Medical Simulation: "See one, do one, teach one…just not on my Mom"

Part One: Why simulation should be a priority.

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Background

This manuscript is part-one of a three-part series on Medical Simulation. Part-one will address the "why" of Simulation, namely, why Medical Simulation offers novel opportunities to improve education, continuing-competency, and patient safety. Part-two will focus on the "how" of simulation, namely, how to design, implement, and maintain a viable program. Part-three will cover the "what", namely what the future directions are likely to be, what sort of programs are currently available, and what evidence supports their implementation.

Definitions

Our definition of "Medical Simulation" means any technique, "low-tech" or "high tech", that attempts to realistically recreate clinical situations and allow training with minimum patient risk. In this way it resembles the "war-games" of the military or "flight simulators" of aviation. Medical training has always involved graduated acceptance of decision-making and supervised practice. Equally, examinations have long included actors. As such, medical training has always incorporated a degree of simulation of real practice. What has changed is the explosion of available technology; the principles of adult education, the focus on patient safety, and the expectation of proof via research. Simulation is therefore a huge topic. We hope to offer a concise introduction.

"See one, do one, teach one"

Sometimes, we need to ask difficult questions: For example, ask a colleague how they learnt to intubate; learnt to manage a difficult airway; or learnt to "run a code". It becomes clear that competence is often gained through trial-and-error, and often by junior trainees caring for unstable sick patients with little supervision. Unfortunately, this means potentially exposing patients to a higher risk of adverse incidents than if all care were delivered by established experts. However, the "catch-22"[1] of medicine has always been that we can only create and maintain "experts" if they are given the chance to practice; the chance to make their own decisions; and ultimately the chance to make and rectify their own mistakes. In short, while appropriate supervision should always be available to mitigate risk, there was previously little choice but to rely upon the infamous "see-one, do-one, teach-one" approach.[2, 3] Medical Simulation offers a new way to educate, maintain

competence, and to supplement clinical experience, but without any risk to patients. Medical Simulation should also be of interest to clinicians, educators, licensing boards, and administrators-alike: In short, anyone concerned with optimal education, staff retention, and safe patient care.

Ability to become proficient with infrequently events with deadly consequence (simulation of Severe Acute Respiratory Syndrome (SARS). Photo: Dr. Peter Brindley/Dr Randy Wax

"Teaching the next generation"

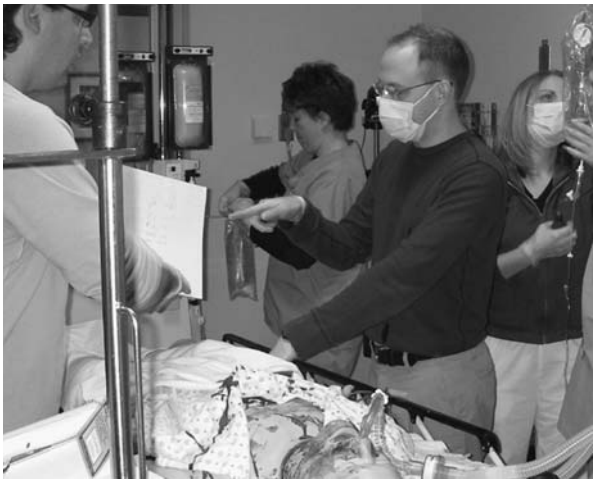
Health care workers cannot be created solely in the lecture-hall or library: ongoing realistic clinical experience is always going to be mandatory. While factual knowledge is certainly important, it is also not enough to produce the best medical practitioners or promote the best outcomes. As the famous Canadian Physician, William Osler stated: "He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all.".[4] Equally, penetrating wisdom is offered but by the less politically-correct musings of the American surgeon, who stated that you "can't learn surgery sitting on your ass"!![5]

