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CONCEPTS

A LITERATURE SUPPORTED MODEL FOR IMPLEMENTING EFFECTIVE USE OF SIMULATION AND DEBRIEFING IN PARAMEDIC EDUCATION

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ABSTRACT

The purpose of this paper is to provide a literature supported pathway to incorporating effective simulated learning experiences (SLE) into paramedic precertification courses. The literature is sparse on simulation incorporation into paramedic programs; however, it demonstrates extensive benefit in medicine and nursing. Paramedic educators have access to simulation equipment, yet seldom use it for more than skills development. Studies show that effective simulation can lead to improved patient care, outcomes, and safety, but requires ongoing faculty development, especially in the area of debriefing. Learning the structure and purpose of debriefing and committing to practicing the skill is crucial to unpacking meaning from a SLE. This paper describes the reasons for implementing SLEs into paramedic precertification courses, suggests a comprehensive model for faculty development, describes a debriefing method for immersive SLEs, and provides guidance for ongoing simulation professional development.

INTRODUCTION

Simulations implemented in a medical education environment create a realistic scene that allows learners to engage similar to how they would during an actual event. Simulation based education (SBE) and simulated learning experiences (SLE) are increasingly important to medical education across all provider levels (Issenberg et al, 2005; Nehring & Lashley 2010; Cook et al, 2013). SLEs provide experiential learning opportunities that research indicates are optimally implemented early in learning before clinical encounters. SLEs reduce risk to patients while allowing for the creation of myriad clinically relevant encounters (Mills et al, 2015). Despite this broad recommendation of SBE, McKenna, et al (2015) found that while access to simulation equipment and resources among paramedic programs approached 100%, use of programmable high-fidelity simulators and live simulated patient actors was only reported in 71% and 66% of programs, respectively.

The SUPER study (2015) concluded that training and support in use of simulation technology were the greatest impediment to SBE. Increasing access to initial and ongoing faculty development in the use of simulation creates communities of practice and increases confidence in the use simulation (Palaganas et al, 2014; Zigmont et al, 2014). Faculty development, for the purposes of this paper is defined according to Centra, as a "range of activities that institutions use to renew or assist faculty in their roles" (1979). These activities can include workshops, conventions, courses, series of seminars, and individualized feedback (Cheng et al, 2015). Faculty members across medical disciplines often report feeling unprepared to deliver SBE, particularly in debriefing (Zigmont et al, 2014; Cheng et al, 2015; Eppich & Cheng, 2015; Jeffries, 2008), highlighting the importance of initial and ongoing faculty development.

Cheng, et al, define debriefing as a "discussion between two or more individuals in which aspects of a performance are explored and analyzed with the aim of gaining insights that impact the quality of future clinical practice" (2016). It is the portion of the SLE for facilitator-guided reflection of the simulation while unpacking objectives. This discussion allows learners to translate the simulated experience and apply it to clinical practice (Rudolph et al, 2006; Cheng et al, 2016; Meyer et al, 2011; Boyle et al, 2007). This paper seeks to describe the need for debriefing in precertification paramedic education, while establishing an outline for faculty development for simulation best practices and recommends the debriefing with good judgment (Rudolph et al, 2006) model for paramedic educators.

TEACHING CRITICAL CARE MEDICINE

With limited research available regarding simulation education in paramedic courses, a reasonable proxy was needed. Teaching medical students critical care medicine offers a reasonable parallel to paramedicine work levels, clinical reasoning, decision making, and responsibility. Beal et al provides a comprehensive literature review of articles that discussed training in acute care specialties including "critical care, intensive care, anesthetics, emergency medicine, trauma, or prehospital care" (Beal et al, 2107, p.105).

The authors concluded that the addition of high-fidelity simulation involving the use of high-fidelity manikins and standardized patients into the curriculum correlated to a 50.0 percentile gain in competency for the high-fidelity simulation over 12 studies making it significantly more effective than other teaching methods collectively. The percentile change was calculated using Z Scores and found to be an increase of 49.8 percentiles, meaning a 50th percentile student from the simulation group would be in the 99.8th percentile if in the control group comprised of those learners who did not have simulation in the curriculum. Therefore, considering the average time of two hours to implement simulation is worth the investment with such a high percentile gain (Beal et al, 2107) and further indicates that simulation is effective at addressing objectives related to performance outcomes.

