Original Contribution

Comparison of 2 resident learning tools—interactive screen-based simulated case scenarios versus problem-based learning discussions: a prospective quasi-crossover cohort study[☆],[☆☆]

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Abstract
Study Objective: Simulation-based learning is emerging as an alternative educational tool in this era of a relative shortfall of teaching anesthesiologists. The objective of the study is to assess whether screen-based (interactive computer simulated) case scenarios are more effective than problem-based learning discussions (PBLDs) in improving test scores 4 and 8 weeks after these interventions in anesthesia residents during their first neuroanesthesia rotation.
Design: Prospective, nonblinded quasi-crossover study.
Setting: Cleveland Clinic.
Patients: Anesthesiology residents.
Interventions: Two case scenarios were delivered from the Anesoft software as screen-based sessions, and parallel scripts were developed for 2 PBLDs. Each resident underwent both types of training sessions, starting with the PBLD session, and the 2 cases were alternated each month (ie, in 1 month, the screen-based intervention used case 1 and the PBLD used case 2, and vice versa for the next month).
Measurements: Test scores before the rotation (baseline), immediately after the rotation (4 weeks after the start of the rotation), and 8 weeks after the start of rotation were collected on each topic from each resident. The effect of training method on improvement in test scores was assessed using a linear mixed-effects model.
Main Results: Compared to the departmental standard of PBLD, the simulation method did not improve either the 4- or 8-week mean test scores ($P = .41$ and $P = .40$ for training method effect on 4- and 8-week scores, respectively). Resident satisfaction with the simulation module on a 5-point Likert scale showed subjective evidence of a positive impact on resident education.
Conclusions: Screen-based simulators were not more effective than PBLD for education during the neuroanesthesia rotation in anesthesia residency.

1. Introduction

Simulation in health care is defined in recent literature as "any technology or process that recreates a contextual background and allows a learner to experience success, commit mistakes, receive feedback, and gain confidence in a safe environment" [1].

Among the many advantages of simulation cited in literature, the ability to provide a learner-focused and nonthreatening educational environment that is not hindered by patient service commitments or clinical repercussions is probably the most important [2–9]. Disadvantages of simulation have also been reported and include lack of realism in the simulation experience and patient responses, as well as the expense of the high-fidelity computer-based simulators [3–5].

Problem-based learning discussions (PBLDs) are interactive teaching methods that use a written case stem as the learner stimulus for the acquisition and application of knowledge in a clinical setting. Students are expected to assess and manage the patient described in a scripted scenario based on verbal- and stimulus-triggered feedback received from the instructor.

Learning via PBLDs and simulators overlap in terms of clinical scenarios; both require prospective and ongoing management in the face of an evolving clinical picture with relevant feedback for the learner. There are no previous studies comparing the direct educational benefits of simulated scenarios in neuroanesthesia with conventional or problem-based learning methods as a part of an anesthesiology residency curriculum. If simulation is to become an integral part of training, the efficacy of this modality must be established with definitive evidence.

We hypothesized that teaching through screen-based simulation (SBS) is more effective than teaching through PBLD scenarios with respect to test scores. If the study hypothesis held true, we would be able to provide another alternative mode of effective education in this era of a relative shortfall of teaching anesthesiologists. In particular, the primary aim of the study was to compare the simulation and PBLD training methods on short-term and long-term test score improvements from baseline. The secondary aim of the study was to assess residents' feedback in terms of their anticipation toward a better performance after acquisition of the simulated learning and in terms of their ability to be receptive toward the simulation training method.

2. Materials and methods

2.1. Setting

This was a prospective, nonblinded quasi-crossover trial involving anesthesia residents conducted between September 2011 and March 2013 at the Cleveland Clinic. We received prior approval from the institutional review board of the Cleveland Clinic to conduct the study and written informed consent from the trainees participating in the study.