

Enhancing Early Clinical Pharmacology Education with Interactive High-Fidelity Virtual Patient Simulations in the Lecture Theatre

Background and aims: In much of preclinical medical education, the basics of science are still taught with little practical clinical application. Consequently, medical students can struggle to integrate and apply basic pharmacological principles within the clinical management of patients. I have been developing the use of a high-fidelity patient simulator (HFPS), SimMan, in large preclinical pharmacology lectures. Currently, HFPS is primarily used in small group settings for clinical undergraduate and postgraduate training¹. A limited number of institutions use lecture theatre based simulations, with a few students controlling the scenario and the remainder of the class observing. When designing simulations, a concern was how to actively engage the full lecture theatre with the scenario. I aimed to develop novel lecture theatre-based simulations delivered in a way that required the participation of every student, enabling them to apply their recently learned pharmacology knowledge to 'real-life' medical emergencies.

Summary of work: SimMan is a sophisticated virtual patient who breathes, talks, has heart beats, responds to drugs appropriately etc. He can be programmed to present with signs of a vast range of medical conditions. To enable the entire class (>200 preclinical medical students at Newcastle University) to engage in clinical decision making around the use of drugs in medical emergencies, I employed split screen and interactive voting technologies. One screen projected SimMan's vital signs while the other was linked to a TurningPoint interactive quiz. At key clinical points throughout the scenarios, students had to vote individually on the most appropriate course of action for example which drug to use, the route of administration, a dosage calculation. The option with the most votes was applied to SimMan, and the students observed the physiological effects this had in real time. Students were debriefed at the end of the scenarios as to the correct sequence and rationale of choices.

Outcomes: Online evaluation of the use of SimMan in the lecture theatre revealed that over three quarters of students believed this enhanced their learning experience. Students highlighted that it demonstrated the effects of drugs in a patient-centred manner and that it enabled them to see how the pharmacology principles learned in class applied in clinical practice. Simulations where SimMan died (e.g. after 5ml of 1:1000 IV adrenaline for anaphylaxis!) appear to have provided particularly memorable learning experiences.



SimMan in action

Discussion and conclusion: Engagement of students from the very first years of their medical education, with realistic clinical scenarios, will contextualise the importance of basic pharmacological knowledge. The more frequently students are guided through the clinical decision making processes surrounding the application of drugs (e.g. in an acute asthma attack or sepsis) the more likely they are to provide a higher quality of care when they encounter real patients. Simulation based teaching can be applied beyond medical education to enhance the learning of a wide range of physiological and pharmacological principles.

References:

Issenberg SB *et. al.* 2005. *Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review.* Medical Teacher 27(1):10-28.