Training in laparoscopy – which model to use?

The advent of laparoscopic techniques has led to a new paradigm in surgical training, with a move away from the apprenticeship model, toward structured programs of teaching new skills outside the operating room. Hands-on courses, enabling young surgeons to practise techniques on synthetic, porcine or more recently virtual-reality models, are now commonplace. The aim has been to ensure trainees are armed with basic laparoscopic skills, such as hand-eye coordination and depth perception prior to entering the operating room. The success of these initial courses led to the development of similar courses for the advanced laparoscopic skills required for gastric and colonic surgery.

A cursory review of the literature reveals a number of publications on the use of simulation for training in technical skills, not only for surgery but for all types of interventional techniques. This is further fuelled by the production and marketing of new synthetic and virtual models. It is not possible to learn some of the basic psychomotor skills required for surgery. It is thus encouraging to see the approach of Supe et al. to design a laparoscopic training course with human cadavers as the training modality. The human cadaver is anatomically identical to the patient in the operating room, and has been regularly used to teach medical students basic anatomy. The availability of such a model should enable surgeons to practice their skills before performing live cases.

This is not a unique approach, and indeed has been pursued across the globe. However, the distinguishing feature of this model is the use of unembalmed human cadavers preserved within one hour after death. The authors have striven to deliver a model that has the fidelity of the anesthetized patient. To a varying degree, this is the aim of all simulated models, whether they are based on synthetic, virtual, animal or human material. However, it is not appropriate, nor realistic, for all simulation types to attempt to achieve the exact fidelity of our patients in the operating room.

Training in surgery is beginning to evolve into a stepwise, curricular approach that is not organ- or procedure-specific. Instead, it is necessary to learn manipulative skills, which are then combined to achieve proficiency in tasks such as laparoscopic suturing or division of a vessel. The constituent parts can then be combined with anatomical knowledge to enable completion of a specific procedure. Traditionally, all skills and tasks were learnt on the patient. Within this hierarchical, stepwise model of training, each simulation type can be evaluated in terms of its efficacy in transferring the skills to the trainee. For example, basic psychomotor skills can be learnt with a simple, cheap version of a video-box trainer. Higher level skills such as dissection and use of high-energy instruments will necessitate the use of more realistic tissues, which can be achieved on porcine or human cadaveric models. Recent advances in virtual reality simulation are also beginning to produce realistic simulations of complete procedures, for example, laparoscopic cholecystectomy.

The efficacy of each type of simulation depends on whether it can teach the skills required, its cost, and availability at each center. Almost every surgeon first learnt to tie surgical knots with a piece of string over the bed-post or the back of a chair. It was only once they had learnt this skill that they were allowed to tie knots using real sutures on a real patient. Similarly, it is possible to train in laparoscopy using a variety of models, although the cheapest will be most attractive. As described in this issue, Supe et al. have made use of available resources in a country where obtaining cadavers is not a problem. In the United Kingdom, we have sought to define the role of virtual reality simulation for laparoscopic skills training. Though more likely to be used in the future, this currently has limited application for training in advanced laparoscopic procedures. The standard view is that only until we achieve the fidelity of the flight simulators can they be useful for surgical trainees.

In this vein, it would be rational to assume that a high-fidelity simulation model, such as anesthetized animal tissue, would be superior in terms of training outcome to a synthetic plastic model. In fact, a study comparing two groups learning to perform micro-anastomotic repair of a transected spermatic cord on either the animal or synthetic model found no difference in eventual outcome of the two groups. The synthetic model is obviously cheaper and does not require specialized storage facilities. It can be assumed that as the subjects were using real sutures and instruments,
the nature of the task was learnt regardless of the fidelity of the simulated tissue.

It may not be necessary to strive toward realistic imitation of the anesthetized patient at every stage in the training curriculum. The human cadaveric model is cheap and easy to obtain in Mumbai and should be utilized by surgeons once they have achieved mastery of skills with inexpensive synthetic models on the laparoscopic box simulator. In other countries where human cadaveric models are in restricted supply, animal, synthetic or virtual reality simulation should be utilized to a greater extent. Though the tools may vary, the important aspect is to ensure that the early part of the surgeon’s learning curve is no longer achieved at the expense of our patients.

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References


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