

Teaching and Learning: Simulating Rural Trauma

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Last summer, third-year medical students Desmond Whalen and Chris Harty donned scrubs and monitored the vital signs of a mannequin.

That might sound like an ordinary occurrence for medical students at Memorial University. Simulations like these are a large part of medical education in Canada, and medical students quickly become adept at performing a variety of procedures on lifelike mannequins. But Whalen and Harty's experience was somewhat different. They performed the whole procedure on camera – in a helicopter simulator.

Whalen and Harty were filming a teaching scenario they went on to publish along with a team of doctors and researchers from Memorial University of Newfoundland's Faculty of Medicine and the Marine Institute [1]. The scenario describes a dramatic case: a boy is rushed to the Emergency Room after an accident on ice renders him unconscious. The boy appears to have a blood clot in his brain. His doctor phones a neurosurgeon, who recommends the patient be transferred to a tertiary care centre in St. John's via helicopter. En route, the doctor discovers a problem with the patient's airway. The helicopter must make an emergency landing so the doctor can fix the problem before continuing on to St. John's.

The case was based on a real-life scenario from a rural community in Newfoundland and Labrador (NL). The idea of rewriting a true story for the purposes of medical education is nothing new. Neither is using video, a medium whose authenticity and comprehensiveness make it an attractive teaching tool [2]. What is unusual about this case, according to Dr. Tia Renouf, Chair of Emergency Medicine at MUN's Faculty of Medicine, is that the scenario features rural doctors, who may see a much broader scope of medical cases than their urban counterparts (personal communication, October, 2015). They might be called upon to practice anything from anaesthesia to home care for the elderly. The farther away from a city a physician practices, the broader that scope becomes [3].

Scenario co-author Whalen, who completed a series of rural placements shortly after filming the video, feels drawn to rural medicine for precisely that reason. “You have to be a jack-of-all-trades,” Whalen explains. Ask him how his placements went, and his eyes sparkle as he describes the wide range of procedures he saw, such as laparoscopic hiatal hernia repairs, vasectomies and both simple and radical mastectomies. The vast numbers of learners who line up for bedside teaching in urban areas mean that it is unlikely a medical student would have the opportunity to observe all of these procedures (and more) on a single rotation.

Rural doctors face some obvious challenges. Though they see a wide range of health problems, they typically see each specific occurrence less often. This includes what is known as *high-stakes, low-frequency cases*, rare situations that rural doctors must manage expertly, regardless of how infrequently they occur. Many physicians feel inadequately prepared to deal with these kinds of cases in rural practice [4].

Simulation as a Solution

Medical education offers a solution to this: simulation. This immersive technique can be used to teach and learn a variety of skills, knowledge and attitudes [5], and is now a standard part of health professions education. Students practice on task trainers (simulated body parts), on high-fidelity simulators (computerized mannequins with lifelike heartbeats, breath and mannerisms) and on standardized patients (everyday people playing the role of patients) before entering real-life clinics to treat real-life patients. Simulation allow learners to practice high-stakes, low-frequency scenarios *before* they commence work in remote areas and provides a risk-free learning environment [6]. Simulation also facilitates continuing medical education (CME), allowing practising rural doctors to perform simulated versions of critical medical procedures in between real-life occurrences, so that, should one strike in real life, these doctors feel ready.

“There's nothing like being in a situation where something goes wrong to teach you what can go wrong. You never forget that”, explains Dr. Renouf (personal communication, January, 2016). The obvious advantage with simulation is that whatever goes wrong, does so in a safe learning environment that is risk-free to patients.

Transportation in Rural Healthcare

Dr. Mohamed Ravalia, a 30-year practitioner in Twillingate, NL, identified this particular story as an ideal teaching tool, because “[I]t outlines the potential hazards in transporting patients from a rural/remote site to a tertiary care centre, particularly when air transportation is used as the mode of transfer” (personal communication, September, 2015).

Some rural cases require sophisticated interventions that are unavailable in the immediate area; often transporting the patient to a larger tertiary care centre is the only option for managing the injury—and, sometimes, for saving the patient’s life.

But transportation itself is risky and complex. Unlike a hospital, where support and equipment is available, the team in the air is limited to the equipment, the personnel and the expertise they have brought on board. A rural doctor might have to perform, in a noisy jostling helicopter, a high-stakes/low-frequency procedure they have not performed on stable ground for years.

Thus, for the rural doctor, transportation and healthcare are closely entwined.

Dr. Renouf, who herself has many years’ experience with rural medical evacuations in Australia, Micronesia and the Canadian North—sometimes over 350 kilometres from the nearest tertiary care centre—feels that air transport should receive consistent curricular attention, particularly for learners who intend to practice in rural areas.

This is an educational opportunity for simulation. “Simulation offers the opportunity to practice these scenarios in a controlled environment and ensures that the nuances of medical transportation become second nature to physicians,” explains Whalen. Performing a medical procedure in a moving helicopter will not feel quite so daunting if the sensation of the helicopter itself feels familiar to the doctor – a familiarity that a simulator can help the doctor attain.

“We have an excellent medevac system in this province,” notes Dr. Ravalia, “and a dedicated flight team is accessible in most life threatening situations. Exposure and experience with medevacs in a more structured manner would certainly be beneficial to MD's and trainees in rural and remote settings.”

Dr. Adam Dubrowski, Academic Director of MUN’s Clinical Learning and Simulation Centre and a co-author of the case, refers to Specificity of Practice – a sports theory that also applies to education. Dr. Dubrowski explains:

“To become better at a particular skill, you must perform that skill in the environment in which it will be performed. The underpinning mechanism is that context drives action. In medical education, and in this case, teaching students how to intubate a patient in a simulated emergency room may be less than ideal if they have to perform the action in a rushed manner in a helicopter, as the context – that is, the instrument availability and placement, light condition, space, noise levels, et cetera) are fundamentally different” (personal communication, February, 2016).

There are obvious limits to just how much a medical professional can train. Medevac helicopters, like emergency rooms, are spaces prone to what Dr. Renouf calls the

“unpredictably unpredictable.” While one can never fully be prepared for everything that can possibly occur during a risky medical intervention, particularly one that involves transport (case in point: this scenario’s emergency landing), one can practice performing procedures in, for example, moving environments. In other words, the helicopter itself does not necessarily have to be a source of unpredictability.

Video as a bridge

Video can be helpful to depict simulated cases. Videos are “authentic and illustrative,” and present what de Lang et al. (2007) [2] refer to as a “comprehensive view” – allowing viewers to see not only the clinical side of things, but also the bigger-picture details, such as communication, in this particular case between doctors, helicopter pilot and air traffic control. Videos might also be more easily committed to memory [2]. Finally, Kozma (1991) [7] noted that video might provide students with mental representations of things they themselves have never experienced and connect them to real-life situations. For example, de Lang et al. (2007) [2] found that watching videos allowed students to better visualize medical conditions that they had not yet encountered in their training (or in real life). The team behind the helicopter-simulation scenario hopes that this scenario will, similarly, allow students to better visualize the medical transport process, as well as some of the potential complications that can arise in transit.

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