

MEDICAL SIMULATION: MORAL AND ETHICAL ISSUES

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Medical simulation is now widespread as an integral part of medical education. Simulation begins with an important moral claim: we must do the best we can to keep patients safe while training the next generation of clinicians and retraining current clinicians so that they are kept up-to-date. As a powerful teaching tool, simulation allows practicing communication, decision-making, practical skills and leadership as well as evaluation which can be standardized and poses no risk to patients associated with experiential learning conducted in the actual clinical setting. It is also the fact that simulation raises ethical questions of its own. That training is not simply technical. It is also a way to learn and practice dealing with the emotional challenges of real-life ethical situations. Simulation also provides a safe zone for students to make practical skills and communication mistakes and to develop moral imagination. Despite the growing acceptance of clinical simulation to enhance quality and safety in medical education, the question of whether students actually acquire and transfer the ethical principles that takes place in a simulation setting is unknown.

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Background

Medical simulation is a widely used method for practicing communication, decision-making, practical skills and leadership (1) in an effort to increase patient safety (2). The three most important imperatives in simulation are: the safety of patients, students and faculty members; preventing errors, and enabling engaged learning. Many ethical issues encountered in everyday practice can be seen in simulation as well. Clinicians who have already challenged many problems and have more "experience" with mannequins make fewer mistakes while treating real patients. Ethics is not an add-on to simulation; it is an integral

part of simulation and it is learned during simulation. Simulation begins with an important moral claim: we must do the best we can to keep patients safe while training the next generation of clinicians and retraining current clinicians so that they are kept up-to-date (3) and able to implement current medical guidelines.

In practice, guidelines are based on propositional knowledge (fictive/declarative) derived from the best available domain-specific evidence and on the domain expert consensus on the current best practices. Whether designed for individual professionals or for health delivery systems, the guidelines regularly lack information regarding how they will be adequately implemented so they may be indeed necessary but not sufficient for providing good outcomes, given their strategic incompleteness. Their effectiveness on the ground depends first on the quality of their actual propositional content knowledge and second, on how it is implemented ("know-how") (4-7). However, the regular absence of implementation knowledge in the formation of guidelines also lacks moral justification, in addition to epistemic justification (8). Every implementation process involves learning curve period, as the implementers and end users figure out how to translate guidelines into practice and apply the new system in everyday clinical practice. It is the medical simulations that provide gaining critical knowledge for supporting ethical controls to guideline implementation, adding a much needed epistemic and ethical grounding for minimizing harms to every learning cycle.

Simulation-based medical education (SBME) is increasingly recommended, as an educational strategy and for improving patient safety. SBME has largely been conducted in an off-site simulation (OSS) setting in simulation centers, which range widely from publically financed simulation centers at hospitals and universities to simulation centers that are detached facilities funded by sponsors and user payment. Some hospital departments also provide OSS as in-house training room(s) specifically set up for simulation training away from the clinical setting but within the hospital department (9).

Why is medical simulation so important for teaching?

Overall, SBME is a complex educational intervention. SBME was defined by Issenberg et al. (10) as: "In broad, simple terms, a simulation is a person, device, or set of conditions which attempts to present education and evaluation problems authentically. The student or trainee is required to respond to the problems as he or she would under natural circumstances". Simulation techniques and devices can comprise, for example high-tech virtual reality simulators, full-scale mannequins, plastic models, instructed or standardized patients, animal or animal products, human cadavers, or screen-based simulators.

In a typical setting, a teacher designs a simulation-based clinical scenario using various teaching tools such as manikins, task trainers, standardized patients (SPs), or role-play by staff or students. Students then participate, with facilitator guidance, by demonstrating the key integrated skills, tasks, and decision-making according to predetermined objectives. Following the simulation experience, a structured faculty-facilitated debriefing and discussion are conducted in order to highlight the most important part of the lesson and to allow maximal long-lasting learning through reflection. Debriefing is important because it emphasizes the educational principles and objectives, and identifies gaps in a learner's knowledge or skill. Simulation is a powerful teaching tool (11).

What makes simulation so unique is that no patient is at any risk associated with experimental learning conducted in the actual clinical setting (12). Also, simulation makes a bridge between didactic and observational learning to clinical practice. It allows deliberate practice and learning experience by repetition prior to or in parallel with traditional one besides training (13). Also, it enables learners to develop skills such as communication competence and other non-technical skills (14).

