Chapter 40
Surgical Education in the Future

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Overview This chapter explores an ideal surgical programme for the future. Previous chapters have primed us for what we know we can achieve. Here, we amalgamate the many solutions to the challenges we currently face. We gaze into our crystal ball looking to the year 2030. In doing so, there will be focal aspects of surgical education where changes in the way we consider, teach and evaluate what we do has conceptually evolved. Using some focal points below, we can consider the way surgical education and training programmes will eventually look and feel.

40.1 Introduction

We were asked to consider the future of surgical education with 2030 in mind. We write from our perspectives as academic surgeons who have a strong interest in surgical education and its progressive development. We imagined we were in 2030 and looking back on the development of surgical education and training. We explore key points – training time and scope, mentoring, simulation, robotics, e-learning, social media, communication, work-based assessment, mental health, bullying and harassment and gender and race inequality.

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40.2 2030 and Looking Back

We've much to reflect on… The process started with how medical students were educated and inspired because of their clinical attachment. Each speciality fostered and created a clinically sound interesting programme for students. This included formal surgical teacher programmes so that clinical educationalists drove the process. Junior doctors gained access to terms where useful clinical skills can be acquired. Part of that involved access to teaching and skills development. Along with that are defined preselection criteria for surgical training with the facility to achieve the required skill base. Selection into programmes became fair, transparent and objective. Curricula were clearly defined and resourced to deliver what was expected. This encompassed an enriching environment for safe learning and the tools to ensure that theoretical and practical knowledge were developed at the expected rate. Engaging with technology in a useful and efficient manner was essential. Assessments were both formative and summative with validated whole activity tools and constructive feedback. It has been challenging for any programme to achieve all the ticks, but striving to do has fostered an ethic of constant improvement.

Elements of graded responsibility in surgical training, based on the original master-apprentice model, have been preserved in some form as a way to sequentially acquire complex skills. To be acceptable to jurisdictions, professional training institutions and surgical trainers and trainees, change has had to be gradual and with purpose.

Surgical education focusses on learning opportunities, safe working environments as well as adherence to set staged and achievable curricula. Efficient systems offer high-quality surgical education within a shorter working week and timeframe.

Re-engagement with medical schools ensured that undergraduate curricula received a reinvigorated surgical emphasis to offset the dilution in the years preceding 2018. This involved partnered integration of postgraduate programmes by providing stepwise 'primers' into the undergraduate curriculum. Formal curricula have been developed in partnership with undergraduate educators using the changes in technology. Graded simulation and surgical education has been progressively formalised with the goal of better preparation of trainees for clinical operative exposure [1]. *Opt-in* formal structured programmes via online delivery for junior residents or even medical students who aspire to a surgical career path are now offered. Much of this has been integrated into procedural skill sets to help junior doctors keep their options open building on the primers from their undergraduate degree [2].

Surgical societies in conjunction with postgraduate training colleges have developed collaborative models to offer additional technical and nontechnical skills development programmes to help those who desire additional learning. Flexible mode, easy access and timing remain the key.

Table 40.1 The ten FMEC recommendations for MD education [3]

1. Address individual and community needs
2. Enhance admissions processes
3. Build on the scientific basis of medicine
4. Promote prevention and public health
5. Address the hidden curriculum
6. Diversify learning contexts
7. Value generalism
8. Advance inter- and intra-professional practice
9. Adopt a competency-based and flexible approach
10. Foster medical leadership

40.3 Training Time and Scope

Surgical training programmes have developed a two-stage qualification where the primary training of 3–4 years offers a core set of skills for general specialty practice and a second stage of 2–3 years for higher level subspecialised 'fit-for-purpose' qualification. This has added flexibility in some branches of surgery and will likely extend into other areas as jurisdictions formalise scope of practice.

The Future of Medical Education in Canada Postgraduate (FMEC PG) Project culminated in ten recommendations for change (Table 40.1) [3]. Many of the recommendations have been applied to other jurisdictions and serve as a template for institutions looking to address programme deficiencies.

