

CURRENT SCIENCE

Volume 111 Number 7

10 October 2016

GUEST EDITORIAL

Surgical training

Surgery is a highly evolved skill based science. Like in all other disciplines, surgical learning involves all three major domains of learning, namely, cognitive (knowledge), psychomotor (skills) and affective (attitudes) components. While the psychomotor component takes a prime place in surgical training, it is important to give importance to both cognitive and affective domains as well.

How does one learn skills? How is training in skills best imparted? The basic principles of training skills are well established.

Learning styles differ among human beings. They generally belong to one of three groups: (1) Visual learners – who learn by seeing written text and seeing graphics; (2) Auditory learners – who learn by listening to the spoken word; (3) Kinesthetic learners – who learn by touch and movement. Surgeons would belong to this group.

Skills are learnt in a phased manner. The phases include a cognitive phase, an associative or integrative phase and an autonomous phase (Dankelman, J. *et al.*, *Minimally Invasive Therapy Allied Technologies*, 2005, 14(4–5), 247–256).

In the cognitive phase, the mind of the learner breaks down a given skill based task into several components and works out a way of doing this by hand.

In the associative phase, the task is carried out in a deliberate, thought out, manner; it will be slow and not so smooth in the beginning; with practice, the moves become faster and smoother.

In the autonomous phase, conscious thought towards the components of a skill are not required. The moves are automatically carried out.

The teacher performs the task, first without and then with a commentary about the components of the task and an explanation as to how he achieves the components of the task – thus giving an auditory and visual input to the student. In the next step, the student describes the various components as the teacher is performing the task. This gives an opportunity for the teacher to assess how well the student understands the components of a given task. Next, the student performs the task while describing what he is doing. Formative feedback from the teacher is important at this stage. After convincing himself that the task components and their execution are learnt correctly by the student, the teacher can leave the student to practice the moves. With adequate practice the student will reach the autonomous phase for the given task (Smith, F. C. T. *et al.*, *Surgery*, 2012, 30(9), 471–476).

Surgery is a complex undertaking that involves several stake holders, all of whom have to be ‘satisfied’ with outcomes. The surgical patient is the primary stake holder. The surgeon, the health care facility and the trainee are the other important stake holders. The other significant ‘player’ would be the funding authority, be it the patient himself, the government or the insurer. Lastly, society at large is an important stake holder. The training process has to cater to the needs of all these stake holders.

The patient wants to be treated safely and efficiently; he wants assurance that he gets the correct operation for his disease carried out safely with a minimum of complications; he wants to be looked after with a round the clock surgical staff cover for his care.

The surgeon wants to do the right operation safely; he needs help to give the required round the clock cover from a team of colleagues. He wants to exercise his ‘professionalism’ for the so called ‘self-actualization’ of Maslow’s hierarchy. According to Maslow, ‘self-actualization’ is the highest level of hierarchy of human needs. This goes far beyond doing operations; The CanMEDS document from the Royal College of Physicians and Surgeons of Canada describes the role of a health care professional in society. He is, in addition to his clinical role, a manager, a communicator, a leader, a health advocate, a scholar and teaching being an important part of his role as a scholar – and society needs him in all these roles if the health care system has to succeed (<http://www.royalcollege.ca/rcsite/documents/canmeds/canmeds-full-framework-e.pdf>).

The health care facility needs the required number of committed, professional and well trained surgical staff to be able to provide good care.

The trainee wants to receive good training; he must be assured of receiving adequate training in return for all the long hours of work he puts in during the training. The surgical trainee needs adequate opportunities to hone his skills to be able to do operations safely and expeditiously.

The ‘payer’ wants all the above done at the least cost.

Society at large, wants to have a good health care system. Having a large enough pool of well trained professional surgeons is the most important and the most difficult to meet need, of a surgical health care system.

Certain conflicting interests become obvious when we look at training from the perspective of different stake holders. These conflicts become pronounced if ‘paying’ patients refuse to participate in training programmes. We have a lot to learn from the American surgical residency

system as to how to resolve this conflict. The question of 'learning' on paying patients becomes important in India as well, even though the penetration of medical insurance is low. This is because 80% of health care in India is in the private sector, with 67% of the patients paying 'out of their pockets' (http://www.mckinsey.com/~media/mckinsey%20offices/india/pdfs/india_healthcare_inspiring_possibilities_and_challenging_journey_executive_summary_ashx).

