University Avenue, Toronto, ON M5G 1X8, Canada
[f] Department of Anesthesiology, Alberta Children's Hospital, University of Calgary, 2888 Shaganappi Trail NW, Calgary, AB, T3B 6A8, Canada
[g] Department of Anesthesiology, The Ottawa Hospital Research Institute, The Ottawa Hospital, General Campus, 501 Smyth Rd, Critical Care Wing 1401, Ottawa, ON K1H 8L6, Canada

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ABSTRACT

Aim: Simulation training has been shown to be an effective way to teach crisis resource management (CRM) skills. Deliberate practice theory states that learners need to actively practice so that learning is effective. However, many residency programs have limited opportunities for learners to be "active" participants in simulation exercises. This study compares the effectiveness of learning CRM skills when being an active participant versus being an observer participant in simulation followed by a debriefing.
Methods: Participants were randomized to two groups: active or observer. Active participants managed a simulated crisis scenario (pre-test) while paired observer participants viewed the scenario via video transmission. Then, a trained instructor debriefed participants on CRM principles. On the same day, each participant individually managed another simulated crisis scenario (post-test) and completed a post-test questionnaire. Two independent, blinded raters evaluated all videos using the Ottawa Global Rating Scale (GRS).
Results: Thirty-nine residents were included in the analysis. Normally distributed data were analyzed using paired and unpaired *t*-tests. Inter-rater reliability was 0.64. Active participants significantly improved from pre-test to post-test ($P = 0.015$). There was no significant difference between the post-test performance of active participants compared to observer participants ($P = 0.12$).
Conclusion: We found that learning CRM principles was not superior when learners were active participants compared to being observers followed by debriefing. These findings challenge the deliberate practice theory claiming that learning requires active practice. Assigning residents as observers in simulation training and involving them in debriefing is still beneficial.

1. Introduction

1.1. Literature foundation

Acute care, including emergency medicine, critical care, and anaesthesiology, is a dynamic environment where physicians can be exposed to patient crises at any time. Non-technical skills for crisis resource management (CRM) such as task management,

* Corresponding author at: Department of Anesthesiology & Department of Innovation in Medical Education, The Ottawa Hospital, University of Ottawa, General Campus, 501 Smyth Rd, Critical Care Wing 1401, Ottawa, ON K1H 8L6, Canada. Tel.: +1 613 737 8187; fax: +1 613 737 8189.
E-mail address: sboet@toh.on.ca (S. Boet).

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teamwork, situational awareness and decision-making are crucial to ensure patient safety when managing crises [1]. Over recent years, high-fidelity simulation training has been demonstrated to be an effective tool in learning CRM, and to be more effective than didactic teaching [2–5]. In addition to increased knowledge and skills [3,6], learning CRM in the simulator appears to transfer to patient care [4]. Simulation-based education is supported by the theory of deliberate practice which states that learners need to actively practice in order to be effective [7].

Due to the financial costs of simulation sessions, limited time availabilities and an increasing demand for simulation training, there may be limited opportunities for each learner to be the active participant in simulated scenarios. As a result, simulation instructors often designate an active participant who is given the opportunity to practice their clinical skills in a simulated scenario, while other trainees are assigned to an observational role outside the simulation room.

The importance of actively participating is emphasized in both Kolb's experiential learning cycle [8], which describes the importance of experimentation through actively participating and then reflecting on the experience and Ericsson's theory of deliberate practice [7], which describes the importance of actively participating and obtaining feedback to become expert in a field. Following these theories, one hypothesizes that learning by "actively" participating would allow for more effective learning than being simply an observer, but this is unproven [7]. Currently, we are unaware if observer participants improve their skills at the same rate as their active colleagues. In order for educators to best prioritize resource allocation in simulation, it is imperative to gain a better understanding of the importance of actively practicing on learning CRM in simulation training. Once this issue has been better addressed, educators will be better equipped to make best practice decisions regarding scheduling trainees for active versus observational roles while in simulation sessions.

1.2. Study objective

The aim of this study was to compare the effectiveness of learning CRM principles when being an active participant in simulation-based education versus being an observer participant. We hypothesized that active participants would improve their CRM skills more than observer participants.

