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Trauma simulation in prehospital emergency care

Abelsson A^{1*} Lundberg L^{2,3}

Anna Abelsson*, RN, PhD.

* Corresponding author

¹Jönköping University, School of Health Sciences, Jönköping, Sweden

Email: anna.abelsson@ju.se

Lars Lundberg, MD PhD, Professor

²Swedish Armed Forces Centre for Defence Medicine, Göteborg, Sweden

³PreHospen - Centre for Prehospital Research, University of Borås, Borås, Sweden

Abstract

Introduction: Well-educated ambulance staff is a prerequisite for high-quality prehospital trauma care. The aim of this study was to examine how nurses in the ambulance service experienced participation in trauma simulation.

Methods: Sixty-one nurses, working in an emergency ambulance service, performed simulated trauma care on four different occasions and afterward rated three statements on a 5-point Likert scale. A descriptive and inferential analysis were conducted.

Results: There are statistically significant increases between the pre- and post-test regarding all three statements; "I think simulation of severe trauma with manikins is realistic" (.23 or 6% increase), "Simulation is a suitable method for learning severe trauma care" (1.3 or 38% increase), and "I am comfortable in the situation learning severe trauma care through simulation" (.74 or 19% increase).

Discussion: With the experience of realism in simulation, participants become more motivated to learn and prepare for future events. If the participants instead feel uncomfortable during simulation training, they focus on their own feelings instead of learning.

Conclusion: In a realistic simulated environment, participants are prepared to understand and manage the emergency care situation in clinical work. Participants learn during simulation when they are outside their comfort zone but without being uncomfortable or experiencing anxiety.

Keywords: simulation; trauma, ambulance; prehospital emergency care

Introduction

In Sweden, the National Board of Health and Welfare (2015) defines trauma as "patient with apparent or suspected life-threatening injury, or where there is a risk of persistent serious disability" (National Board of Health, 2015, p. 60). Traumatic injuries in a prehospital setting may be caused by both blunt and penetrating mechanisms (PHTLS, 2014). Globally, every year around 6 million people are killed by injuries. In addition, millions of people are injured temporarily or permanently. Traumatic injuries are increasing significantly in the whole world and represent 9% of the world's deaths yearly. About 90% of all injuries occur in low- and middle-income countries and have been steadily increasing over the recent years (World Health Organization [WHO], 2014).

The severity of injuries can be reduced through adequate prehospital emergency care. In the case of accidents, many people die of injuries that are survivable (Wilson et al., 2015). Globally, road traffic injuries are one of the leading causes of death for people between 5-59 years (Browne et al., 2014). Most deaths occur within the first hour of the accident due to airway compromise, respiratory failure or uncontrolled hemorrhage. These injuries may be quickly addressed with basic first aid knowledge. Early and rapid care measures are likely to improve the possibility of survival, as compared to more advanced efforts at a later stage (Wilson et al., 2015). Patients with life-threatening injuries have a mortality rate of 6% in countries with well-educated prehospital ambulance staff, as compared to countries with little or no advanced prehospital ambulance staff with a mortality rate of 36% (WHO, 2014).

The complexity of the care of patients affected by trauma requires that caregivers have relevant education (Steinemann et al., 2011). Higher education and continuing education of nurses in trauma care have been shown to improve the care and the outcome for trauma patients (WHO, 2014). By legislation from 2005, there must be a registered nurse in every Swedish ambulance (SOSFS, 2000:1). World health organization (WHO, 2008) states that all Member States of the European Union should introduce and regulate specialist training for all prehospital emergency care personnel. The quality of prehospital emergency care must be guaranteed, and all emergency medical care measures should be provided by staff that is trained in prehospital care (WHO, 2008). The Swedish National Board of Health and Welfare (2015) points out that all prehospital caregivers should have adequate trauma training to improve trauma care. There is no standard that indicates how often continuing education should be offered. Knowledge and skills that are frequently used may require little updating.