Factual knowledge can be transmitted in the lecture hall, at the bedside, even in the coffee-room. Of note, it can also be taught using Medical Simulation (see below) and preliminary data also suggests that retention is better with Simulation than by passive or didactic methods.[6, 7] However, factual knowledge needs to be supplemented by procedural dexterity. Choices here are limited to real patients, task trainers and simulators. However, beyond knowledge and dexterity healthcare workers need to learn appropriate judgment, behavior and attitudes. These myriad latter skills cannot all be adequately addressed in a didactic setting. This is where Medical Simulation offers enormous opportunities. These essential skills include the ability to work in multidisciplinary teams, work under stress, make decisions with limited information, advocate for patients, know when to delegate, and know when to take control. In short, there is far more to good healthcare delivery than a "good memory" or "good hands", and far more to a good healthcare worker than performance on a written exam. Clinical Medicine will therefore always be one of the most challenging professions to aspire to, and medical training and useful continuing competency programs will always be some of the most complex to deliver. For all of these reasons, Simulation offers a chance for a truly comprehensive, and reassuringly practical, education.

"But what if it was your mother?"

The public is (appropriately) less tolerant of being cared for by the inexperienced or fatigued. The tradition of long hours to ensure adequate clinical experience is no longer deemed safe or acceptable.[8,9] However, trainees are not eager to endure further years of training to make up for the decreased clinical exposure, and the shortage of frontline staff means that nor are many supervisors eager to demand it. As such, we have to be "smarter" with the limited time we have for education. It is tough to argue against the practical nature of Simulation. For example, didactic education allows others to tell passive learners what they would do in a particular situation. Oral examination permits the examinee to discuss what they might theoretically wish to do. Only Simulation demands real-time demonstration of actual healthcare delivery.

Add to this that our society has high expectations, is less forgiving of bad outcomes, and is increasingly litigious. Combined, these factors could further dilute experience in direct patient care which might further decrease the competence of the next generation of



Simulated multidisciplinary resuscitation of apatient with a major gastointestinal bleed. Photo: Dr Jason Lord

healthcare workers. Social justice concerns also means that it is inappropriate to learn disproportionately on patients disadvantaged by illness, income or circumstance. When there was no alternative but to rely solely upon real patients, this was deeply regrettable but perhaps understandable. When simulators exist it becomes hard to justify. Equally if we apply that other medical maxim, namely, "what would you want for your Mother?" then each hospital without a Simulation program ought to ask why not. Nobody is asking for Simulation to wholly replace didactic education or actual clinical experience. However, it should be clear that Simulation offers an exciting opportunity to compensate for decreased clinical experience, and perhaps even decrease malpractice.[10]

Medical Error…oops, I did it again

Studies suggest that 98,000 Americans[11] and 23,000 Canadians[12] may die annually following medical errors. Although exact numbers are debated[13-16] few deny that errors greatly affect patient outcome and skyrocketing costs. Notably, experts emphasize that most errors results from systemic causes, and rarely from any lack of dedication or effort by healthcare workers.[17,18] This non-punitive philosophy is essential if we wish to find solutions and get away from an overly simplistic "name, blame, and shame" approach to medical error. As such, The Canadian National Steering Committee on Patient Safety has outlined that novel medical education initiatives are essential to decrease medical errors. Furthermore, they recommended "simulations of high risk health-care interventions".[16] In short, Simulation is likely to become an expectation, not a luxury. It is also likely to become a significant draw as the best trainees and graduates look for the best (and safest) places to train and work. Early adopters have the chance to lead this field. Laggards will be forced to catch up.

"Teaching beyond the facts"

Health systems represent some of the most complex institutions in society. In addition, inexperience, insufficient education, human fallibility and imperfect work environments mean that errors occur in all medical settings.[10, 14,-16] Unfortunately, with the acutely-ill, the need to make decisions quickly, under stress, and with limited information, can compound the likelihood of error precisely where consequences are most dire. A significant "care-gap" also exists in medicine, namely the difference between what we know and what we do, or between what we ought to do and what is actually done.[19]

In addition to system-wide challenges, at a more micro-level, Critical Care Medicine research from Canada has shown a lack of hands-on training in resuscitation and insufficient supervision of trainees during actual resuscitation.[20-23] When one considers that this is a selected group who have chosen a specialty for which resuscitation is central to practice, this is concerning. This presumably reflects that most training programs focus on topics that can be taught didactically. In contrast, Medical Simulation is ideally suited to teaching hands-on skills such as resuscitation.