Teamwork has become a major focus in healthcare. Teamwork can be defined as the ability of team members to work together, communicate effectively, anticipate and meet one another's demands, and inspire confidence resulting in a coordinated collective action (15). The teamwork is required for effective patient management because of the increased specialization of tasks, the increased complexity

and risks associated with treatment options, and the need to ensure appropriate healthcare outcomes and patient safety (16).

Based on the classic Bloom's taxonomy of learning objectives (17), simulation-based inductive learning promotes learning at the highest levels of all three objectives including cognitive (analyze + synthesis + evaluation), affective (organizing + characterizing) and psychomotor (adaptation + origination) abilities.

Kwanet al. (18) determined the effectiveness of simulation in improving student confidence in acute coronary syndrome (ACS) and the Advanced Cardiac Life Support (ACLS) curriculum. Secondary goal of their study included examining student perceptions of the role of simulation in medical education. Third-year medical students enrolled in the internal medicine clerkship between January and June 2014 attended a simulation course during their ambulatory block. Following a 2-hour session, participants completed a 17-item questionnaire. Students reported improvements in their ability to identify and manage ACS and ACLS before and after the simulation course: 93% felt that simulation boosted their self-confidence in performing these tasks on a real patient; 86% reported receiving useful feedback during the training sessions; 98% agreed that their experience was enjoyable; and 95% would recommend this course to other students.

Wayne et al. (19) assessed baseline proficiency in ACLS among internal medicine residents and determined that performance improved significantly after simulator training.

Ojha et al. (7) conducted an online search of original and review articles related to simulation and pediatric medical education and provided an overview of the role and utility of simulation in pediatrics that included 147 studies, and concluded that simulation had tremendous potential as a teaching and assessment tool for pediatric acute care providers.

The research evidence is clear that high-fidelity medical simulations facilitate learning among trainees when used under the right conditions (10). Several important features and aspects of simulation-based learning that will lead to effective learning are summarized in Table 1. McGaghie et al. (20) identified and discussed 12 features and best practices of SBME that medical educators should know and use. The first five are named in Issenberg's review (10) followed by the seven that are evident from later researches and practice (Table 2).

Simulation-based medical training is an "ethical imperative"

An ethical imperative has been presented for using simulation to train health care professionals. Simulation leads to better-educated students who developed a more humanistic care towards patients. Every year, millions of people die or get seriously injured due to errors in health practices. Therefore, it is crucial that safe care is enabled and medical errors

Table 1. Features and uses of high-fidelity simulators that lead to effective learning (10)

Important features and aspects of simulators
Feedback is provided during the learning experience
Learners engage in repetitive practice
Simulation is integrated into the overall curriculum
Learners practice with increasing levels of difficulty
Adaptable to multiple learning strategies
Clinical variation
Controlled environment
Individualized learning (in addition to team)
Outcomes / benchmarks clearly defined
Validity of simulator

Table 2. Medical simulation and gaps in understanding (adapted from McGaghie et al. (20))

Simulation features	Gaps in understanding
Feedback	What model of feedback?
Deliberate practice	Verify value of distributed practice versus massed practice
Curriculum integration	How and when to best integrate with other modalities?
Outcome measurement	Narrow bandwidth versus complex professional practise
Simulation fidelity	How does trainee readiness shape simulation use?
Skill acquisition and maintenance	What are the mechanisms of skill maintenance?
Mastery learning	What are the sources of variation in time to mastery standard: cognitive aptitude, motor skill, professional experience?
Transfer to practice	Pathway: simulation laboratory - health care
Team training	Team skill maintenance
High-stakes testing	Creation of test mechanisms (for crisis management e.g. resuscitation)
Instructor training	Should simulation instructors be certified for various devices?
Educational and professional context	How to break down barriers and overcome inertia?

are minimized in clinical practices and rapid response is given to changing health conditions. Ziv et al. (12) discuss that training in simulated contexts before practitioners interacting directly with patients should be mandatory for ethical clinical care. Simulation activities need to ensure patient safety without danger of harming the patient during the learning process. Hence, students would be allowed to perform medical procedures on actual patients after acquiring knowledge and skills in various simulated clinical scenarios. Simulation scenario is critical in the preparation of students and clinicians prior to the first actual patient experience including collaboration through team training, interprofessional, critical thinking, and independent decision-making skills (21, 22). Simulation scenarios also help young doc-

tors and specialists in refining advanced techniques. The vital component in these scenarios is the pre-briefing and debriefing. Especially, effective feedback and debriefing after the simulation can provide the opportunity to learn about ethical knowledge gaps (23). In other words, simulation training also assists in the determination of ethical problems that relate to principles of autonomy, beneficence, justice, informed consent, non-maleficence, fairness, truthfulness, advocacy, and dedication.

