Demonstrating the Relevance of First-year Medical Cardiovascular Physiology Using a Simulation of Hemorrhage

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Abstract: Many first-year medical students struggle to recognize the relevance of the basic sciences to their future work as physicians. The availability of high fidelity simulators in our institution allowed us to develop a scenario that encouraged students to correlate physiological concepts with clinical experience. Students studied material on low cardiac output the night before the simulation, but no specific information on the simulated case was provided. Once in the simulation center, students completed a short quiz and then participated in a case in which the victim of an automobile accident had lost an unknown quantity of blood. Faculty adjusted the physiological condition of the simulated patient as the students evaluated the situation and conducted therapeutic interventions. A large-group debrief the following day reinforced the physiological concepts demonstrated in the simulation. Pre- and post-activity evaluations assessed students’ opinions on the value of the simulation. Additionally, students’ performances on examinations were compared with previous years in which such an activity was not available. There was improvement on some questions and similar outcomes for others despite less time invested in formal lecture. We conclude that the use of clinical simulation is an effective strategy for reinforcing critical concepts in cardiovascular physiology during first-year medical training.

Introduction

Many older physiologists recall the days when medical students were introduced to physiological concepts by means of laboratory exercises that provided a hands-on experience. These exercises may be a thing of the past, but the availability of high-fidelity clinical simulators offers an alternative that encourages students to correlate the underlying physiology with clinical practice. As part of our first-year medical physiology course, we introduced a simulation of a hemorrhagic patient that served as the capstone event in our two-week cardiovascular section. Students rotated through the simulation on January 29, 2014.

Students prepared for the simulation by independent study of online materials. They knew that they would face a case of low cardiac output, but the details were not known ahead of time.

To facilitate independent study, we suggested an organizational strategy that guided student review and included links to additional material.

When the teams of four arrived in the simulation center, each member completed an independent readiness assessment test. They were then given the briefing for the case.

With the aid of simulation manikins, the student teams assessed the hemorrhage and intervened as necessary. They had to choose between the intravenous administration of isotonic saline, atropine, or phenylephrine. We anticipated that most teams would recognize the reduction in stressed volume as the underlying clinical problem. A debriefing allowed the teams to assess their performance.

The morning following the simulation, a large-group debrief using PowerPoint reinforced the relevant physiological principles illustrated in the scenario. Videos of the students were used to highlight key parts.

Students indicated that the clinical simulation was very helpful. Moreover, there was a significant shift in opinion between the beginning and end of the course (chi-squared test, p<0.05).

For more information about medical education at TTUHSC, link to http://www.ttuhsc.edu/som/medicaleducation/mededMOSInnovation.aspx

Performance Outcomes

Overall performance on the cardiovascular examination over the past few years has improved, despite a reduced number of lectures. The use of clinical simulation as an alternative to lecture appears to be a useful strategy for increasing student-centered learning.

Student Feedback

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Performance Outcomes

Number of Views (class of 162)

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