Employing high-fidelity simulation in the context of performance-based objectives will yield the greatest gains in critical care medical students. It is also clear that simulation should be used as an adjunct not replacement to other teaching methods (Beal et al, 2017). Considering this, and that prehospital care was at least considered for inclusion in the article's analyses, careful integration of high-fidelity simulation and standard-

ized patient methodology into the paramedic curriculum should yield similar results in paramedic courses than didactic teaching alone. Since this study focuses on preclinical learning objectives, placing simulation in the preclinical phase of paramedicine courses would yield optimal results.

Mills, et al (2015) determined that the placement of SLE prior to clinical placements (CP) resulted in more learning gains than the reverse. Two groups naturally formed through students' self-selection into one of the two groups and producing sufficient randomization and homogenous groups, n=85, (Mills et al, 2015). The SLE was standardized, administered by the same instructors, and compulsory for all students as a part of their regular education. Uncontrolled variables included the CP instructors and complexity or volume of actual clinical encounters for the groups, consistent with typical ambulance work. One group had simulation experience prior a clinical experience (Sim-Clin), and the other group (Clin-Sim) had real-world CP followed by the same SLE. Assessment scores for the Sim-Clin group were reported to be higher than those of the Clin-Sim group by a statistically significant margin indicating more sustained learning and a faster ascent to competency.

Mills et al (2015) illustrate that there is an optimal place for simulation in the paramedic curriculum, and Beal et al (2017) conclude that critical care medicine can be taught effectively using simulation. The authors both highlight the necessity of developing faculty capable of teaching with simulation effectively.

Making the Argument for Faculty Development

Preclinical nursing programs have increasingly used simulation to supplant clinical hours due to increasing difficulty obtaining clinical experiences for their learners. Some paramedic programs face the similar challenges; there is no guarantee learners will see critical patients requiring critical thinking during field clinical experiences on the ambulance. McKenna, et al, (2015) evaluated the access to, comfort in using, and availability of simulation equipment and found that paramedic educators have extensive access to myriad simulation equipment, including 31% of programs that have access to equipment and never use it. Most programs (66%) indicated never using simulation to replace field hours, and 77% of respondents never replace field internship hours with simulation. Therefore, these programs exclusively rely upon ambulance apprenticeship and patient encounters in emergency departments to supply all the clinical learning, despite mounting evidence that paramedic programs are facing similar challenges as nursing counterparts.

Paramedic education lacks simulation implementation in an environment that appears to be flush with access to a variety of simulation resources with the broadest disparity being 71% of programs using high-fidelity manikins despite 91% of programs having access (McKenna et al, 2015). Use of some simulation equipment is intuitive; however, high-fidelity manikins require training on the user interface and manikin functionality; only 48% of programs indicated adequate training (McKenna et al, 2015). Additionally, only 13 programs reported an in-house expert was available to train faculty and 23% of programs had simulation support personnel available during the courses (McKenna et al, 2015). Based on these data, with a majority of paramedic programs lacking simula-

tion expertise, training, and support, it can be inferred that paramedic educators would greatly benefit from enhanced training on the simulation equipment.

With most programs having access to simulation modalities and only a fraction implementing it, McKenna et al (2015) found that debriefing training is needed, with 45% of the users citing lack of debriefing training as a barrier to implementing simulation. This is coupled with only 24% of the core faculty stating they have received "a lot" of training on debriefing. Although 67% of programs identify that training in running simulation events and scenario writing are the barriers to using simulation, these are pre-event barriers which could artificially lower the number of programs reporting a need for training in debriefing because, if you do not know how to run the manikin for a scenario, you would not recognize the need to debrief it. The training deficit in debriefing is critical since faculty need to know more than just how to turn on the equipment, but what to do with it after the scenario has been carried out.

