Paramedic Students' Experience with Simulation-Based Learning

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Abstract

Technically oriented industries demand job-ready skill sets from employees upon their immediate completion of post-secondary studies. To meet these needs, many post-secondary institutions have mandated the incorporation of simulation-based learning (SBL) into curriculum, across a wide array of disciplines (Fang et al., 2011). The purpose of this research was to explore the experiences of three recent graduates from the same cohort of a paramedic program that had engaged in an ambulance simulator at a western Canadian post-secondary institution. An investigation considered how the design of and associated physical interactions within an industrial simulation affected learning outcomes and emotional responses after exposure to a mobile healthcare simulation. Analysis of data gathered from independent interviews revealed differing personal experiences grouped into four categories associated with SBL: realism, facilitation, learning outcomes, and personal responses. For SBL to be compelling to the learner, it must be realistic, facilitated by properly trained staff, and aligned with clear and valid learning outcomes capable of inducing physical and emotions responses. All of the research participants articulated that exercises in the ambulance simulator provided a unique opportunity to enhance their practice of clinical skills.

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INTRODUCTION

SBL is a safe, accessible, flexible, and convenient method of incorporating real-to-life industrial training scenarios into educational curricula (Ghasem, 2016). Within the field of healthcare, SBL is popular for facilitating training in hospital-like settings, ranging from simple to procedurally complicated scenarios (Harder, 2009). Although most literature is focused around facilitation, instructor training, and pedagogical design, little information is associated with the experiences, emotions, and resultant outcomes realized by simulation participants. A gap in the research is a lack of investigation into SBL implementation in

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mobile emergency healthcare environments. Mobile and non-mobile healthcare environments differ in situational logistics, with the mobile field environment temporarily acting as an independent entity in often dynamic and rapidly evolving medical circumstances. It was reasonable to assume that the experiences and emotions associated with each setting could also differ in simulation. A need exists to understand the experiences and emotions of students who utilize a full-scale ambulance simulation in a paramedic-training program to be cognizant of optimization opportunities to enrich future learning. However, as the interviews unfolded, facilitation and pedagogical design issues remained as factors in this simulated mobile healthcare environment.

METHOD

This research utilized a basic qualitative approach with a situational-constructivist theoretical framework. Participants' realities investigated during a semi-structured interview process, that were audio recorded and later transcribed, were used to develop categories and themes dependent on individual perspectives with a focus on the views, values, beliefs, feelings, assumptions, and ideologies of the study participants (Charmaz as cited in Creswell, 2015). This was assumed to apply to many individuals (Guba & Lincoln, 1994). Data analysis was performed on recorded interview transcripts using the constant comparative method. Open coding, the first stage of data analysis, was followed by axial and selective coding (Creswell, 2015), leading to informed conclusions based on the interview data (Guba & Lincoln, 1994).

Site and Participants

The full-scale ambulance simulator investigated in this research was located at a post-secondary technical institute in a large urban center in western Canada, with a dedicated learning space customized for paramedic students to practice their skills. The simulation room was built around both the treatment and driver's portion of an ambulance, retrofitted with the same equipment included in a functional counterpart. Realism included, but was not limited to, full-motion control in response to road conditions, a full array of mobile analytical apparatus, and a mannequin patient. The mannequin was fitted with multiple sensors and real-time communication abilities for instantaneous feedback on immediate medical diagnosis and treatment. Access to the simulator, under faculty supervision, was restricted to those involved in the paramedic program.

The method of selecting participants included sampling that was criterion referenced, purposeful, typical, and convenient (Merriam & Tisdell, 2016). It focused on former paramedic students from the same cohort that had graduated the prior year. The participants included two males currently working in an urban environment, and one female currently working in a rural area, all with a western Canadian emergency healthcare service provider. Prior to the approximately one-hour interviews, institutional ethics was obtained and informed consent received from all participants. To ensure consistency of all elements within the simulation, all participants had the same learning experiences in the same ambulance simulator. All sessions included detailed pre-use orientations, briefing sessions (in which students were instructed to approach all aspects of patient care as they would in real-life), a variety of cohort-based emergency medical scenarios (that exposed them to cardiac arrests, myocardial infarctions, strokes, seizures, toxicological overdoes, and traumatic injuries), debriefs immediately following each activity, and self-reflection opportunities via audio and video recordings.

