How to Teach Practical Skills in Medicine: Out of Hospital Training

MF Higgins[1], AP Macken[2-5], O Coyle[2,4], W Cullen[2,3], D McGrath[2], CS O'Gorman[2-5]
[1]Maternal-Fetal Medicine, Mount Sinai Hospital, Toronto
[2]Graduate Entry Medical School, and [3]Centre for Interventions in Infection, Inflammation & Immunity (4i), University of Limerick
[4]The Children's Ark, University Hospital, Limerick
[5]National Children's Research Centre, Crumlin, Dublin

"See one, do one, teach one" is the traditional paradigm for teaching medicine while working, the apprenticeship model. This paradigm is based on training during long working hours and with evaluation by mentors[1]. More recently, medical education is turning towards more structured programmes of teaching skills, where formal training can be objectively assessed using competency-based assessment[2]. At an undergraduate level this is driven by the requirement of a newly-qualified doctor to be familiar with basic competencies required for clinical work; these competencies are often assumed by other members of the healthcare team and are desired by the undergraduate students themselves. In fact, students themselves have requested training in particular practical techniques such as venepuncture, catheterisation and suturing in order to better prepare themselves for the practicalities of working life[3].

Changes in methods to achieve competency in practical skills in postgraduate medical education have been driven by several factors. Firstly, the introduction of the European Working Time Directive (EWTD) has reduced the working hours of junior doctors and thus the number of procedures performed by trainees and thus decreased the emphasis on the apprenticeship model[4]. Secondly, there are increased requirements to assess skills based on competency[5]. Thirdly new procedures (such as laparoscopy) have been introduced so quickly that all grades of doctors have needed to be trained at the same time[1]. Many new techniques for teaching practical clinical skills have just been introduced recently. Therefore trainers who themselves were taught using the "see one, do one, teach one" paradigm are now the postgraduate teachers of students who have used –and are therefore familiar with - the newer methods of teaching.

This paper is a literature review of the evidence in the area of teaching practical techniques in medicine. The first article reviews the research on skills laboratories and simulation and the second concentrates on training in direct contact with patients.

Skills labs

The aim of a clinical skills laboratory is to allow students the opportunity to practise practical procedures in a safe, non-stressful environment, where procedures can be broken into a number of steps in order to improve understanding. From its beginnings in eighteenth century France where Madam Du Coudray used fetus and pelvis models to train midwives, clinical skills laboratories have expanded to utilise many varieties of media. Animals models provide living simulations[6] but may raise concerns about moral issues, cost and infections[1]. Virtual reality techniques raise interesting possibilities[7] but are expensive and may not be accessible to all. More commonly, manikins, synthetic tissues, trainers or skill stations have been used to teach both basic and more advanced practical skills.

Manikins

Manikins are of value in training a large number of students in a variety of skills procedures. Studies have assessed the use of manikins in endotracheal intubation[8] and in the assessment and treatment of an acutely ill patient using a Laerdal SimMan[9]. Other simulators may be used to teach uncomfortable procedures such as otoscopy, vaginal delivery, catheterisation, colonoscopy, bronchoscopy and digital rectal examination. The generic components of these practical sessions with manikins include: breaking the skill down into individual steps, learning on simple scenarios before moving onto more challenging clinical scenarios (cognitive based learning), limitations of time to allow for maximum concentration and low teacher to student ratios. In all these scenarios, students can use the manikins to practice team work in assessing and treating these acute emergencies. In the study on intubation, after a single session, 93% of the 115 students reached the required standard to attempt intubation on a patient and feedback from students was very positive.

Simulators

Simulators permit practice to achieve mastery both techniques and instruments used in laparoscopic surgery within a controlled environment. The user-friendliness of such models for novice surgeons is evidenced by the continuing popularity of courses using these models in teaching surgical skills.

Skill stations

Skill stations have been successfully used in undergraduate and postgraduate medical education to teach practical skills. One Canadian study assessed skills training of fourth year medical students in teaching basic surgical practice at the start of a surgical rotation. Here 69 students were taught such practices as scrubbing, gowning, gloving, aseptic technique, suture cutting and instrument handling. Students taught using skill stations within a one-hour station by a surgeon and nurse educator scored higher in assessment than those who were not exposed to the teaching module. Student feedback ranked the teaching module highly in areas such as value, contribution to knowledge and increased confidence in technical skills[10]. In addition, students in the teaching group had improved post-test scores compared to both their own pre test scores and to the non-teaching group. A similar study performed in the Netherlands used a short (2 hours) course to teach skills to qualified general practitioners. These skills included shoulder injection, cervical smear taking and ophthalmic evaluation in diabetes. Competence in the skills was measured by a knowledge test. After the course, a significant positive effect on performance in practice was found for both cervical smear taking and shoulder injection[11].

