

Simulation in critical care

The Editor,

“I hear, I forget; I see, I remember, I do, I understand.” Apt for a novel educational tool: The “SIMULATOR.”

Yet another thing inspired from aviation industry in anesthesia is “simulators.” Simulation is several decade-old technique, now being frequently used for patient care worldwide. Simulation is a scenario that closely mimics clinical situations. The aim of simulation is to teach the application of knowledge and skills. Medical simulation can be broadly divided into two types as follows:

1. Team simulation – where situational awareness, human interaction, and cognitive improvement are the priority
2. Technical simulation – where safe repetitive practice of an individual technical skill is the focus.

Simulation has evolved from low fidelity to high fidelity models that mimic human responses in a realistic manner, extremely life-like mannequin that breathes, generates E.K.G, and has pulses, heart sounds, and an airway that can be programmed for different degrees of obstruction. Simulation in anesthesiology is no longer a research topic, but an integral part of resident education.^[1]

Apart from preparing a newcomer to face acute clinical setting and be prepared for unforeseen complications, it also imparts efficiency, capability to eliminate errors, orientation to new procedures, perfection in skill, teaches team work, mutual respect, communication skills, situation awareness, leadership quality, division of work, resource management, decision making, assessment of response time, and faster and better patient management. Recorded events make individual performance assessment and feedback. It proves to be an excellent mode of teaching irrespective of whether it is intraoperative, critical care, or an emergency situation, wherein complex skills and

practical knowledge are needed. It even acts as a method of testing and formulating guidelines. It is another initiative by anesthesiologists for patient safety.

Decision making in a situation, wherein time is limited, is always under pressure and liable to being erroneous. Sometimes, in the presence of limited knowledge and resources, a team with varied opinion can grossly affect patient outcome.^[2]

Simulation in cardiac critical care is quintessential for reasons that cardiac monitoring devices and equipment are complex and skillful, for example, insertion of a central venous catheter, pulmonary artery catheter, arterial cannulation, IABP insertion, putting a patient on ECMO, transesophageal echocardiography (TEE), etc.

In a study by Prat *et al.*,^[3] they revealed that the addition of virtual reality simulator sessions to a standardized 6-month curriculum improves the learning curve for the Intensive Care Unit (ICU) TEE hemodynamic assessment. The use of the simulator especially reduced the number of TEE examinations required to achieve competency by improving acquisition of practical and technical skills.

Echocardiography learning has evolved from learning from books, cardiology echocardiography lab rotations, theoretical and practical courses, and online echocardiography learning to echocardiography simulators. Technical and manual skills can be improved with the use of high-fidelity probes and mannequins; a wide range of artifacts and pathological conditions can be taught; most importantly, echocardiographic anatomy and imaging planes can be related to topographical anatomy.^[4]

A study by Liu *et al.*^[5] suggests that simulator-based VRSim TEE training is more effective in training anesthetic residents in understanding TEE imaging and manipulation of the TEE probe compared to the web-based TEE modules alone.

Despite the rapid increase of point-of-care ultrasound and echocardiography use in the ICU and the recognition by critical care fellowship programs for the need of formal training programs, standardized education does not exist. Even though competency requirements for image acquisition and interpretation have been outlined both for ultrasonography and echocardiography, there remains no consensus on how the education, training, and evaluation of these competencies should be achieved.^[6] Development of courses based on the published guidelines for the standardization of training among critical care fellows as described by Dinh *et al.*^[6] with the help of simulators not only in ultrasonography and echocardiography but also in various clinical scenarios of cardiac critical care can serve as a very useful educational tool. Utilizing tools such as written tests to assess basic knowledge, live models to teach practical skills, and ultrasound simulators to teach pathological image identification can help standardize critical care ultrasound training.^[6-8]

Evidence supports long-term retention of skills learned by simulation training.^[5] Addition of simulation to postgraduate curricula and fellowship programs will enhance and accelerate the theoretical and the practical components that produce competency.^[4]

Apart from the several advantages of simulation enumerated above, one must not forget the fact that biology is the science of exceptions, and the situation faced in real life can be quite different than that practiced on high-fidelity mannequin. Another disadvantage of simulation is the associated cost.

Evidence is lacking whether the use of simulators is associated with better patient outcome on long-term follow-up. In addition, research is needed as to define clinical scenarios where simulation-based teaching is actually needed above didactic methods, which simulator to be used for each scenario-skill based or clinical scenario and finally what method to practice. In particular context to cardiac critical care, emphasis should be on both skill as well as clinical scenario-based simulation. In ICU, one needs to be skillful enough in arterial as well as venous cannulation; simultaneously knowing how to manage a given situation involving various team members such as surgery resident, nurses, and fellow colleagues. The need of the hour is to define the standards of simulation in all aspects of cardiac critical care.

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