Mannequin-simulation methods for teaching of postgraduates skill lab training

Dr. Sandhya Gujar, Dr. Pradnya Jagtap, Dr. Shirish Chavan

Professor and H.O.D. Dept. of Anaesthesiology, ESIPGIMSR Andheri Mumbai, Assist. Professor Dept of Anaesthesiology ESIPGIMSR Andheri Mumbai, Associate Professor Dept of Anaesthesiology ESIPGIMSR Andheri Mumbai

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ABSTRACT

Clinical skills on simplest levels are psychomotor skills, learned via reinforcement and require straightforward simple instruction. Clinical skills are easier to master because students tend to remember 90% of what they do and only 10% of what they read. As medical field is advancing fast it is very difficult for teacher to stay current in curriculum. Patients are becoming more concerned day by day that student and residents are practicing on them and at the same time because of medico-legal issues students feel that they are not allowed adequate hands on practice for clinical skills like history taking, physical examination, diagnosis and management of patient. As medical educators, we have tremendous responsibility to our students, patients and society as a whole. We must help our students to develop ability to manage complications, rare events which occur in medical fields. Simulation is tremendous tool as it allows our students to achieve their goals with out our patients being put at risk. Simulation based training has showed improvement in mainly two areas such as laparoscopic training and advanced cardiac life support protocol simulation, based than those who received standard training of cardiac arrest treatment. In our institute, skill laboratory with mannequin being available, we have conducted study of training for intubation by direct laryngoscopy as a part of basic life support which is important factor in saving lives of patients. All residents from various fields such as anaesthesiology and surgery, gynaecology and obstetrics, pathology and microbiology and medicine were included in study. Charts of basic life support and direct laryngoscopy pictures were displayed. Small instructive power point presentation was made on basic life support protocols and video showing direct laryngoscopy for intubation was used as a part of training programme. Students were given repeated attempts for face mask ventilation and endotracheal intubation and ease of intubation was assessed after repeated attempts. For anaesthesiology students, senior anaesthesiologists were asked about performance of students in OT after training on mannequin which showed definite improvement in quality of skills of students and students rated that their experience of laryngoscopy was much easier and took less time. It is likely that role of simulation will only grow in the field of anaesthesiology, in which rare events and resource management training is so essential and so crucial.

Introduction

Simulator training, as defined by Dr David Gaba (1), is an instructional process that substitutes real patient encounters with artificial models, live actors or virtual reality patients.

The most important aim of simulation is to replicate patient, a case scenario in a realistic environment. For post graduate and undergraduate students simulation training helps because learning abilities can be made predictable, consistent, standardised, safe and reproducible. This allows students to learn, rewind, rehearse and practice without negative patient outcome.

We have conducted extensive literature search through Medline and Pubmed to review evidence for utility of simulation in medical education and in anaesthesiology for study of endotracheal intubation.
Argument whether simulation will help in improving performance in clinical medicine, two studies have been carried out with anaesthesia residents and medicine residents and twelve unique simulated intraoperative emergencies were able to distinguish the junior trainee from more experienced anaesthesiologist. (2)

Anaesthesiologist Dr David Gaba of Stanford Medical School has started studies on anaesthesia simulation since 1980.

In anaesthesiology learning treatment of rare events is often sporadic. In an emergency situation little training takes place and legal consensus often prevents debriefing and discussion among colleagues. Simulation enables learners to witness such events in a safe environment and creates learning opportunities .

Because of increased patient awareness and medical litigation had made it more important to start simulation based training of graduate and postgraduate medical students so American Board of Anaesthesiology now requires simulation based education to fulfill maintenance of certificate in anaesthesia. (3)

Israeli board of anaesthesiology examination committee had made it crucial element in certification of anaesthesiologist. (4)

The ultimate goal in medical education is expertise or mastery of one's trade.

(a) Deliberate practice is an educational technique used to produce expert performances. (b) Repeated simple instructions are used to make student understand procedure easily and remember it for a longer period.

Aim

Main purpose of our study was to teach and make students practice endotracheal intubation out of OR setting i.e. on high fidelity mannequin simulators. Face mask ventilation is very important part of basic life support protocol. And endotracheal intubation is mainstay in providing general anaesthesia. Many health care providers and residents working in various fields require having knowledge and technical expertise for endotracheal intubation.

Several studies have shown improved survival with proper face mask ventilation and endotracheal intubation in cardiac arrest. Unsuccessful endotracheal intubation has been associated with worst patient outcome with mortality rate of almost 56%, because of oesophageal intubation.

Material and methods

30 postgraduate residents were included in training programme of airway management with endotracheal intubation. Residents from various fields like anaesthesiology, medicine, gynaecology and obstetrics and surgery and nonclinical fields such as pathology, microbiology and biochemistry were included. No exclusion and inclusion criteria were used for selection of students.

