



## Surgical skills and lessons from other vocations

### A PERSONAL VIEW

RM KIRK

Royal Free Hospital and University College London, London, UK

#### ABSTRACT

Formerly, a few lucky trainees, attached to talented masters\* keen to teach, derived excellent, well-rounded training – but many others struggled alone. Now, formal courses allow experts to teach simple, safe methods, often using simulations. Courses are usually delivered as modules – each unit designed to provide an assessable competence. Simulations are, however, imperfect substitutes for living tissues. Such courses are aids, not substitutes, for operative experience – but this, for many irreversible reasons, is restricted.

Successful operators in all specialties and all countries, have in common the combination of good judgement, commitment, intimate knowledge of anatomy and pathology, together with technical skills that are more easily recognised than described. We need to identify good trainers and relieve them of commitments that reduce their ability to pass on their skills. As a trainee, try to identify and copy their characteristics. This advice comes not from a gifted surgeon but from one fortunate to have worked with, and watched, surgical masters – and who is still privileged to teach.

#### KEYWORDS

Trainees – Skills – Teaching

#### CORRESPONDENCE TO

Prof. RM Kirk, Honorary Professor of Surgery and Honorary Consulting Surgeon, Royal Free Hospital, London NW3 2QG, UK  
T: +44 (0)20 7794 0500 ext 5412; F: +44 (0)20 7472 6444; E: r.kirk@medsch.ucl.ac.uk

### Practical courses

'Skills' course is a misnomer. Methods are demonstrated, copied by you under guidance and finally you need to show that you can perform them safely. Preferably, you should then have the opportunity to carry out the procedures a number of times in the operating theatre while being monitored. As a substitute, use a simulation. Some hospitals provide 'skills' laboratories but they are not always well maintained, stocked or accessible. Skills can be practised and assessed using simple apparatus,<sup>1</sup> so use your ingenuity. For example, the cut ends of Tubigrip® behave like opened bowel, everting like mucosa and needing to be controlled when carrying out a simulated anastomosis. You can familiarise yourself with laparoscopic techniques using a cardboard box and two mirrors.<sup>2</sup> Ask an expert to watch you perform, and accept criticism without resentment. Computerised virtual reality exercises also offer facilities for practical exercises. Study films of operations to understand why they are performed in the manner depicted; unfortunately such films often suffer from being impersonal.

Of all vocations only airline pilots have access to simulations that offer practical challenges that closely approach actu-

al flight conditions. Simulations offering the varied texture and behaviour of healthy living or diseased tissues, are unlikely to be available in the near future.

### Defining skill

A skilled performance is accomplished by subordinating attention on practised skills in order to concentrate on achieving the desired result. An inexperienced workman knocking in a nail must concentrate on controlling the path of the hammer-head. With practice he develops stereognosis (G stereos = solid – three dimensional + gnosis = knowledge), so requiring only subsidiary awareness of the hammer. Focal awareness can now be centred on correctly driving in the nail.<sup>3</sup> A footballer's focal awareness is on the ball and the target, not the kicking foot; a pianist's focal awareness is on music, not on the fingers. Pedal and manipulative skills are thus instruments to achieve an objective, not the objective in themselves. A motor activity can be relegated to subsidiary awareness only when the brain has developed an automatic programme. Repeating the action many times as in striking a ball at a target, or playing a sequence of notes on the piano are such exercises.

\*Master – encompasses skilled men and women who have mastered the technical skills of their profession.

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Repetition does not improve but merely fixes an action. Practice is a separate activity from exercises in that each repeat is different from the preceding ones in order to improve the performance.<sup>4</sup> This is achieved by the application of Bayesian strategy – determining what degree of confidence we may have in the intended action, based on the available evidence. From previous attempts the optimum sequence of movements is projected – ‘feed-forward’. During the procedure, sensory feed-back generates adjustments to improve the outcome.<sup>5,6</sup> Sportsmen and musicians recognise this difference but it is not sufficiently emphasised in operative surgical teaching.

While practising a manoeuvre, do not rigidly copy what was demonstrated but try changes in your approach, posture, sequence of actions, searching for ways that feel most natural. We all have slightly different ways of performing an action comfortably and controllably. Only when you have achieved the maximum improvement to the point that you can perform it automatically, quickly, without error or repetition, have you acquired a skill. When you watch a surgeon at work, your appreciation of expertise is strongly influenced by the naturalness of the posture and movements you observe. When you have acquired a skill, attempts to hurry the procedure, or demonstrate it to others, interfere with your performance as you transfer control of your automatic skill to consciousness, making you clumsy!

Modular teaching of skills splits the curriculum into units. However, the way in which the parts are assembled is at least as important as the modules themselves.<sup>7</sup> The balance between teaching parts and whole compositions has been studied and argued, especially in music teaching.<sup>8</sup> Some prefer exercises or practice pieces, others start with playing whole compositions, notably the Suzuki violin method. Modular teaching of surgical procedures offers preparation for, but not replacement of, clinical operative training. Only then do you learn that although a major operation is merely a series of minor procedures, for success, every step must be the correct one in the sequence, and perfectly performed.