Components of Crisis Resource Management Training:

- Anticipation and planning
- Communication strategies
- Leadership and assertiveness
- Use of all available resources (Both material and personnel)
- Distribution of workload
- Mobilization of help
- Frequent re-evaluation
- Challenge assumption
- Concurrent management of multiple problems

Reference: Gaba DM, Fish KJ, Howard SK: Crisis Management in Anesthesiology. New York. Churchill-Livingstone 1994.

Putative Benefits of Medical Simulation:

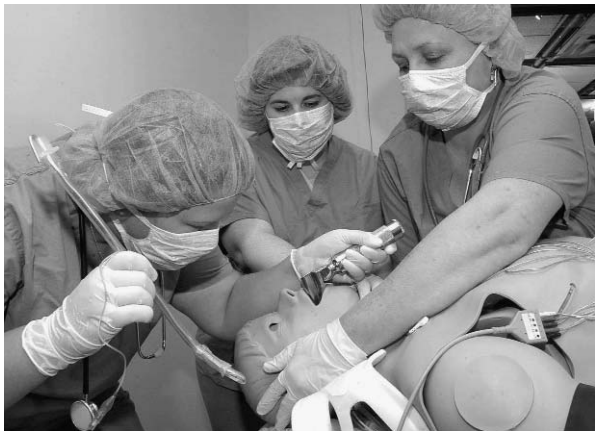
- No patient risk
- Practice real-time healthcare delivery
- Allows wide variety of scenarios (including high-risk, low-frequency diseases)
- Errors are allowed to be played out
- May repeat as often as required to achieve proficiency
- Recording of performance allows for objective assessment and feedback
- Educators can control material – rather than rely upon random clinical presentations.

It is widely accepted that medical errors, rather than being due to inadequate factual knowledge, more often result from poor communication, inadequate teamwork, and inexperience managing evolving medical crises.[13, 24-26] In medicine, this skill set is collectively referred to as 'crisis resource management' (CRM).[20-22] CRM includes strategies such as: how to recognize the sick patient; mobilize assistance; and act preemptively. It is based upon the principles of 'crew resource management' which are widely taught in the airline industry. Deficiencies in medical CRM have been identified as a major source of error, and affect practitioners at all levels of experience.[25-27] While medical CRM training is increasing,[27-30] most programs, with the exception of Anesthesiology, do not explicitly address it.[27-31] In addition, examinations typically focus on factual knowledge and curricula rarely include training in leadership, problem-solving, situational awareness, resource utilization or communication. In short, without Medical Simulation, medical CRM is unlikely to be widely taught or tested.

Barriers to teaching CRM have included the risk of learning on patients and the difficulty teaching realistic CRM in a didactic format. Medical Simulators now obviate this.[32, 33] Studies suggest that trainees perceive simulations to be highly realistic,[34, 35] and errors committed during simulations are similar to those of real practice.[35-39] Simulators can also permit repeated practice and immediate feedback. They also allow us to train in the same multidisciplinary teams that deliver the actual care. In contrast, lecture-based education is usually delivered separately to the different medical professions. Furthermore, Medical Simulation facilitates training in rare conditions that demand proficiency but do not occur frequently enough to allow regular training. Examples include the surgical airway, mass casualty, bioterrorism, even avian flu.[40]

"Would you want to fly with an airline that didn't do flight simulation?"