Materials used were (1) mannequin i.e. intubation torso, (2) chart showing basic life support protocol with chain of survival of patient in cardiac arrest (3) power point presentation on basic life support with importance given to simple instruction was presented to all residents, (4) video presentation on direct laryngoscopy with methods used for difficult intubation were presented.

Methods

Hands on practice on mannequins were allowed to each resident.

Mainly facemask ventilation with methods for maintenance of airway with chin lift with head tilt and jaw thrust methods were taught.
Simulator sessions included instruction of each basic step of intubation and repetition of technique with each student.

Specific numbers of intubation were not required rather students were required to achieve excellent technique with advancing level of airway difficulty.

Difficult airway was achieved by using cervical spine immobilisation and using simulators option to tongue swelling, oropharyngeal swelling and laryngospasm. (4)

Ease of intubation and laryngoscopy was assessed. Each student was given repeated attempt for successful intubation.

Results

30 post graduate students were given training for airway management with direct laryngoscopy. Students were allowed repeated attempts till successful intubation.

Opinion of anaesthesiology residents and senior anaesthesiologist was taken in operation theatre for intubation on patient after mannequin training. They were asked for any improvement in performance of residents for doing direct laryngoscopy and intubation.

Opinion about face mask ventilation was asked.

Overall there was much improvement in performance of students in holding mask for ventilation during pre oxygenation.

Interference by senior anaesthesiologist during face mask ventilation and laryngoscopy was not required after training as the residents were more competent for the procedure.

Discussion

A first mannequin used to teach airway and resuscitation was prepared by two anaesthesiologists Dr. Peter Sufar and Dr Bjorn Lind was known as Resusci Annie.

Dr. Gaba from Stanford developed realistic mannequin simulator that could replicate human response to various physiological responses and pharmacological responses. This has started new tools for education of medical graduates to learn clinical knowledge and examination of patients without patient being put at risk. Different types of simulators include simple demonstration on fibre optic bronchoscope to partial task training such as intubation, chest tube insertion to full environment simulation (FES) using high fidelity mannequin.

Students studying anaesthesiology may be taught with checklist of anaesthesia preanaesthetic check up (PAC) and induction, while administering anaesthesia to a patient in a particular order, but in simulator theatre. Along with this reality of emotions, confusion, distraction can be added which helps students to act in a proper and reliable manner in problematic situations.

The ultimate goal in medical education is expertise or mastery of one’s trade.

Deliberate practice is technique used to improve performance of graduate students which include four conditions:

1) Intense repetition of skills or procedures,
2) Rigorous assessment of that procedure,
3) Specific informative feedbacks,
4) Improved performances in a controlled setting.

In previous studies by Wayne et al (5) assessed value of using simulation technology and deliberate practice to enhance acute resuscitation skills.

This study of 41 second year residents in internal medicine using deliberate practice to teach advanced cardiac life support showed statistically significant improvement in retention of skills and knowledge of standard ACLS (advanced cardiac life support) protocols even after 14 months.

In a study of Issenberg et al described utility of simulation as an educational tool. They stated that ability to produce immediate direct feedback is primary advantage of simulator. The only limitation of simulation is a learner dependent and it requires full participation and engagement by the individual.
One of the most important parts of experimental learning cycles is debriefing, a process which is difficult to perform in a clinical setting.

In a study by Savoidelli et al (6) found simulator without debriefing showed no improvement in non technical skills in comparison with either oral or video tape assisted teaching which showed significant improvement (p >0.005).

Depending upon this review of literatures and previous studies we have conducted airway management programme with endotracheal intubation by simulator method on mannequin of intubation torso. The model which is used for this study was Gaumard U.S.A. "Simon multipurpose intubation" (Torso).

30 students, post graduates were divided into groups of 10 each. Initially a short power point presentation was used to teach students airway management with mainly importance given to holding of facemask and ventilation through facemask. Simpler repeated instruction were given. This was followed by video showing direct laryngoscopy as debriefing was important in methods of simulator teaching.

Overall students were given practice for facemask ventilation and laryngoscopy and intubation. Repeated attempts were allowed for ease of intubation. This study supports using patient simulation to teach endotracheal intubation. Further study is required to teach standard protocol of advanced cardiac life support training.

The benefit of simulation must be balanced with cost of purchase, maintenance and repair of sophisticated equipments.

**Conclusion**

This mannequin study has shown that graduate students i.e. residents were able to learn how to intubate by direct laryngoscopy method. Objective of the course was to make them able to use face mask for ventilation and carry out intubation by direct laryngoscopy. This study has shown that skill training in general increases individual performance. From learner’s perspective simulation affords the ideal opportunity to practice patient care away from bedside and patient are more willing to allow students to perform procedure on them after they have undergone simulation training.

**References**