2. Materials and methods

2.1. Participants

The Ottawa Hospital Research Ethics Board granted approval to this study (20120008-01H). All emergency medicine residents in postgraduate years 1–5 in both the Royal College of Physicians and Surgeons and College of Family Physician programs at the University of Ottawa were invited to participate in the study. The decision to participate was voluntary and had no impact on residents program. Prior to acceptance into an emergency medicine residency program in Ottawa, Advanced Cardiac Life Support (ACLS) certification is required; therefore all the participants were ACLS certified. For the past five years, a standardized curriculum of simulation training in emergency medicine has been the norm in Ottawa. On average, each resident is assigned two simulation sessions per academic year. Informed consent and confidentiality agreements were obtained for each participant to prevent details pertaining to the clinical scenarios from being disseminated before the end of the study.

2.2. Study design and intervention

For this prospective randomized controlled study (ClinicalTrials.gov ID: NCT01653704), participants were randomized to one of two groups: active group or observer group (Fig. 1). The study took place at The University of Ottawa Skills and Simulation Centre of The Ottawa Hospital and The University of Ottawa. All participants completed a demographic questionnaire. Assignment of each participant into each group was done through computer randomization. Each participant of the active group was randomly paired with one of the observer group participants. Active group participants individually managed a simulated crisis scenario (pre-test) while the paired observer participant observed the scenario from outside of the simulation room using a video transmission system. Immediately afterwards, both participants were debriefed together on CRM by a trained instructor using an advocacy-inquiry model [9]. The instructor reviewed video footage from the simulation scenario and both participants were encouraged to actively participate in the debriefing. The objective of the debriefing was to discuss and reflect on resident's performance. The debriefing was guided by the concept of debriefing with good judgment that includes an advocacy-inquiry model [9]. Following the debriefing, both the active and observer participant individually managed a simulated crisis scenario (post-test). The post-test occurred on the same day as the pre-test. The perceived usefulness of learning CRM and the perceived stress of the two scenarios (pre-test and post-test) were collected in a post-scenario survey using a six-point scale. Participants independently completed a survey, which consisted of a 7-point Likert scale ranging from not comfortable/useful to extremely comfortable/useful after the completion of each scenario (Appendix A). Two independent raters, blinded to the participating resident's experience and training levels and unaware of the research question, rated CRM performances of all videos in a random order using the Ottawa Global Rating Scale (GRS) [10].

Both pre- and post-tests scenarios involved the application of CRM principles and were piloted to ensure that they were of equal difficulty (Appendix B). Simulation faculty, with experience in emergency medicine, approved the scenarios for content and also to further ensure equality of level of difficulty. Two confederates

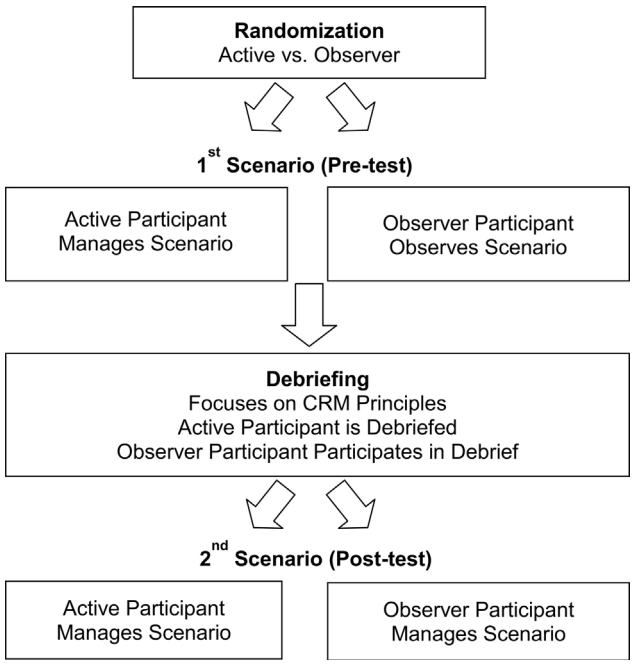

Fig. 1. Methods flow diagram.