FINDINGS

Interview data gathered from the three participants revealed differing perspectives that was thematized into four categories associated with learning in SBL (in order of decreasing significance): realism, facilitation, learning outcomes, and personal responses. Because the participants were working as active paramedics in the field, they were able to correlate their shared post-secondary experiences in SBL to their daily routine (and non-routine) workplace responsibilities, as well as SBL they had experienced in industry after graduation.

Realism

Participants unanimously identified the importance of realism in simulation design as the most significant aspect in acceptance and engagement in SBL. In fact, the realistic design of a simulation, viewed as preparation for work readiness, accounted for 16% of all responses documented through the coding process. Participant A repeatedly stated that experiences in SBL "translated into my real-world experience" and was "more like real-life." Participant B echoed those sentiments and added: "Going out into the real-world I was not under-prepared for anything." With SBL, they were able to gain familiarity with their future working environments through an increase in spatial awareness, hone leadership skills in multi-user teamwork situations, and significantly practice clinical skills. Participant C indicated that simulated scenarios were very real, using "technology that we really use out in our day-to-day jobs". This agreed with the work done by Fang et al. (2011) who indicated that SBL could enrich learning while promoting autonomy, mastery, memory and comprehension.

However, participants identified limits to realism. According to Participant B, "We can't simulate everything," and said (with a note of frustration) "I don't think we got to use it to its full potential." All participants observed a "pretend" element as a barrier to full immersion in SBL. Even though they indicated they had overcome this limitation themselves, all felt some members of their cohorts had been unable to do so, and seemed to struggle with the relevancy of simulation. Participant C observed "immaturity around sim days" and constantly referred to personal "buy-in" as a requirement for acceptance of simulation activities. Participant C continued with the statements: "I think it is really beneficial for people that make an effort and really work at it," and "You get out of it what you put into it." This aligns with Josephsen (2017), who reasons that self-regulation and self-reflection are required in SBL. A lack of understanding and insight into the goals of simulation could prompt students to adopt undesirable skills and behaviors. This could unintentionally omit important variables and information that could undermine individual learning and negate the positive effects of SBL. Of utmost importance to all participants, however, was the identification of the ambulance simulator as a "safe learning place" that would allow them to experience the same environmental conditions that they would in their workplace. According to Participant A, "The simulator gives them that opportunity to get used to their working environment now, so that's good."

Facilitation

Instructor facilitation was vital to student success in SBL. During discussions on facilitation, all the participants listed brief/debrief/feedback, appropriate time scheduling and the promotion of teamwork as the most significant responsibilities of a facilitator in SBL. Simulations do not function independently and need specialized curricular activities to increase efficacy (Eskrootchi & Oskrochi, 2010; Harder, 2009).

The importance of scenario briefing and post-scenario debriefing was reinforced. "You definitely need to have a debrief," remarked Participant C, but mentioned it was hard to do honest debriefing in most group situations. Participant C offered an option to have an online anonymous forum afterwards, where students could share their experiences and learnings in a more comfortable and controlled setting without the fear of reprisal from their cohort. Another idea was one-on-one direct facilitator/student debriefs if logistically viable. Feedback was deemed especially valuable if provided in real-time. Participant A experienced feedback that was "really quick" which led directly into discussions with the facilitator on "why you didn't do this, or why you did this or that" during debrief. This type of immediate support allowed these students to quickly resolve issues, making accommodations or adjustments to be applied at the next SBL opportunity.

The participants felt that each individual session in the ambulance simulator was of an appropriate length, but expressed a desire to experience more time in additional scenarios. Participant B said, "I just wish we would have got to use it more," A common suggestion

by the participants was for facilitators to schedule more frequent, but shorter, sessions, to improve utilization of this limited resource. Participant C wished their roles in simulation would be better defined and that they should have been forced to assume changing responsibilities. Some students automatically assumed leadership roles in all the scenarios, which put less outspoken students at the disadvantage of always being followers.

Because their real-life tasks involved teamwork, all the participants appreciated the benefits of the facilitators allowing simultaneous multiple users, scaled to size in response to scenario requirements, in the ambulance simulator. Participant B stated, "The teamwork dynamics were really good." Participant A recognized the value of teamwork in conjunction with a simulation that allowed different people to be assigned different roles. This was supported by the comment, "One person can be task oriented, whereas another person can be standing back and then watching everything and then delegating from there." All the participants noted that their cohort was comprised of users with varying personality traits and learning styles. SBL seemed most effective when differentiated instructional strategies were built into the design of the simulation, due to the inherently different personality traits and learning requirements of each user.