One of the major changes in earlier decades was the focus on graduates' readiness for general practice by medical schools. This was understandable as most graduates entered a career in general practice. The challenge with this concept was that there had been a de-emphasis on the needs of those students who aspired to a surgical career path. Parallel electives in surgical sciences and skill development began to be offered to those who choose a procedural path and this was further integrated into non-surgical procedural medical careers as well [2]. This not only allowed for development of skill but also generated and consolidated interest in a procedural career path.

40.4 Mentoring

Surgical mentoring became multifaceted and formalised [4]. This was achieved by the increased use of technology, 24/7 access and tele-mentoring. Surgical trainees now use multiple sources of mentoring with each offering different expertise. This 'mosaic mentoring' also fits the needs of trainees (Fig. 40.1) [5, 6]. Mentors can

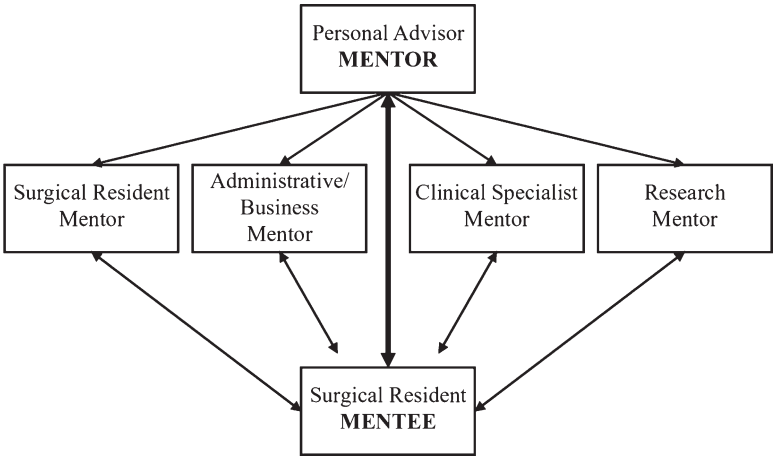

Fig. 40.1 Mosaic mentoring [7]

provide multifaceted nontechnical guidance or coaching to help manage interpersonal issues and work-life balance – an area most surgeons continue to struggle with. Despite simulation technology, ongoing mentor support remains vital in the global education process.

40.5 Simulation

Simulation has developed into a viable adjunct to the apprenticeship model. Exciting possibilities with detailed 3D imaging and printing as a teaching tool continue to evolve [8].

Collaborative resourcing between various institutions help with cost structures. Adjunctive simulation is now delivered starting with basic aspects and leading to a full immersive scenario to bring together all the technical and nontechnical skills [9].

Trainers and trainees intuitively recognise and accept that the use of simulation is worthwhile. Virtual reality simulation assists in 'whole activity' simulation encompassing technical and nontechnical skills with good face validity and the ability of repeat tasking.

Models for investment in simulators have been developed with better access for trainees, needs analysis and validity research along the way to offer standardised definitions and valid methods of measurement (Fig. 40.2) [10]. Trainers routinely apportion time and resources as well as ensuring that their own train-the-trainer needs are met.

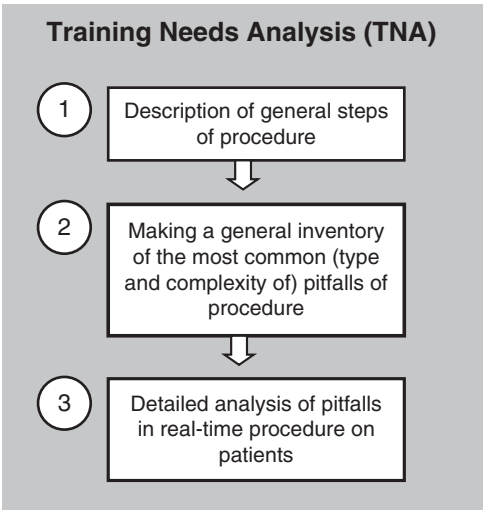

Fig. 40.2 Training needs analysis [10]

40.6 Robotics

Robotic surgery, single port and natural orifice minimally invasive surgery continue to evolve with innovative clinical applications in time. With introduction of new technology comes the learning curve that qualified surgeons need to acknowledge. Simulation and parallel console programmes have been able to provide the early modular structured learning required [11]. More conventional procedures be they open, endoscopic or laparoscopic have been modularised for stages in training.