However, skills that are used less frequently should be trained more often (Gonzalez & Kardong-Edgren, 2017).

Simulation is a suitable method for training of the prehospital staff since it is not advisable to use real patients for training purposes, such as those who suffer from severe trauma requiring immediate care (Steinemann et al., 2011). Learning with simulation involves learning theory and practical skills that can be applied and integrated with already existing skills (Garvey, Liddil, Eley & Winfield, 2016). The simulation creates experiences. It involves understanding how disease or injury can be experienced, integrated with the knowledge of the actual injury or disease (Benner & Tanner, 1987). In the simulation, caregivers learn to integrate thought, feeling, and action, which can then be translated into patient-centered care measures.

Improving the ambulance staff's knowledge and skills of care of patients affected by trauma can be a cost-effective way to improve patient outcomes. The nurses' theoretical and practical knowledge, as well as experience, are improved and maintained through training in a simulated environment. It is therefore of interest to study how nurses experience trauma simulation.

The aim of this study was to examine how nurses in the ambulance service experienced participation in trauma simulation.

Method

This study had a quantitative design. Data were collected by participants performing simulated trauma care on four different occasions during a six-month period and directly after the last simulation rating three statements on a 5-point Likert scale. A descriptive and inferential analysis were conducted.

Participants

Participants in this study consisted of 61 nurses whereof 21 were registered nurses (34%) with a three-year university education with a bachelor's degree. The additional 40 participants were specialist nurses (66%) which is a registered nurse with specialist training and work experience from hospital-based emergency care and in addition, has a one-year university-level education with a focus on prehospital emergency care. This education includes a master's degree in prehospital emergency care. There were 36 males (59%), and 25 females (41%) and the ages ranged from 25–63 years (mean 39). The experience from prehospital

emergency care ranged from 0–36 years (mean 9). All participants received oral information about the study and were then asked to participate voluntarily. Inclusion criteria were registered nurses working in an emergency ambulance service, participating in a low fidelity trauma simulation in a prehospital setting. All participants had previous experience of simulation training which could strengthen validity (Polit & Beck, 2017).

Data Collection

The participants performed simulated trauma care on four different occasions during a six-month period. The simulated patient scenarios consisted of a range of typical prehospital injuries, for example; closed pelvic fracture, penetrating abdominal wounds and open extremity fractures. All patient scenarios were represented by a Resusci Anne Basic manikin (Laerdal® Stavanger) with moulage injuries.

Before the first simulation and again directly after the last simulation, participants were asked to rate three statements on a 5-point Likert scale, ranging from “strongly disagree” to “strongly agree”. By using the same questions in the before and after rating strengthened the reliability (Polit & Beck, 2017). The statements were asked in the form of assertions and aimed at answering the participants’ perceptions of trauma simulation. The statements were:

- *I think simulation of severe trauma with manikins is realistic*
- *Simulation is a suitable method for learning severe trauma care*
- *I am comfortable in the situation learning severe trauma care through simulation*

Data Analysis

The descriptive and inferential analysis was conducted using IBM Statistical Package for the Social Sciences (SPSS) 24.0. Descriptive analysis (central tendency and distribution) were used to describe the data, whereas inferential statistics (Paired sample t-Test) compared potential differences between the groups. The level of significance used was set at $\alpha=0.05$.

Ethical consideration

The study followed the ethical principals in accordance with the World Medical Association (2013) about anonymity and integrity. Ethical approval was obtained from an Internal Review Board. Participants were given full information about the study before the simulation started. Informed consent was obtained from each participant.

Results

The results show that there are statistically significant differences between the pre- and posttest regarding all three statements. The realism of simulated trauma care on a manikin increased from pre- to post-test with mean .23 (6%) on a 5-point Likert scale. Simulation as a suitable method for training and learning trauma care was on a 5-point Likert scale rated mean 4.69 in the post-test which was an increase of 1.3 (38%) from the pre-test. The participants' experiences of being comfortable in the simulated trauma situation were rated mean 4.64 in the post-test which was an increase of .74 (19%) on a 5-point Likert scale compared to the pre-test (table 1).

