

# Editorial

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## Navigating new technology in surgery: A user's guide in the 21st century

It is self-evident that technology has played a dominant role in shaping our choices and decisions in surgical treatment in the past 2 decades; however, we were not prepared for the geometric rate of its advances. In the age of information, technology has acquired a life of its own and the human brain extended by the multiplier effect of material sciences, electronics, and computing has provided the impetus for independent innovation exemplified by the operation of Moore's law of annual to biannual doubling of components in integrated circuitry<sup>1</sup>. The sky is truly the limit. As we crossed the threshold of the 21st millennium, we have perhaps moved from a paradigm of "problems were driving technological solutions", at least in part to a state of "new technology is looking for applications".



## Technology drivers in diagnostics: Hope and hype

The burst of technology in diagnostic imaging has lit up a field until recently in the shadows. Techniques using molecular and genetic tools have been generating tests faster than the journals can keep pace, raising hopes of magic horses striding out from the genomic stables. Clinicians have a minefield of data to negotiate to make out the truly cost-beneficial progress from the hype of novelty. In a privatized economy, where angel investors and start-ups drive the change, survival is the bottom line and motives must be clearly understood for novel clinical applications to be allowed to mature into standard practice. The gold standard is the test's impact on clinically measurable outcome which makes a difference to the patient's life; all too often we may be encouraged to accept a poor surrogate of isolated biochemical or imaging outcomes and this must be critically assessed.

## Multiplicity of therapeutic solutions requires a resource-stratified approach

As the blazing edge of technological progress cuts a trail of innovation in therapeutics, it leaves in its wake a multiplicity of surgical solutions. Surgeons can see this phenomenon clearly operating in the spheres of surgical techniques and instrumentation relating to minimal access surgery; a phenomenon best exemplified in the extracervical access to thyroidectomy and endoscopic access to the adrenal and parathyroid. In the recent past, a plethora of surgical solutions calls out for our serious consideration, each claiming to be the prima donna in the "triumph of the surgeon's craft". Our literature and presentations tend to be delivered in the style of modern media influenced by the economic demands of production seeking positive press and viewer ratings and consequently can be confusing for the truth seeking surgeon. Let us heed the counsel of the old adage – "When a multiplicity of treatments exist, then probably none is clearly superior". Especially in the situation of lower-middle income countries, a marginal or nonsignificant improvement in clinical outcome need not be chased at great cost. A resource-stratified approach may be appropriate in the framework suggested by the National Cancer Care Network guideline recently published for oncology – three broad strategies based on the availability and cost - basic, core and enhanced care.<sup>2</sup>

We may have to recognize that the differential rate of adoption of new technology<sup>3</sup> and techniques as well as the limitations of their cost will also create a stratification of utilization depending on the aptitude of surgeons and resources of patients that is available. We need to be clearly aware of the status of the patients we serve depending on our national care plan, availability of private insurance, and the capacity for "out of pocket payments"; then we can identify the appropriate surgical solutions to train and invest in. In many centers, we will see a mix of strata and will need to make available multiple solutions for cost-effective care of all.

## Choosing the appropriate technology

Herein lies the crux – how shall we choose? Two players can be clearly made out in the smoky haze of the problem situation – the surgeon and the patient. The surgeon, who has to assess the fast-changing technology

and get up to speed in technique and skill, is best advised to assess one's self-regarding aptitudes for learning new skills. If we cannot master multiple techniques, performing at least one of the surgical procedures well with low morbidity for the appropriate patient will be adequate.

Equally important is the critical appraisal of the new technology as to what tangible benefits it is offering. Let us ask of the new technology, three key concerns in a problem-solving approach are as follows:

Is it improving the clinical outcome for the patient?

Is it making the operation simpler and easier to perform?

Is it reducing the cost and logistics related to the operation?

Often however, I am constrained to note that the technology makes the procedure more complicated, at greater cost with similar major clinical outcome. Surgeon scientists continue to enter the arena and develop the technology that will give us better answers to the triple test for technology. The future is in our hands. If we shape it well, many more can reap the fruit of science. When a procedure proves itself, we can redouble our efforts to bring the benefits to our patients. Aptitude regulates the speed of learning and skill acquisition; however, with time and tutored practice, we can master anything. Conferences, workshops, and training programs all help in the process of skill transfer. Auditing our progress and results keeps us on the track of patient safety. To cap it all, spending time, observing an experienced surgeon in his operating room has been the traditional method of direct learning for centuries and so it continues as the most efficient transfer of technology and technique; this is enhanced using virtual and web-based methods. On the contrary, advanced laparoscopy is a skill that may not come easily to all despite effort and we look to robotics and other innovative instruments to make the skill accessible to more surgeons. It is hoped that Moore's law of technology and economies of scale<sup>4</sup> will drive the costs down to democratize the adoption of innovative instruments and robotic technology. In drug development however, we are seeing the reverse effect with costs of drug development doubling every nine years, and the fruit of new pharmaceutical products out of reach of the majority of the world's population; this effect was ironically dubbed Eroom's law<sup>5</sup>. Likewise, though spatial cramming can be improved on electronic circuitry, the actual cost of product development for hardware rises steadily and we watch sadly as the price tags of each new surgical tool rise and our hopes of unfettered use sag inversely. Truly free markets will ensure the opposite<sup>6</sup>, but we live in a monetized world where profit is the bottom line and markets are manipulated. Surgeons across the world are forced to constantly innovate in the operating room to offset the cost of surgical tools. The onus is on us professionals to appraise and regulate the adoption of new technology to promote cost effectiveness and optimal clinical outcomes.

## **Health Technology Assessment: help from the non-profit sector**

Recognition of the problem has manifested in various organized groups around the world creating, collating and making available the results of assessment of the new technologies. All of these are non-profit, predominantly public funded groups that have teamed in 1993 to form the International Network of Agencies for Health Technology Assessment (INAHTA) and reached a total of 46 members from 47 countries by 2009<sup>7</sup>; they have played a role in advising public health policy of governments. Reports on Bone Densitometry, PET scanning, Prostate screening have been released so far. The Australian Safety and Efficacy Register for New Interventional Procedures – Surgery (ASERNIP-S) is one of the collaborating agencies that looks specifically at surgical procedures and a number of assessment reports are published in peer reviewed journals accessible through the RACS website.

## **Helping patients navigate**

The second player is the patient who seeks a cure for his ailment and thus approaches the venerable surgeon. Just ponder the difficulty faced by the patient in making a decision from the variety of surgical options. Listening to various opinions and friendly advice, hampered by little knowledge and yet enticed, patients are often confused and we must step in to help using the following bioethical approaches.

In the Hippocratic tradition, the surgeon is the sole arbiter and must use his skill and judgement with benevolent intention. Some patients still subscribe to this view putting on us the onus of fitting those big shoes hoping we are armed with adequate knowledge and competence.

In the modern legal and consumer context, the patient's autonomy is paramount, so we are encouraged to lay out the choices and say – 'you decide'. In straightforward cases with informed patients, this is reasonable and simple.

However, many of our patients on account of unfamiliarity with scientific knowledge or confused by the complexity of the choices are unable to choose. This is where we must play the role of counsellor<sup>8</sup> – one who helps the patient navigate the choices. For this, we must engage with the patient's life goals and concerns to determine which choice is likely to bring long-term satisfaction. In a typical clinic, we are likely to use all three approaches as befits the patient best; our time and effort will empower the right choices.

## References

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