Learning Outcomes

Interactive learning strategies and authentic assessments must be incorporated into curriculum integrated with SBL (Varutharaju & Ratnavadivel, 2014). The participants in this research used SBL to practice their clinical skills (scaffolded to various levels of complexity), and increased their engagement and learning of the curriculum. The simulation was useful as an assessment tool, most notably in participant verbal communication, crew resource management, and the measurement of cardiac arrest performance in complex resuscitation scenarios.

Participant A realized that the ambulance simulator provided a unique opportunity to enhance clinical skills, especially in "halo events with low occurrence but high acuity." Halo events are crisis situations. They require advanced paramedic skills but, despite common public perception, do not happen very often. Participant B used an example of a pediatric seizure. Participant A continued, "They don't happen very often, but we should know how to do it right away and do it perfectly." Participant C found the practice of halo events in simulation extremely helpful because "the next time you do have a real call, it is the second time you have done it." The intricacies of the simulation itself, and how they interacted with it, did not seem to be a barrier to learning with the research participants.

All the participants identified communication as fundamental to their success in the ambulance simulator, whether inter-personal with the other members of their cohort, or with their facilitators. Participant C said the simulation allowed them to "get it out there and just start talking" about what they experienced during scenarios, as "it was all about communicating." Participant B felt that "communication was really good" and that often the simulation "allowed someone to try to make a point about something." These shared learning opportunities, on clinical processes or the results of treatment, were necessary to learn from mistakes and to initiate strategies to mitigate scenarios of greater complexity.

In this curriculum, simulation was used both as a formative and summative assessment tool. All participants appreciated being made aware if a simulated scenario was graded or not, and being provided a rubric beforehand if it was. Whether used as a formative or summative assessment tool, these students perceived that their performance in simulation was not affected. Participant C often repeated that "buy-in," or adherence to the process, was required to get the most out of the opportunities provided to them through SBL.

Personal Response

Stress and anxiety were the most significant factors affecting the physical and emotional (personal) responses of all the participants in the ambulance simulation. Of the 29 codes identified in this theme, stress and anxiety accounted for 33% of all the category responses, with

the next closest code, enjoyment, having trailed at seven percent. In a study on clinical healthcare simulation, DeMaria et al. (2010) found that certain levels of stress and anxiety do not hamper learning but may even accelerate it. This agreed with the responses from the participants in this research. Participant C said, "I think that with middle-of-the-pack stress, we perform probably at our best" and "stress might have improved me actually doing it." Both participants A and B suspected that the programmers of simulators purposefully designed scenarios to elicit responses to induce stress. They also noticed that their stress decreased over time as they became more familiar and comfortable with this method of learning.

Although the participants had experienced additional feelings such as discomfort, tension, and frustration, this information was not readily forthcoming by them through the interview process, nor did they dwell upon it. When prompted if SBL had induced either positive or negative emotions, there seemed to be a limited emotional aspect to simulation in their experience. It was determined not to be a key driver in participant successes, or failures, in simulation.

DISCUSSION

Four themes were determined from this investigation of SBL in a mobile healthcare environment used in a curriculum at a western Canadian post-secondary institution: realism, facilitation, learning outcomes, and personal responses. These results were derived from a qualitative study of three recent graduates from the same cohort of a paramedic program. The small sample size of three participants is acknowledged as a limitation of this study and the results should be considered within the framework of the qualitative research methods used.

The functional design of a simulation that realistically captured the working environment had the most impact on student experience with SBL. As long as participants were able to overcome the challenges of immersion in an artificial environment (or "buy-in"), they were able to learn in a safe and comfortable setting that directly correlated

to the real-life counterpart, while being able to practice a wide range of clinical and inter-personal skills. Properly trained instructors facilitated each simulated session to reinforce skills practice. Before, during, and after each simulation, briefings were necessary to support scenario or lesson objectives to maximize learning opportunities. All participants desired greater opportunities to fulfill different roles and responsibilities in the ambulance simulator. Learning was scaffolded effectively to allow for increased levels of complexity. Students practiced low occurrence, but critical (halo) events rarely seen in the field. They could use SBL as a platform to share experiences across cohorts by learning from the mistakes of others, regardless of assessment. The participants seemed to strive on stress, although stress associated with the simulation itself decreased as the participants became more comfortable with SBL throughout their experiences. Very few emotional barriers or negative influences affected learning in simulation. Overall, the experiences of these participants in a mobile emergency healthcare simulation aligned well with non-mobile healthcare simulation discussed prominently in the literature. It was a powerful and effective training tool for use in this healthcare application.

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