40.7 E-Learning

E-learning has increasingly become an acceptable and efficient way to educate with access to technology and progressive online tools [12]. Online education tools being progressively introduced are promoted and complement traditional methods. E-learning modules with smart device access are used to rapidly introduce and progress key concepts in the learning continuum making face-to-face interactions more worthwhile and efficient.

40.8 Social Media

Technology helps positively address power imbalances in traditional hierarchical structures. Smart devices and wearable technology continue to be dual-edged swords in being enormously helpful and adding to efficiency but equally can be distracting and a source of abuse (e.g. during examinations).

Social media (SoMe) has become a valid method of exchanging legitimate clinical and educational content [13]. Much of this continues to grow at an unprecedented rate surpassing the speed of traditional models [14]. The SoMe platform continues to prove to be powerful, influential and efficient, transcending many traditional barriers. SoMe now delivers efficient piecemeal updates to supplement traditional delivery of education. Short quizzes, highlighting key research findings, journal club, meeting updates and rapid communication all lend themselves to SoMe platforms [15]. SoMe and online networking in general will remain an ever-changing growth area with novel ways to educate and engage between peers.

40.9 Communication

Communication errors continue to be responsible for adverse outcomes. High-quality communication skills cannot be assumed for any individual as failure to engage the team can affect the complexity of surgical processes. Communication failures can occur for a number of reasons [16]:

- Error of judgement
- Carelessness
- Inadequate hand over
- Unclear responsibilities
- Failure to convey critical information
- Knowledge gaps
- Fear of loss of autonomy

Focussing on communication from a situational and cognitive perspective has tangible benefits for the surgical staff and patient care. Reflective writing and discussion forums are used to bolster insight and empathy. We have left behind the original methods of allowing junior surgical trainees the ‘opportunity’ of ‘learning from their mistakes’ while engaging in unfamiliar clinical situations that could lead to patient harm.

Interpersonal communication skills remain a vital core competency. Correct situational awareness, assessment and handling are key components in complex environments like the operating room. Multiple points of source information and recording make this type of learning feasible and, most importantly, valuable. Updating in real time via smart devices continues to be key in making the process seamless.

Nontechnical skill and communication tools have been used to improve skills of surgical trainees including specific feedback [17]. Much of this is assessed and corrected via interpersonal observation and counselling and via instructional video capture, team scoring and analysis.

40.10 Workplace-Based Assessments (WBAs)

Ongoing evaluation of the types and effectiveness of the different WBAs has led to their increasing usefulness within each programme [18]. Trainer upskilling in the use of assessment processes remains essential. This is accomplished in real time, formalised and credentialed to ensure trainers meet their obligations as well.

Whole activity competency from the first consult to discharge and aftercare is what the practice of surgery requires and is now achievable. Entrustable professional activities (EPAs) remain an ideal tool for assessing discrete milestones and competencies [19]. Improvement in these types of tools continues to be developed and evaluated on an ongoing basis for quality and supplemented where required.

40.11 Mental Health, Bullying and Harassment

Mental stress is a significant issue for all doctors. It can emerge in a variety of forms including underperformance, mood swings, increased tendency to depression, substance abuse and suicide. Stress management training and appreciation has become an integral part of the ethic of surgery and surgical education.

There was enough evidence to suggest that bullying and harassment needed to be addressed and workplace environments free of intimidation. Mechanisms are in place with most workplace environments instituting policy about the issue. The culture of bullying and harassment was once pervasive in the surgical environment. Change started when the President of the Royal Australasian College of Surgeons issued an unreserved apology and promised to begin a process of rectifying this long standing issue [20].