For sure, simulations can be stressful to students. They may experience both physiological and psychological stress while thinking how to perform a simulation and how to address a virtual patient. Also, they do not feel comfortable being videotaped and they feel anticipatory anxiety by thinking about

the feedback from the faculty. A key part of learning is the debriefing session. It is also a skill that needs to be exercised during every simulation. It is not something that should be taken easily and happening only if there is time before the next scheduled task. Facilities where simulation is performed must be safe places, where students can both learn and make mistakes. Even some level of stress is good, highlighting the awareness of the situation. In that way, an impact on students is made i.e. in a real-life situation they will act more effectively and efficiently. At the same time students should not be placed in situations where the level of stress is too high, because it may affect their cognitive abilities (3).

Many hospitals and medical schools have begun using high-fidelity simulation medicine in their educational curriculum. Despite the growing popularity of clinical simulation to improve quality and safety in healthcare education, the question of whether students actually transfer the ethical values that takes place in a simulation setting is unknown.

How to teach ethics using simulation?

Teaching ethics and using simulation share a common obstacle which is lack of faculty resources (24). There is a clear distinction between teaching clinical content and medical ethics. Ethical principles are based on many factors like social science, medical science, religion, law, economy, culture, language, and more. Many different ethical considerations are more difficult to teach than any medical issue. This renders facilitation of simulation scenarios designed to teach medical ethics more complicated and difficult than topics with a limited focus. It may be a reason why many medical students may feel under-

prepared to deal with the emotional challenges of real-life ethical situations.

Simulation also provides a safe zone for students to make communication mistakes (14) and to develop a moral imagination. The moral imagination is necessary because it represents a capability to feel empathy with others, thus making right ethical decisions. Unfortunately, during medical education clinicians receive little or no training in dealing with death, dying and end of life issues. The biggest and only concern about allowing the mannequin to die is the psychological safety of the students. Prior to implementing a scenario where a simulating patient must die, discussion must be made among the members of the simulation team.

Conclusion

At the end of their education, medical students are expected to be able to transfer their experiences from this education process to real life and to find a solution more easily for problems encountered in the everyday clinical practice. Many various scenarios fictionalized in simulation education bring along useful ethical approaches.

Invaluable importance of simulation is that students get a personal experience by this method while having the opportunity to share it with others. Great asset of simulation as a supporting learning is the feedbacks of the teachers. It is up to educators who must provide evidence-based strategies to enrich the students' clinical judgment. It is indicated that high-fidelity manikin-based simulation contributes not only to the development of the students' skills and medical knowledge, but also supports achieving communication, leadership and team collaboration.

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Medicinska simulacija je danas široko rasprostranjena kao deo medicinske edukacije. Osnove simulacije temelje se na važnom moralnom principu: moramo da učinimo sve što možemo kako bi sačuvali bezbednost bolesnika, kako tokom obuke budućih generacija lekara tako i tokom sticanja novih znanja i veština lekara brojnih specijalnosti. Kao izuzetno korisno sredstvo učenja, simulacija omogućava vežbanje komunikacije, donošenje odluka, praktičnih veština i rukovođenja, uz mogućnost analize i procene uspešnosti u standardizovanim uslovima bez rizika po zdravlje bolesnika - što nije odlika učenja zasnovanog na iskustvu koje se dobija u kliničkom okruženju. Činjenica je, takođe, da simulacija sama po sebi nosi brojna etička pitanja proistekla iz toga što ova vrsta vežbi nije samo tehničke prirode, već istovremeno predstavlja i učenje prihvatanja emocionalnih izazova sa kojima se susreće u realnim okolnostima. Simulacija istovremeno obezbeđuje zonu sigurnosti u okviru koje je studentima omogućeno da greše u izvođenju praktičnih veština i komunikaciji, kao i da razviju moralnu imaginaciju. Uprkos rastućem prihvatanju kliničke simulacije, kako bi se poboljšao kvalitet i bezbednost medicinske edukacije, ostaje otvoreno pitanje u kojoj meri studenti zaista primenjuju etičke principe koje su usvojili tokom vežbanja simulacionih scenarija.

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