Faculty Development Framework

Peterson, et al (2017) describes a faculty development plan that includes best practices in simulation design, implementation, and debriefing SLEs across the entire simulation community at the University of Alabama at Birmingham (UAB) and the rationale behind their tiered approach to faculty development while including certification as a simulation educator. The educators at UAB began with explaining why this was needed and proceeded to develop a tiered approach to faculty development that addresses varied faculty need while creating uniform, scaffolded learning processes rooted in best practices in simulation education.

Effective simulation educators can vary their approach to different situations within a simulation or debriefing while consistently employing best practice recommendations. The authors recommend a tiered approach where faculty who are new to simulation can be coached while developing their skills, irrespective of clinical knowledge or experience level (Peterson, et al 2017). Faculty are allowed to implement the newly acquired teaching methods with regular observation and feedback and consequently grow in their simulation skills at their own pace. Experienced faculty can enter the development model at different points based on prior simulation experience, so they can move from competent to expert at a comfortable pace.

The different facets in UAB's faculty development program include observation, didactic presentations, interactive learning experiences, practice, expert feedback, mentoring, and networking. Progression through the facets requires the faculty to continuously work at improving themselves in all areas. Regardless of how long the faculty works in simulation, observation and feedback is continuous, and as junior, inexperienced simulation faculty become senior, they give more feedback but still receive feedback. This creates a culture of growth, development, and mutual support among simulation educators and formal and informal learning opportunities builds a high functioning community of simulation practice.

Faculty development requires attention to the detailed needs of the faculty member, as well as a safe environment for the faculty to grow and develop their skills. The UAB model considers the varied aspects of simulation education and considers the needs of the adult learner. Further, it is enhanced with a rigorous program that is not time sensi-

tive allowing faculty to learn at their own pace, acquiring skills over time. This process leads to an effective community of practice in simulation education and capable faculty which can be able to be applied to paramedic instructors' simulation development, particularly using peer feedback.

Peer Feedback and Growth of the Debriefer

Cheng, et al (2015), explore the impact of faculty development of novice debriefers to not only feel supported in the use of simulation, but also to develop self-confidence in debriefing. There are several debriefing models, each with its own niche for optimal use, but all tend to fall into one of two broader debriefing categories; revealing learner frames to effect broader learning; or plus/delta style discussions where favorable actions are reinforced, and others are identified and changed going forward. Learning objectives for the simulation, learner type and level, and time available to debrief, determine the ideal debriefing model (Cheng, et al, 2015). Mastering one debriefing technique while ignoring others may result in using a suboptimal technique for the current learning situation. Therefore, equipping the educator with multiple debriefing techniques is beneficial.

A cornerstone in adult learning theory states that learners need immediate relevance and practicality (Cheng, 2105) in the experiential learning. Additionally, learners in a debriefing course seek peer feedback alongside expert feedback to help develop the community of debriefers. Therefore, the authors assert that combining repetitive practice with guided expert and peer feedback during, but especially after, a debriefing course is essential to master debriefing skills. Standardization of the delivered feedback is critical to maximizing its effectiveness.

The Debriefing Assessment for Simulation in Healthcare (DASH) and the Objective Structured Assessment of Debriefing (OSAD) are widely accepted, validated tools available to assess and provide feedback to a debriefer of any experience level (Cheng et al, 2015). The DASH evaluates six elements of debriefing, each scored on a 7-point criterion referenced, behaviorally anchored scale. The OSAD evaluates 8 elements on a 5-point scale with anchors at the 1-, 3-, and 5-point positions. Both show good inter-rater reliability, and content and concurrent validity in studies of experts and first-time users. The tools look at how the facilitator leveraged debriefing events to strengthen learning and meet both scenario objectives and learner objectives.