## Master/apprentice

This relationship has suffered most from shortening of training, and also the distraction from almost whole-time direct patient care. The change is irreversible so the deficiencies must be identified and compensated for, in other ways.

Trainees formerly spent many hours assisting surgeons. Some surgeons and trainees did not use the relationship profitably as a teaching opportunity, so it is now deprecated. However, it can be beneficial provided you have studied the anatomy, pathology and operative procedure beforehand, and your teacher explains the intentions, methods and the sequence of the operation, and answers questions during routine parts of the procedure. Delegation of suitable parts of the procedure adds a vital further interest and feeling of

commitment. The benefits are not only explicit. Indeed, the greatest value is the tacit, that is unspoken, wisdom that an experienced surgeon transmits to the assistant: *‘by watching the master\* and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art, including those which are not explicitly known to the master himself’.*<sup>5</sup>

It was formerly a custom for trainees and visiting consultants to travel and watch operations performed by surgical experts. These experts were not selected by committees but identified by the number of people crowding into their operating theatres, and the queue of trainees hoping to work for them. Informal visits are no longer possible but, by forward planning, it can still be a valuable experience. Look within your own hospital and recognise that you can benefit from watching senior colleagues through whose service you will not rotate, or in a specialty of interest outside your intended career aspirations. Methods are often transferable between specialties.

## Tacit to explicit

Although certain areas of practical knowledge are best transmitted by example, erosion of the master/apprentice relationship makes it important, where possible, to make this knowledge explicit. Not all gifted surgeons are good communicators – but they are often the best teachers by example. As you watch an experienced surgeon operate, do not concentrate exclusively on the focus of the procedure. Watch the surgeon’s composure, and appreciate how he or she relaxes during the routine parts of the operation and focuses intently during the critical periods. Can you identify the reasons for the concentration? During a later, relaxed period you may confirm those reasons. Notice the flexible postures adopted in order for the surgeon to be aligned correctly and able to use natural movements. There are many lessons that can be tacitly or explicitly learned by watching, or better still by assisting, provided you have prepared yourself beforehand, to know the procedure and how it should be performed.

*Some of the lessons of which you may be aware already, include:*

1. Take every opportunity to revise the anatomy before carrying out an unfamiliar procedure. Take every opportunity to see and feel live human tissues. It is only in this way that you can decide what is normal, and what is abnormal. Unless you know the limits of normality you cannot reassure yourself or confidently advise your patients. Observe the textural behaviour of different tissues, and how experts utilise and exploit them – perhaps by gently distorting them to drive through a needle, deciding how deeply or how far from the edges to insert stitches, or how far tissue may be mobilised or put on tension without threatening its survival.

Your intimate knowledge of anatomy must not be limited to the target structures but also the intervening tissues as you approach them. Recognise the importance of tissue planes; an abdominal surgeon faced with adhesions in the upper abdomen recognises the value of staying in contact with the liver; an orthopaedic surgeon exposes deep structures along carefully developed pathways.<sup>9</sup>

2. React to changed circumstances. Do not inexorably continue with your original intention if the circumstances have changed. If you find it difficult or awkward to carry out a manoeuvre, can you convert it into a natural, comfortable and, therefore, safer task by changing your posture, position, instruments, or by allocating more profitable tasks to your assistants? Do you need advice or help? Surgeons do not delegate to trainees who cannot be trusted to call for help when in difficulty.
3. Inexperienced surgeons too often rush to get started. Be acutely aware of the 'setting up' by experts before beginning a procedure. It may appear boring and non-progressive to you, but they are often converting a potentially difficult procedure into a standard and comfortable routine, perhaps as simple as allowing them to insert stitches from far to near or from dominant to non-dominant sides of a seam.
4. React intelligently to bleeding. It is not always wise to search aggressively for obscure, diffuse bleeding with a haemostat. It may be more effective to pack the area and allow time for the natural haemostatic mechanisms to take effect while you undertake another task.
5. The sequencing of an operation needs to be flexible. In some cases, it may be important to defer the planned routine, perhaps in order to make a subsequent manoeuvre easier by first removing an obstacle, to limit exposure of a raw area to a minimum, or to avoid the need to interfere with an already completed manoeuvre.
6. Resist being hurried. As I have explained, changing an automatic manipulation into a consciously hurried one is a sure way of causing error – at best requiring to be repeated.
7. Keep in mind throughout the purpose of the operation. Think twice before adding an auxiliary procedure. First ask yourself if you will be able to face the patient, your peers and, more importantly, yourself if, as a result, complications develop.
8. Operating standards are not black and white but shades of grey. Make sure you do not accept imperfection, even though you may have seen others do so and get away with it.
9. Trainees who have learned a method of performing a procedure from one chief are often reluctant to change. When you change firms, be willing to adopt the methods of your new chief. As you progress through your training you acquire an amalgam of manoeuvres that suits you.

