Simulation: Is it the Future of Training in Critical Care Medicine?

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"Knowing is not enough; we must apply. Willing is not enough; we must do."

–Johann Wolfgang von Goethe

Knowledge (a noun) means facts, information, and skills acquired through experience or education, the theoretical or practical understanding of a subject. Anderson and Krathwohl divided knowledge into four categories and cognitive processes into six dimensions (Table 1).[1]

In this issue of *Indian Journal of Critical Care Medicine*, Suseel et al. report the findings of their pilot study of imparting adult cardiopulmonary resuscitation skills to the first-year medical students.[2] In this study we are discussing imparting procedural knowledge. The 33 students who consented to participate in the study were divided into three groups who were then taught CPR skills using one of the following methods: didactic lectures or animation-based videos or simulation. Following the training, the post tests showed a significant and similar improvement in all three groups. However, the third group did much better in the skills test (mean score 9.3 ± 0.98 out of possible 10 marks) as compared to the other two groups (mean scores 4.3 ± 1.15 and 4.0 ± 1.48 out of possible 10).

Simulation-based medical education is an educational activity that uses variety of aids to mimic the clinical situations. Depending on the quality of simulator (and of course cost of simulator), these can be very lifelike. Simulation has been used for a long time in other high-risk professions such as aviation. Medical simulation allows the students to gain and hone their skills in various clinical scenarios. A trainee can make mistakes during simulation, get feedback from the trainers, by watching the video of the scenario recorded during the session (called debriefing), and most importantly acquire skills without being scared about causing harm to the patient.[3]

Apart from the high fidelity, lifelike dummies which can speak and interact with the participant, non-machine-based simulation can also be used to improve clinical skills. One of the most important areas of critical care practice is communication with the patient and family. Ferretti et al. recently described how debriefing feedback in the middle of simulation can make trainees realize their mistakes and use these mistakes as opportunities to correct them.[4]

Simulation can also help in quality improvement. The literature abounds with simulation being helpful in improving processes of care in a variety of situations such as trauma,[5] improving door to needle time in acute stroke patients.[6] There are also reports about improvement in outcomes after resuscitation.[7]

The pros and cons have recently been discussed nicely by Krishnan et al.[8] I think the most important points they make are supposedly the strongest points in favor of simulation. The person undertaking simulation training has two behavioral aspects, which are different from the real-life situation: the participant is expecting something to happen and he or she is therefore over-alert (which is abnormal) and there is no real fear as it is known that the patient cannot be harmed (as there is no patient). It is difficult to decide how to overcome these two very important problems. The authors discuss various other issues, which though relevant, can be overcome in some way or the other, such as no simulation being totally life-like, defective learning due to poor simulation, cost and time factors and technical difficulties.

All said and done, simulation is a good way to impart knowledge and in particular technical skills and is here to stay. When imparting medical education, in particular, a skill set such as CPR or insertion of lines or pacemakers, simulation is the best way.[9] We should look for opportunities to integrate simulation in more areas of medical education and in advanced training particularly before incorporating new devices and technology in clinical practice, which will allow us to spare the patients from unknown and unperceived dangers.

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Table 1: Knowledge and cognitive dimensions of bloom's taxonomy as revised by Anderson and Krathwohl[1]

Knowledge categories	*The cognitive process dimension*					
	Remember	*Understand*	*Apply*	*Analyze*	*Evaluate*	*Create*
Factual	List	Summarize	Classify	Order	Rank	Compile
Conceptual	Describe	Interpret	Experiment	Explain	Assess	Plan
Procedural	Tabulate	Predict	Calculate	Differentiate	Conclude	Compose
Metacognitive	Appropriate use	Execute	Construct	Achieve	Action	Actualize

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