Since no one piece of information can be learned, meaningfully practiced, and masterfully implemented in one setting, debriefing education needs to be refined over time, employing Kolb's concepts of experiential learning of feedback suggestions. With both tools anchored, either can be used for guided reflection or to show skill improvement in an experiential learning cycle promoting programmatic debriefing quality. This method illuminates a pathway to success at the pace of the individual learner which is influenced only by the experience that the faculty member brings with them (Peterson et al, 2017; Cheng et al, 2019). Such skills may include small group facilitation, effective communication and negotiation skills, or a capacity to synthesize events in complex situations they inherently apply to debriefings.

Peer feedback is a collegial and collaborative aspect of educator development that can foster a community of practice, augment competency for the feedback provider and receiver while ameliorating weaknesses and supporting successes (Rudolph et al, 2006;

Cheng et al, 2019). As more educators use these or similar rater systems, they will understand what is expected of them self-evaluate debriefings and individualize their development. The DASH has a version designed for instructors to rate themselves either with an immediate after-action review or watching themselves on a recording. Self-reflection paired with expert or peer feedback can provide magnify debriefing prowess (Rudolph et al, 2006).

In recognizing the development of debriefing as a skill developed over time, and that not every new educator needs to begin the development continuum at the same point, debriefers can be supported in their budding expertise. Transitioning from instructor led pedagogy to learner centered education represents a categorical shift in the outcomes related simulation education and the ability of the learner to apply their experiences to the clinical environment (Rudolph et al, 2006).

Shifting from Instructor-Centered Teaching to Learner-Centered Teaching

Debriefing can be constructed in a learner-centered manner or in an instructor-centered manner. Instructor-centered teaching is where the instructor makes knowledge deposits into their learners. The instructor is the unilateral holder and disseminator of the content, and the passive unquestioning learners absorb, memorize, and regurgitate that knowledge. While it allows for the fastest delivery of information, it results in shorter retention times than its counterpart (Cheng et al, 2016). Conversely, learner-centered teaching is a constructivist method where learners take an active role in the learning process and the instructor is a facilitator of the learning. The instructor has objectives to meet, however, the learner may bring up topics they wish discuss generated from the scenario. This creates more motivated learners who have ownership over their learning, leading to longer retention time.

Cheng, et al (2016) make the argument for the value of establishing debriefings as a largely learner-centered event and identify several variables to consider when implementing learner-centered debriefings including amount of time available to teach and the knowledge and experience of the learners. When time is limited for debriefing, instructor-centered teaching is preferred because it allows the instructor to maximize the material covered. This applies when time is running short during debriefing or in the clinical environment when patients are present. When dedicated sufficient debriefing time exists, a learner-centered approach is preferred allowing learners to contextualize the learning to the clinical setting. Learners with little background or experience may benefit from more instructor-centered pedagogy since those learners will be less inclined to engage in discussion-style learning, whereas learners with base knowledge will be more likely to engage in a discussion to modify their frames of reference and implement new practices to an existing repertoire. Experienced learners may enrich the learning of others participating in the experience during a well-constructed and facilitated debriefing.

Each of the three phases of a debriefing – reactions phase, analysis phase, and summary phase – incorporate learner-centered teaching concepts. The reactions phase invites learners to share their feelings and perspectives on the SLE and allows time for the learners to process and share perspectives, frames, and learner-developed objectives, thus activating learning. The analysis phase begins with the instructor setting a loose

agenda for the discussion to follow. Much of the time in a debriefing is spent in this phase unpacking objectives and is where learner-centered approaches often provide the most benefit. During the summary phase, the learners are given a chance to express in their own terms what part of the experience resonated most with them and allows the instructor to evaluate the learning that has taken place. The instructor should refrain from summarizing, describing, or stating what should have been learned during the encounter, focusing rather on the learners' self-reflection as a crucial step in formative assessment.

The goal should be to incorporate learner-centered teaching styles into debriefings of SLEs but Cheng, et al, (2106) concede that it is not always practical or possible to have purely learner-centered experiences with time and learning knowledge base variables. They recognize that a good debriefing starts with a good pre-briefing which sets the stage for learner-centered teaching because it contains important components designed to establish ground rules for the experience, encourage participation and active learning, and establishes the safe learning environment where even failure is an acceptable and encouraged option.