Interaction with other teaching methods

Skills labs may also be used in conjunction with other methods of teaching: one example in teaching neonatal examinations and procedures (Apgar scoring, assessment of gestational age, oxygen therapy) used a combination of an interactive multimedia programme on CD-ROM followed by practice in a skills laboratory[12]. Students also found the CD to be useful for revision purposes. On their own, computer assisted learning tools are not as useful as they lack immediate feedback; one study showed that medical students learning how to tie a knot were more effectively taught using a lecture and feedback seminar than by a CD alone[13]. Notwithstanding, a definite advantage of interactive computer programs is the ability to deliver such training in many different languages.

Multidisciplinary team skills labs

Interestingly, a multidisciplinary skills lab has also been developed to allow medical and nursing students to learn how to work both individually and as a team, in order to integrate their learning at an early stage. In one example, a simulated patient takes the role of a patient being admitted for hemicolectomy with four students (medical and nursing) sharing the tasks required to admit the patient to the ward, assess him for surgery, consent him and discuss postoperative recovery while being observed by a general surgeon and stoma therapist. After the shared exercise, the

students, the simulated "patient", and observers come together to discuss their findings[14].

How are these educational programmes assessed?
One study questioned postgraduate students attending a course in resuscitation skills and found that the proportion of students who identified themselves as being "uncomfortable" with specific resuscitation skills (attaching a defibrillator, delivering shocks, leading an cardiac arrest team) fell significantly after completion of the course[15]. Obtaining student opinion however is a limited, and potentially biased, method of assessing an intervention; student opinion alone is not sufficient. However in conjunction with other methods of assessment it is important to know that any new educational intervention is acceptable to students. Also, it is important to obtain and to reflect on the feedback of patients or simulated patients involved. The ultimate result is that of improvement of patient safety: a study assessing the impact of introduction of the Advanced Life Support in Obstetrics (ALSO) course in Tanzania found a reduction in the rate of postpartum haemorrhage (PPH) from 32 to 18% and halving of the rate of severe PPH from 9 to 4.3%.

Correspondence: CS O'Gorman[1,2]
[1]Graduate Entry Medical School, and [2]Centre for Interventions in Infection, Inflammation & Immunity (4i), University of Limerick
Email: Email: clodagh.ogorman@ul.ie

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How to Teach Practical Skills in Medicine: Bridging the Gap from the Course to the Patient, and Teaching on the Job

CS O'Gorman[1-4], AP Macken[1-4], O Coyle[1,3], W Cullen[1,2], D McGrath[1,2], MF Higgins[5]
[1]Graduate Entry Medical School, and [2]Centre for Interventions in Infection, Inflammation & Immunity (4i), University of Limerick
[3]The Children's Ark, University Hospital, Limerick
[4]National Children's Research Centre, Crumlin, Dublin
[5]Maternal-Fetal Medicine, Mount Sinai Hospital, Toronto

One of the disadvantages of clinical skills laboratories is the lack of "real life" scenarios which might bridge the gap between the simulated laboratory and clinical settings. While technical skills are important in learning a practical proceedure, effective communication with a patient is essential in order to competently complete the procedure. Taking "blood" from an orange is one thing; drawing blood from an 80 year old woman with dementia at 3am is another experience entirely. Various techniques have been developed which bridge the gap between the clinical skills laboratory and clinical settings, usually using simulated patients (SPs) or a simulated environment.

Simulated patients
Simulated Patients (SPs) are defined as "actors trained to provide a consistent performance of a clinical role and to offer structured, learner-centred feedback"[1]. SPs can be used in a variety of settings. Firstly, SPs may be used in skills labs, and there are now many examples of these. One purpose-built suite in St Mary's Hospital, London is described in published literature. Here ceiling mounted video recorders and playback equipment explored how both teachers and learners responded to the use of stimulated patients in the teaching of practical procedures such as suturing or catheterisation. In one example, simulation of wound closure used a pad of simulated skin attached to the "patients" arm and covered with a drape in order to simulate a real wound [2-3].

Simulated environment
Alternatively, skills labs may be developed to simulate a clinical environment: simulating a domestic environment to mimic a home visit by a general practitioner, a simulated accident and emergency to run resuscitation procedures (with the addition of appropriate equipment and tape recordings to further add reality) or a theatre "scrub area" to teach students how to scrub, gown and glove[4]. The disadvantage of using simulated patients or environments is that, although students perceive the procedure to be more realistic, they are still aware that the "procedures" are carried out in a non-clinical environment.

In response, one group developed a quasi clinical scenario using a portable recording device to record students performing procedures on SPs in the Minor Procedures Room in the Accident and Emergency Department of a hospital[1]. The recording device was linked to two miniature cameras mounted on a drip stand, providing different views of the procedure. Student assessment