Role of Technology in education: SimMan Teaching in medical education

“Simulation is defined as, the process of designing a model of a real system and conducting experiments with this model for purpose either of understanding the behaviour of the system or of evaluating various strategies for the operation of the system”

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Introduction:
Since General Medical Council’s document on Tomorrow’s Doctors (GMC 2003), there is a change in the teaching and training of medical graduates with more emphasis on teaching clinical and technical skills to prepare junior doctors in order to provide high standard healthcare to the patients.

Simulation technology is being increasingly used in medical education to safeguard patients’ safety and to avoid subsequent complications. In addition, increasing number of students in medical schools and reduced number of in-patient hospital stay had an impact on teaching technical/clinical skills to undergraduates or junior doctors in training. Gaba (2007) describes simulation as a technique, which may be used “to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner”. Currently, there are various types of simulators are available for teaching practical or clinical skills which include low fidelity mannequins, SimMan, computer based simulators, virtual reality simulators, and high fidelity mannequins.

During my previous job as a teaching fellow, I had an opportunity to teach foundation year trainee doctors (FYT) using SimMan. Details of SimMan is explained below.

What is patient simulation:
Technology of medical simulation has been inherited from airline industry. Early flight simulators are designed to train the pilots in short versions of a real plane. As they progress in training, more sophisticated and challenging scenarios are used to deal with any crisis at a later period.

This model of training is adapted into medical education as an adjunctive to traditional teaching and training the clinical & communication skills etc... Though medical simulators aim to be as “real” as possible, there are few deficiencies like lack of tactile feedback and patients temperature which makes them to be less realistic.

Environment:
Providing adequate environment to the students is necessary. Equipment and facilities provided in the simulation room is crucial as studies have proven that high fidelity simulators are more reliable and efficient (Sleeper,2008). Current high fidelity simulators provide near real patient simulation which is useful to run rare and complex scenarios. Apart from the equipment, a dedicated simulator room with adequate space and provision for audio-video equipment is essential.

From students perspective, the case study should be designed at the right pitch keeping in mind the learning objectives of the session.

How does SimMan work:
SimMan is a full body, adult mannequin that allows the simulation of Basic and advanced teaching skills and Assessment to develop both individual and team skills. The unique feature of SimMan compared to task trainer is that, the simulator can respond to student user. The mannequin will have two input devices, one for power and the other from the computer.

The simulator allows observation and recognition of most vital signs used in emergency medicine either directly on the mannequin itself or on the included simulated Patient Monitor. These features will support the students’ competence and the ability to reach the correct diagnosis based on active observation as opposed to being prompted by instructor cues.

3) SimMan. http://www.youtube.com/watch?v=dS5HeOdBPyo
The current simulators are versatile and sophisticated and incorporate responsive eyes, anatomic airways, patient voices, arm movements, heart and breath sounds. The mannequin's internal components can interface with different computers and electronic equipment connected like patient monitor or an ECG machine. The SimMan is operated through a Software (SW) which runs on a PC. The Interaction with the SW is done through a Graphical User Interface (GUI) where the various vital signs parameters are changed directly or through pre-programmed scenarios. The SW also allows automatic and manual logging of scenario events as well as video capture. The events logged during a scenario can be shown in a debrief viewer together with video capture. The log is synchronized with the video capture (Laerdal.com).

**Patient Scenarios:**

A case scenario includes number of tasks over a period of time. In other words, there should be a “start” and “finish” time for the interaction between the simulator and the students. Number of tasks performed within a scenario is dependent on the learning objectives and goals of the session. A simple scenario like cardiac arrest can be stretched further by adding, respiratory arrest, cannulation, drug interactions etc. to incorporate the learning needs of students. On the other hand, it can be cumbersome and time consuming if the scenario is not properly planned and improper use of resources.

The picture below is a scenario where a young patient had met with a road traffic accident where a truck ran over his chest. This scenario is complex as it involves management of airway, cervical spine immobilsation and dealing with the chest injury. This scene can be devided into parts as per the target groups needs.

**Discussion:**

I had an opportunity to use this technology (SimMan) when I was a teaching fellow (2008-2009). The target group were foundation doctors. With my background experience in General Surgery, few surgical scenarios were designed and fed to the computer. It involved clinical skills like catheterisation, cannulation, control of haemorrhage. In addition, effective communication skills, team working, team leader role, problem solving and logical thinking were also assessed.

The scenario was fed to the computer which is synchronised to the mannequin. The students were into two groups of 4 each, one group being in active role and the other as observer. Instructions were given to both groups about the scenario and adjuncts like blood results, ECG, chest x-ray and blood gas results were provided where necessary. Using the computer the clinical parameters were changed as the scenario progressed. The changes in clinical parameters in the computer is reflected on mannequin by raise of chest wall, stoppage breathing, heart rate, increase or decrease in blood pressure etc.. The students are expected to react to the change in the scenario, think logically to manage the change in patient’s condition. The exercise is recorded on video, which is used to debrief at the end (note: my experience was in 2008-2009, hence video couldn’t be provided to support this). A sample video can be watched by clicking the following link from Nursing department at Fitchburg University (http://www.youtube.com/watch?v=T7SJuKHE_7E).

In conclusion, technology has a major role in medical education. This is especially valid in teaching clinical skills, interventions on patients which can be lethal when training on real patients, avoidable by using simulators.

http://www.laerdal.com/files/software/SimMan