Setting the Stage with Pre-Briefing

Rudolph, Raemer, and Simon (2014) explain the pre-briefing is the time when the simulation faculty set the stage, literally and figuratively, for the learners. The pre-briefing: describes the setting in which students will interact with the simulated patient (manikin or SP), provide the learning objectives, and discuss how the observations made during the SLE will be used. The "safe container" (Rudolph, et al, 2014, p.339) is a context in which learners are free to expand their comfort zone and make mistakes in a psychologically safe environment throughout the simulated experience, respecting the learners for putting their professional identities on display to be evaluated and discussed.

Explicitly recognizing the importance of learner psychological safety and taking steps to actively reduce the feelings of stress the learner will feel from peers, instructors, and supervisors observing and evaluating them has a nurturing effect on the learner. They become willing to practice at the edge of their comfort level and to talk about areas of potential improvement. This safe learning environment allows learners to face negative feelings associated with failure and mistakes and set aside the notion that participation in the simulation will expose their ineptitudes or weaknesses as part of a growth model rather than a punitive one.

To create and maintain the psychologically safe environment throughout the simulation, learners should be assured of complete confidentiality and understand the way the experience will impact them after it is over. Simulations can be used used as a formative assessment; a summative assessment receiving a grade; or can be high stakes, possibly meaning the difference between receiving or keeping a certification, license, or job. Higher stakes mean the learner may see the simulation as a threat to their identity rather than a way to improve and gain knowledge. After securing confidentiality, share the objectives needed to facilitate full engagement in the scenario.

Psychological safety of the learner extends to understanding the physical environment in which the scenario will take place. Despite best efforts, material differences between the simulated environment and the real clinical setting will always exist; deliberately

allowing time for the learner to view the available medications, for example, or practice with the medical equipment and instruments available to the during the encounter will enhance learner comfort in the space. This helps ensure learners stay engaged in the simulation and reduces the chances they cite the physical fidelity as a reason for any subpar performances. This begins "establishing a fiction contract," (Rudolph, et al, p.341) which essentially establishes a mutual understanding between faculty and participant that the situation is not real, and that care was taken to accurately mimic reality while acknowledging its departures from reality. The participants also agree they will engage in the simulation as if everything they encounter is real, to the degree possible. This serves to increase the learner's focus on the objectives rather than gaps in fidelity.

Finally, psychological safety is affirmed with the establishment of the Basic Assumption which states: We believe that everyone participating in activities [at this institution] are intelligent, capable, care about doing their best, and want to improve (Rudolph et al, 2014). Learners seeing and hearing this prior to starting a simulation will be more likely to be comforted knowing the instructor understands they will not be perfect, and that they are present to become better, fostering a growth mindset for all involved, empowering learners to ultimately succeed.

Establishing a safe harbor for putting into practice new knowledge, techniques, or skills is an essential element to creating a successful experience that can lead to a rich debriefing that provides transferable learning. The safe container, established at the outset, will allow the debriefing team to delve deep into learners' frames and points of view with deeply probing questions and meaningful reflection. And throughout, they will know they will be treated in a professionally courteous manner, even in the event things do not go as well as they hoped or wanted.

Debriefing with Good Judgment

Rudolph, et al, (2006) provide a framework for model debriefings they called "Debriefing with Good Judgment" (DGJ). Reflection on action, whether in the clinical or simulated setting, demands critical, yet supportive, facilitation. With the Basic Assumption as a foundation, actions are believed to result from the well-intentioned, rational attempt at the best solution. These frames – or schemata, mental models, etc. – tend to be grounded in experience, cultural upbringing, educational level, and perception of the situation and lead to an action and subsequent observable result. The results can have a favorable outcome, a neutral outcome, or a harmful outcome.