Simulation training and CRM are not unique to medicine. Indeed, most CRM research is from aviation, aerospace and nuclear power.[28, 30, 35] As with medicine, errors in these professions carry disastrous consequences. Unlike medicine, these professions readily adopted simulation. They also insist on regular practice as a function of continued employment. As such, ongoing Simulation experience should really be mandated for all healthcare workers, not just trainees. Highly realistic flight simulators, replicating the complex environment of a plane, have become a standard method of training professional pilots long before they enter the cockpit.[3] This must surely be a comfort as we taxi down the runway as passengers ourselves. It is difficult to justify why our families and patients are not afforded the same concern when they enter high-risk environments such as the modern hospital. It has been remarked that the most dangerous part of a pilot's day is now the drive to the airport: sadly the same can't be said for patients.



Practicing intubation without patient risk.

Licensing boards, such as the Royal College of Physicians and Surgeons of Canada, have now decreed that medical graduates become not just factual experts, but also proficient communicators, collaborators and advocators.[31] These laudable goals, summarized by the CanMeds objectives, are difficult to capture with traditional education. This goals overlap closely with the principles of CRM. Yet again, Simulation has been identified as a key way forward.[42]

"Adult Educational 101"

The contrast between traditional decision making (TDM) methods and naturalistic decision making (NDM) highlights one of the key benefits of Simulation.[43] Traditional decision making methods are well suited for "artificial well-structured problems" in which there are "individual decision makers acting alone" with "no true consequences for decision makers".[43] Questions posed in textbooks are a prime example of TDM. In contrast, consider the multiple decisions when trying to manage a difficult airway, coupled with time pressures and limited resources. Knowing the standard "textbook" management of a difficult airway situation does not necessarily translate into being able to perform at the patient's bedside. In contrast, NDM is better characterized as decision making under conditions involving "ill-struc-

tured problems" in "uncertain changing environments" which are "high stakes".[43] Ironically, healthcare workers are usually trained in TDM methods, yet required to deliver care by NDM methods. Optimal simulation attempts to recreate an environment which forces learners to use NDM.

Simulation training encourages "experiential learning".[2] This involves having "an experience ('concrete experience'), followed by reflection ('reflective observation')" which is then "assimilated into a theory ('abstract conceptualization'), and finally, hypotheses are tested in new situations ('active experimentation').[2] In short, just because you can absorb facts within the controlled confines of a classroom does not mean you can apply them in the clatter of an Intensive Care Unit or Emergency Room.

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Calendar of Events

October 12, 2007
American Society of Critical Care Anesthesiologists 20th Annual Meeting
San Francisco, CA
http://ascca.org/

October 1 -1 3, 2007
5th National Conference on Tobacco or Health
Edmonton, AB
www.ncth.ca/index.html

October 7 – 10, 2007
Coronary Artery Disease, 7th International Congress
Venice, Italy
http://www.kenes.com/cad7

October 11 – 14, 2007
European Committee for Treatment & Research in Multiple Sclerosis, 23rd Congress
Prague, Czech Republic
http://www.akm.ch/ectrims2007

October 12 – 14, 2007
Medifest '07, Second Complete International Medical, Pharmaceutical, Healthcare and Hospital Equipment Trade Fair
New Delhi India
www.vanatgemedifest.com

October 13 – 17, 2007
American Society of Anesthesiologists, 2007 Annual Meeting
San Francisco, CA
http://www.asahq.org/

October 14 – 17, 2007
Canadian Association of Paediatric Health Centres, 2007 Annual Meeting
Montreal, Canada
http://www.siicsalud.com/scripts/congresos.php/cc025795

October 18 – 20, 2007
3rd International Baltic Congress of Anaesthesiology and Intensive Care
Vilnius, Lithuania
www.anestez2007.com

October 18 – 22, 2007
19th International Congress of Pediatrics
Tehran, Iran
ped.tums.ac.ir/congress_home.aspx

October 20 – 24, 2007
Canadian Cardiovascular Society, 60th Annual Scientific Sessions & Exhibition
Quebec, Canada
http://www.siicsalud.com/scripts/congresos.php/cc008123

October 20 - 25, 2007
Chest 2007
Chicago Il
http://www.chestnet.org/CHEST/program/index.php