Addressing these issues was much more than just instituting policy. There needed to be open acknowledgement and a mechanism to address poor behaviour in a manner that fostered permanent change for the better. It helped enormously when this came from the leadership of all organisations involved in healthcare and education instituting with a ‘mindset’ change [21].

40.12 Gender and Race Inequality

Race and gender inequality issues continue to exist but discrimination has become less pervasive in surgery. Inequality in remuneration and workplace discrimination have been progressively addressed by the surgical leadership in all jurisdictions [22]. Focus on flexibility of training with jurisdictions and training colleges was acknowledged and with that came progressive moves to help address race and gender inequalities.

40.13 Conclusion from 2019

Surgeons at all levels should inspire their teams and push to empower the system to reconstruct surgical training and education into the new age. It takes leadership, vision and access to the decision-makers that will allow for progressive change. Resource allocation, tailored solutions and technology continue to be pivotal to improving surgical education into the future. Patient safety, cost and time limitations will be key issues curtailing some of the ideal models. Faculty development will be essential in tandem. Seamless cooperation between undergraduate and postgraduate training bodies should offer the benefits that come with cohesive synergy. Additionally, engaging medical students with a positive experience during a surgical term continues to be an important part of the first step of recruitment into surgery as a career. All this could lead to supportive frameworks for surgical training as outlined in the following diary extract (Box 40.1).

Box 40.1: Excerpt from the Diary of a Surgical Graduate in 2030

It's just 8 years since I completed medical school at my local university. I was fortunate to get the grades to enter a progressive school where we were exposed to many branches of medicine – not just on our largely screen-based resources but in real clinical settings. In my second last year, I had a placement in a urology unit where I could see the breadth within the specialty. We were offered mosaic mentoring. This allowed me to access several mentors who could guide me as the challenges of life presented themselves – not all work related. The surgical trainees I worked with were clearly well supervised and seemed happy in their career choice. One of the consultants took the time to take an interest in who I was as a person and listened to my reasons for doing medicine. I was encouraged to consider writing a review paper which not only allowed me to focus on how to write for scientific publication but the resultant paper was published. My new mentor was supportive and helpful in getting the project to completion despite my cursory first draft.

I continued along my path to complete my medical degree but an interest in surgery had developed. I could attend optional basic skills workshops and simulation labs to acquire an understanding of the skills I would need. The virtual reality platforms were conducive to learning, correcting as I went along. Many of the skills included nontechnical aspects of clinical practice which I had not associated with being a surgeon. Collaborative team practice using smart device technology made learning on the run very easy. My mentor continued to guide me through my early postgraduate years as I undertook clinical projects and slowly built up skills and experience a range of clinical terms in surgery.

(continued)

Box 40.1 (continued)

The selection process for advanced training was transparent and achievable. I was not successful at my first attempt but with encouragement, I found the will to continue trying to improve my CV and skill base. I was successful on the second attempt but did find the early years challenging. I also experienced a personal crisis and needed time to resolve a family matter. Fortunately, I was supported to take a year off during my training to care for my sick child. It was a time when I experienced significant self-doubt about the path I had chosen. All through this period my mentor seemed to be there when I needed her. I could continue to attend teaching sessions and simulation skills labs. The programme was run by amazing teachers who knew how to extract from me what I didn't know I had and progress my rate of growth as a surgeon. Real-time assessment online portals allowed me to evaluate areas where I was doing well and aspects that needed attention. It made me realise that I was doing what I wanted to do.

My final exams were a challenge and I failed the first time but again when self-doubt crept in, I found amazingly supportive peers and seniors. I have now completed my training and have two lovely children. My mentor offered me a position as an associate in her practice and continues to appreciate my responsibilities outside of work. I have been fortunate to have found my place thanks to the people who knew how to bring out the best in me. My experience has helped me better see the needs of the medical students and juniors I work with. Hopefully I will be able to offer to them what was offered to me.

Finally, surgical education and training programmes must establish a mindset that embraces change, finding ways to better tap into progressive thinking and monitoring quality in a meaningful way to foster improvement.

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