The link between frames, actions, and results is very strong; an individual perceives the situation; determines and executes a course of action; and reviews, interprets, and reacts to the ensuing results, beginning the cycle anew (Rudolph et al, 2006). Focusing only on the action that brought about the result is known as single loop learning. This directly and concretely fixes the action – and result – for that singular specific situation but may not lead to extrapolation to other similar situations, only able to apply their experience to the next identical situation. This does not, however, address the thought process that led to the action. A skilled facilitator will focus the conversation on uncovering the learners' frames that led to the action. Since the learners' frames are not typically vocalized during a scenario, explicitly reflecting upon the frames during a debriefing will lead to changes in the incorrect action – or maintenance and expansion of the appropriate ac-

tion – and subsequently a change in outcome. Creating a new way of thinking – a new frame –has the potential to be applied across a broader range of situations beyond the one being debriefed.

In a nonjudgmental debriefing, facilitators get the participants to identify the successful and unsuccessful aspects of a simulation, generally with little specific guidance as in, "what areas do you think could be improved?" However, often the facilitator has withheld a point of view held, leading learners to guess the "right" response in what Rudolph et al (2006) call "Guess What I am Thinking" questions. The judgmental model has the advantage of getting right to the point and highlighting what went well or went poorly, or right or wrong, without considering what led to the events and often lacks any level of discussion as judged purely from the perspective of the facilitator. Adult learners shut out those facilitators who present a correct, finite answer to all situations. Evaluation of these two methods leads the authors to suggest a method they call Good Judgment.

DGJ, instead, follows a three-step approach where the instructor leads a discussion, and all participants are invited to share in the development of new frames. Of critical importance here, is advocacy for the learner followed by a genuinely curious inquiry about the learners' frames regarding a specific moment or event in the simulated experience. First, the facilitator identifies the moment they would like to discuss and shares the perception, thoughts or reaction to the event including how it differs or synergizes with the observed moment up for discussion. At this point, the learner knows exactly what is being discussed and what the view their instructor has on the situation. The facilitator then asks the participant(s) involved to share what their thoughts were at that moment in the scenario in a facilitative, non-condescending fashion, deliberately revealing their frame. In such a healthy exchange, the learner can be vulnerable knowing the discussion's goal is purely to become better providers, rather than punitive for mistakes. Context can then be applied to the entire situation, and, with the help of the facilitator, deep meaning and transferability can be developed. This is the optimal way for adult learners to maximize an experience while making it transferable to actual clinical practices.

DISCUSSION

Implementation of SLE into a precertification paramedic program is the first, if not most crucial, step. This paper should serve as the basis for further research and into simulation usage in programs who have simulation equipment available and access to simulation expertise in their institutions. Furthermore, the creation of a community of practice at the local and national levels would further support needed growth and development of EMS instructors related to best practices in SBE.

There are many simulation associations and EMS organizations that are working to improve the quality of simulation methodology and activities in EMS education. Much research is needed and this author encourages EMS instructors to consider research opportunities in healthcare simulation as an EMS educational methodology. This would include reaching out to those organizations to determine what existing research opportunities and priorities exist, or how additional research questions can be identified and answered.

Further research needed includes, but is not limited to, lessons learned from and outcomes associated with the creation of local communities of simulator educator practice;

educator attitude shifts toward SBE correlated to student performance; demonstration of change in time to competency, proficiency, or mastery of procedural skills after robust implementation of simulation; changes in student self-reported confidence in clinical internships after simulation experiences; and, changes in perceived student stress during clinical internships after simulation experiences. These research opportunities could be qualitative or quantitative in nature, depending on the topic, and would further support the professional development needed for EMS instructors for optimal experiential learning adjunctive to didactics and clinical internships.

CONCLUSION

The very nature of a paramedic's job lends itself to optimal preparation for and experience in critical, stressful situations. Implementation of SLE with effective debriefing in paramedic programs can close the gap between what the clinical experiences and internships can deliver, and the knowledge needed to be an independent paramedic. Optimal implementation of SBE requires paramedic faculty to be skilled in best practices of simulation education, especially around debriefing. Exposing learner frames and reinforcing those frames or restructuring them for improved performance is challenging to avoid learner dissonance and defensiveness. Training in techniques of debriefing should begin with initial training followed with ongoing, routine peer support and feedback with proven mechanisms such as the DASH or OSAD to develop paramedic educators agile in SBE.

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