Over a period of a century and a half, training methods have evolved along with the development of surgery as a science. William Halstead is credited with setting up the first residency system in the US. His residents spent a long period of apprenticeship. The training opportunities were given only on indigent (non-paying) patients. Trainees were given increasingly more 'to do' depending on their improved surgical skills as time progressed in the residency programme – a concept called 'graded responsibility'. In a few years the thought emerged that this would be unethical and all patients must have similar care irrespective of their paying capacity (Rutkow, I., *Ann. Surg.*, 2013, **258**, 1130–1136).

The medical insurance system, employers providing medical cover and government schemes to support the poor and the elderly, resulted in a large number of patients becoming 'paying' patients. This brought about a conflict in that, if most patients did not want any part of their care assigned to residents, there would be little or no training opportunity. There would be very few trained surgeons available and society would suffer from lack of safe surgical care (O'Shea, J. S., *Acad. Med.*, 2010, **85**, 854–862).

This conflict between training and service delivery had an uneasy truce for a few decades until an investigative television programme accused senior surgeons of using untrained junior ghost surgeons – the residents – to get their job done! This led to a public outrage against the surgical establishment. Lawsuits were filed. Certain new laws regulating health care practice were promulgated (Siegel, J. H., *Bull. N.Y. Acad. Med.*, 1980, **56**(5), 433–453). In response, the surgical establishment faced this onslaught with a concerted attempt to educate the public. It explained the logic behind the need for training and reassured the public that all training is under close supervision; graded responsibility is given to trainees and the seniors take full responsibility for the safety of the patient. With this, peace was restored.

The statements of Francis Moore regarding the ethics behind training and the so called 'two standard' system (training only on non-paying patients) is worth quoting here (Moore, F. D., *Bull. N.Y. Acad. Med.*, 1978, **54**, 648–656).

'Clearly, two moral values conflict: the moral imperative to teach a young generation and the moral imperative that each patient has the most skillful person available to operate upon him.'

'...all patients who enter the door of the hospital, the emergency ward, or the outpatient department acknowledge that their care will be managed by a team that basically consists of two individuals, a teacher and a

learner.... The care and responsibility are shared by both members of the team.'

'...always a little shocking to visit a teaching hospital in which the older man, the teacher, does the operation from start to finish in an entirely non-sharing mode, only to leave the hospital and go somewhere else or home to bed for the night, leaving 100% responsibility for all other aspects of the patient's care to the learner,... obviously an unhealthy and unethical situation.'

Over the decades, several papers have established the safety of supervised surgical training programmes. In fact, care in hospitals with residency training programmes is shown to be better than that without these programmes. This is likely to be because of the assured round the clock presence of trainee surgeons who are motivated and committed to giving excellent surgical care. Further, there is closer supervision and earlier flagging of potential problems that may occur during patient care (D'Souza, N., *J. Surg. Edn.*, 2016, **73**(3), 391–399).

The supervised apprenticeship model comes with a price:

Long hours of work for the resident, spent both in the operation theatre and in the wards to get the requisite opportunities and experience. The long hours may result in fatigue setting in. While we have no legislated limitation of working hours in India, the present generation of trainees would want a better life-work balance. This limitation would impact training.

Supervised trainee operating sessions take 30–50% longer when compared to those performed by fully trained surgeons. Operation theatre time costs a lot of money. Health care facilities would prefer a good 'turn-over' in their operation theatres.

While it is a fact that supervised resident surgery is safe, a lingering doubt persists about having a novice perform on a patient. Should not the trainee have some proficiency before he is let loose on a patient?

Fortunately technology comes to the rescue of the surgical trainer. The answer to the issues outlined above is to impart initial training on simulators in skill labs. Apart from helping trainees learn specific skills, simulators serve the important purpose of objectively assessing the proficiency of the budding surgeon. Methods, validity and accuracy of assessments are well established in surgical sciences (Reznik, R. K., *New Eng. J. Med.*, 2006, **355**, 2664–2669). A detailed discussion of surgical simulators and assessment of proficiency is outside the scope of this editorial.

Society needs well trained surgeons. Training has to be a part of every surgeon's life. Every surgical patient must participate in this process with the firm belief that his care is better in the hands of a surgical team, consisting of a senior surgeon and trainee surgeons.

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