Best Practice & Research Clinical Anaesthesiology 29 (2015) 21–25

Contents lists available at ScienceDirect

Best Practice & Research Clinical Anaesthesiology

journal homepage: www.elsevier.com/locate/bean

3

The matter of 'fidelity': Keep it simple or complex?

Alin Schaumberg, MME, Dr. med, Specialist in Anesthesiology and Emergency Medicine *

University Hospital Giessen and Marburg GmbH Giessen, Department of Anesthesiology and Operative Intensive Care Medicine, Rudolf-Buchheim-Str. 7, 35392 Gießen, Germany

Keywords:
simulation
realism
learning success
medical education

Simulation often relies on a case-based learning approach and is used as a teaching tool for a variety of audiences. The knowledge transmission goes beyond the mere exchange of soft skills and practical abilities, including practical knowledge and decision-making behaviour as well. As it seems, simulation requirements largely depend on the skills, abilities or competences to be conveyed. Unfortunately, we lack any scientific evidence as to how much learners should be stressed to achieve a positive learning outcome. As regards learning and practising purely technical skills, however, it can be generally assumed that simulations should be as anatomically/physiologically close to reality as possible. On the other hand, teaching soft or decision-making skills and sharing practical knowledge poses less stringent requirements on simulation realism. For simulation-based learning, learning outcomes depend not only on knowledge, practical skills and motivational variables, but also on the onset of negative emotions, perception of own ability and personality profile. 'Simulation' training alone does not appear to guarantee learning success. Rather, it seems necessary to establish a simulation setting suitable for the education level, needs and personality characteristics of the students. Thus, it is fair to conclude that there is no evidence correlating the realism of a simulation scenario with the learning success of students.

* Tel.: +49 641 98544401.
E-mail address: alin.schaumberg@uniklinikum-giessen.de.

http://dx.doi.org/10.1016/j.bpa.2015.01.005
1521-6896/

Introduction

Technological progress introduces permanent changes in all spheres of life. This is particularly evident in medicine. In the last 20 years, simulators and physiological models have reached unprecedented development levels. Nowadays, simulators in the field of medical education and continued training allow representing and simulating even the most complex scenarios and diseases, with a hitherto unseen level of realism. On the other hand, we need no longer leverage in full all features and capabilities provided by modern simulators. Furthermore, simulator classrooms depict real situations with increasing accuracy by means of appropriate equipment and design. However, technical and spatial equipment alone no longer guarantee optimal learning, because: 'Simulators don't teach!' Not surprisingly, teachers remain paramount in the learning process. As implementing simulation scenarios is a highly complex and costly endeavour, questions regarding the efficient use of resources inevitably arise: How much realism must be sought to achieve a particular learning outcome? This article attempts to portray the current state of knowledge on this topic.

Simulation often relies on a case-based learning approach and is used as a teaching tool for a variety of audiences. Knowledge transmission goes beyond the mere exchange of soft skills and practical abilities, including practical knowledge and decision-making behaviour as well. Learning success has been measured successfully in the past [3]. Such an assessment also included the subjective impression of participants regarding their learning through simulation scenarios [4]. However, we lack a precise understanding of the factors – or the interaction thereof through simulation – leading to this positive learning experience. There is only consensus that simulator learning must be of a multifactorial nature. In addition, the nature of simulation-based learning is also relevant. Simulation realism requirements largely depend on the skills, abilities or competences to be conveyed. In this context, simulation shall be construed as a technique to attain specific learning objectives [5]. Simulation can thus be seen as a means to an end rather than as a fixed, unchangeable variable. The degree of realism seems to be an important control variable, bearing major influence on the learning conveyed by the model. Accordingly, the degree of realism must be commensurate to the learning goals. In the simulation area, such learning goals are primarily connected to the integration of technical skills in a more complex overall situation, or to the so-called nontechnical skills (communication skills), which allow better dealing with usually dynamic situations [6]. In the following section, we describe the current state of knowledge in conveying different learning objectives and the associated realism.

Simulation for hard skills teaching

Miller's learning pyramid distinguishes four competence levels [7]:

1. Knows
2. Knows how
3. Shows how
4. Does.

Each competence level demands its own teaching method. For example, hard skills are particularly suited to the teaching of Miller's competence level 2 (i.e., Knows how). Hard skills of such nature are taught using human-like phantoms (e.g., vein puncture arm). In this case, the degree of realism usually rests on highly realistic depiction of anatomical structures or functional relationships rather than on embedding simulators in a realistic environment. Even today, however, this approach presents certain limitations. For example, airway management, anatomy abnormalities or pathophysiology (cough, secretion, bleeding, aspiration) cannot be adequately represented in this way. Despite some limitations, the benefits of simulator-based teaching are still significant, as these tools offer outstanding training options for teaching technical skills [6].

In this respect, the development and implementation of simulation techniques in medicine tend towards an expansion beyond the necessary transmission of technical skills, focussing as well on the implementation of such skills in complex working environments. Ultimately, the approach is strongly