Table 1. The participants' rating statements on a 5-point Likert scale (strongly disagree to strongly agree) presented as mean for pre- and post-test.

Statements	Pre-test mean (SD)	Post-test mean (SD)	Sig	Mean Increase	% Increase
<i>I think simulation of severe trauma with manikins is realistic</i>	3.85 (1.01)	4.08 (.78)	.00*	0.23	6%
<i>Simulation is a suitable method for learning severe trauma care</i>	3.39 (.88)	4.69 (.62)	.00*	1.3	38%
<i>I am comfortable in the situation learning severe trauma care through simulation</i>	3.90 (.91)	4.64 (.63)	.00*	0.74	19%

*Paired t-test

Discussion

By creating a simulated environment where clinical practice can be realistically trained, participants can better understand and handle different situations when they later arise in real clinical practice. Realism gives participants an enhanced interaction with patients, as well as relatives and colleagues during simulation. It means being prepared for future events (Jeffries, 2016). In the results of this study, participants expressed that simulation of severe trauma with manikins was realistic. The experience of realism means that the simulation is meaningful (Allan et al., 2010). Participants become more motivated to learn and therefore benefit from improved learning (Abelsson, Rystedt, Suserud & Lindwall, 2016).

In this study, it emerged that the rating of simulation as a suitable method for training and learning trauma care increased by 38%. This is consistent with previous research that

demonstrated how simulation improves both theoretical knowledge and practical skills but also increases participants' confidence in critical care environments (Brien, Charette & Goudreau, 2017). A simulation is a good option for teaching inexperienced staff to handle complex healthcare situations (Boling & Hardin Pierce, 2016). Learning through simulation does not require the staff to be exposed to emergency care at accident sites, with real patients. The simulated learning environment is safe not only for the patient but also for teaching the prehospital staff (Abelsson et al., 2016).

Being comfortable or not in the simulation can depend on the participants' level of anxiety, which is a feeling of insecurity due to the inability to predict or control the temporary situation that one faces (Allen et al., 2010). Being uncomfortable during simulation has been described as an emotional reaction to being embarrassed. When the participants feel embarrassed, the result will be that they focus on their own feelings instead of on the learning (Abelsson & Bisholt, 2017). Learning is then obstructed due to the negatively affected cognitive functions (Vytal, Cornwell, Arkin & Grillon, 2012). Fear of failure or negative assessment (Keitel et al., 2011) during simulation can also result in participants being physically affected by increased heart rate (Bauer et al., 2016).

Previous research has described how participants experience comfort when simulated patient scenarios are presented at a level of knowledge appropriate for each one of the participants (Abelsson & Bisholt, 2017). Patient scenarios based on prior knowledge may stimulate an enhancement in clinical decision making and interventions. However, patient scenarios should challenge and be more difficult than the participants can manage, to induce learning (Adams Miller, Kimble, Sudia & Gee, 2016). When participants are outside their comfort zone, challenging patient scenarios can lead participants to manage new care situations (McLellanda et al., 2017; Miyasaka, Martin, Pascual, Buchholz & Aggarwal, 2015). It allows participants to explore their knowledge boundaries and provides the opportunity to understand the need for additional knowledge (McDermott, 2016).

Limitations

A limitation is that the nurses in the study had varying experiences of trauma patients in clinical practice, as well as from simulating trauma care. This may have affected the result.

Conclusions

With the experience of realism in simulation, participants become more motivated to learn and prepare for future events. A simulation is an option for teaching staff to handle complex

healthcare situations. Being uncomfortable or experiencing anxiety during simulation is an emotional reaction expressed as the feeling of embarrassment. When the participants feel uncomfortable, the result is that they focus on their own feelings instead of the learning. Participants learn better from simulation when they are outside their comfort zone but without being uncomfortable or experiencing anxiety.

Conflict of interest - The authors declare that there is no conflict of interest.

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