## Trainers

You need to ensure that you are passing on high standards. Airline pilots appear not to resent regular in-flight checks by senior pilots who report any slipping in standards and routines,<sup>10</sup> and detected or reported mishaps are not punished. It is recognised that everyone makes mistakes, so that instead of blaming the perpetrator, efforts are made to devise system changes that make it unlikely to happen again. Sportsmen and women, musicians at the height of their abilities, retain coaches in order to maintain their talents at the highest level. In the present climate, senior surgeons are likely to bridle at being watched critically by a colleague but it would be arrogant to suggest that surgeons are unique in not making errors or acquiring bad habits. We usually 'get away' with lapses – but in doing so we pass them on to trainees, risking future failures or perpetuation of the bad habits. As new techniques are introduced, they are rapidly taken up in most professions. If you get excellent results from your established procedures you can justify retaining them, but it is valuable to assess newly introduced techniques demonstrated by experts, preferably followed by a period of mentoring. Few of us watch our colleagues, although our best assistants often tactfully inform us of valuable manoeuvres they have seen them perform.

It has not been sufficiently acknowledged that the most important reason why you do not delegate more operations, or parts of them, is because the very high standards you have set yourself will be put at risk. In the past, surgeons chose their assistants, trained them, metered out responsibility and monitored the outcome. Because of the need for rotations, you may have allotted to you assistants you have not selected, whose capabilities are unknown to you, who have been taught to perform in a manner that is not yours. Add the facts that you bear the responsibility, you are often under pressure of time, and some of the most demanding assistants are those who are least prepared. How do you, after years of intense effort to acquire expertise, delegate with equanimity part or all of an operation? Perfectionists, not unreasonably, cannot bear to watch a clumsy, rough or indecisive procedure.

How can you incorporate good operative surgical teaching of juniors who may have minimal practical competence, with your responsibility to your patients? Here are some possible solutions:

1. Make sure you are not passing on acquired bad habits. Are you willing to ask a trusted senior colleague to watch you operate and point out deficiencies? It may be preferable for us to institute professional standards' monitoring rather than wait to have it imposed on us.
2. Are you sure you have kept up with the best techniques? Reading published literature from experts is less valuable than visiting and watching them. Potentially excellent

techniques may at first appear to be unpromising and on first introduction are seemingly expensive of time, equipment and expense. Be willing to visit, observe and, if possible, assist an expert. You may change your opinion and thus pass on a valuable technique to your trainees. Some groups have already introduced mentoring of colleagues taking up new procedures.

3. When you perform a procedure, or part of a procedure, that you are willing to delegate, carefully explain what you are doing and state your reasons. Can you now create, or have created, a simulation of the part and again demonstrate how to perform the manoeuvres? Allow the trainee ample opportunity to practise and demonstrate competence, as an incentive to earning the opportunity to perform. This strategy reduces the tension both for you and for your trainee.
4. Healthy and diseased living tissues are unique. Trainees are increasingly deprived of intimate visible and palpable contact with them. Whenever possible, demonstrate them and allow trainees to feel them during operations.
5. Much tacit wisdom was formerly passed on through the master/apprentice method of training. Identify what is capable of being expressed and pass it on verbally in addition to seizing every possible opportunity to demonstrate important lessons. Ask yourself 'why am I doing it this way'? When you have identified the answer, pass it on.
6. If you wish to delegate part or all of an operation to a trainee, do not do so if you are under pressure of time. The worst influence you can exert is to make the trainee feel rushed. Do not clock watch, do not take over unless it is for reasons of safety, and do not appear to be anxiously hovering. You should encourage the trainee to work slowly, at a completely comfortable, natural pace, seeking perfection, not speedy completion.
7. Beware of inflexibility. Experience improves our pattern recognition and it is easy to react with 'I've seen it before'. Ageing may reduce our willingness to explore other possibilities. Our trainees may not recognise how we reached the conclusion and what other possibilities should be considered. On occasion, failure to consider alternatives causes us to make incorrect decisions, when a less experienced but more flexible colleague might succeed.

## Conclusions

Bemoaning rosy memories of past practice is counter-productive. There are many areas in which we, as teachers,

can maintain and raise operative standards and pass them on to trainees – and many ways in which aspiring surgeons can help themselves.

Techniques are methods of doing things, but skill is the application of techniques as tools with an identified best result. In this regard, we have a powerful lesson from musicians. They recognise that elegant performance alone is not important; what matters is the quality of the music it produces. The objective of operative surgery is the best possible outcome for the patient. Manipulative facility must be allied to good decision-making. Parts of the totality can be learned separately – but skill is tested only when they can be successfully combined. The Gestalt psychologists taught us that examining the parts alone does not reveal the whole. Although some aspects of skilful performance are susceptible to objective assessment, the sum of these assessments does not represent the whole. Albert Einstein had a notice in his office in Princeton University: 'Not everything that counts can be counted, and not everything that can be counted, counts'.

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I have not inserted material from authors or publishers without permission. I have no financial or other interests in the described techniques, products, or their competitors.

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