Robotic surgery: will it be evidence-based or just "toys for boys"?

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Surgeons and government must work together to evaluate new surgical technologies

Robot-assisted surgery has been evolving over the past decade, from simple adjustable arms to support cameras in laparoscopic surgery, through to the more sophisticated four-armed machines now being installed in a number of hospitals in Australia.[1] The name "robot" is somewhat misleading, as these devices do not perform autonomous tasks, but are under the direct control of a surgeon who usually works from a remote console to insert robot-controlled instruments into a patient. This technology has certainly made a number of surgical procedures, such as total prostatectomy and cardiac anastomosis (coronary artery bypass grafting), somewhat easier to perform; however, the true benefit of these interventions is yet to be clearly demonstrated.[2]

Over the past 150 years, surgery has been driven by technological advances. The introduction of anaesthesia; the development of imaging, from x-rays through to ultrasound, computed tomography scanning, and magnetic resonance imaging; and the availability in the operating theatre of heart/lung machines, stereotactic-guided imaging systems, and an array of extraordinary prosthetic inserts for the heart, joints and the vascular system have all meant that surgeons are constantly being challenged by new technologies. The benefits gained from the introduction of laparoscopic surgery into general surgical procedures over the past 15 years have also been possible only through the advances of technology. With these developments has been the need to adapt practice, as new technologies are demonstrated to be of value to patients. Not all new technologies have survived the test of time, however, and some fail on long-term review to deliver on their early promise.[3,4]

While hundreds of robotic systems have been sold worldwide, there are presently four commissioned robots in practice in Australia. One is located in a public hospital; the other three are in private hospitals. This has caused some concern within segments of the surgical community, as the motives for installing these robotic machines appear to be more commercial and marketing-oriented than based on well established science and surgical benefit. However, since more than half of the surgical procedures in our health system are performed in the private sector, it is hardly surprising that aggressive marketing and commercial interests should be factors in the availability of robotic surgery. Is this in the best interests of the Australian community, the patients treated and the associated cost for the health care system? The purchase price of robotic machines varies but is in the range of $1.5–$2 million.[5,6] The costs of disposable items required for a procedure are also substantial, adding a large premium to each surgery performed. If clear and measurable benefits result from robotic surgery, then these costs may be easy to defend and should be supported. But a fundamental issue is why, if the benefits are so tangible, does robotic surgery occur predominantly in private facilities? It may be that the funding is only available within the private sector, or it may be due to a lack of current clear evidence that there is true benefit associated with this technology.[7] Indeed, if all the robots were removed from surgical practice tomorrow, the impact on the health care system would not be significant; the overall cost may, in fact, drop.

The introduction of robotic surgery has many potential advantages. It makes difficult and previously inaccessible body areas easier for surgeons to access and may lead to decreased morbidity for patients.[7] There are exciting prospects for using robotic systems remotely — where the surgeon operates on a patient who is heading to Mars, remotely located in Antarctica, or close to the frontline of a battlefield — none of which are beyond the realms of possibility with the level of technology currently available.[8,9] Furthermore, the possibility for surgeons to perform simulated surgery based on a patient's imaging information and to prepare a range of operative strategies for difficult and complex cases will be greatly facilitated by the availability of robotic systems that are

interfaced with computed tomography and magnetic resonance imaging scans and ultrasound information, all brought together in a virtual surgical environment.[7,8]

We need health professionals who are excited by new developments and new opportunities. Without them we would still be practising surgery as it had been done for hundreds of years. It is unfortunate that our health care system spends much of its energy trying to hold back innovation and development on the basis that funding is unavailable or evidence of benefit is yet to appear. Evidence demonstrating the value of new surgical interventions takes time; its acquisition needs to be properly funded and supported and it needs to be honestly collected and evaluated. Since the Australian Government is the major funder of health care in Australia, and even in the private sector contributes 75% of the scheduled fee for surgical procedures, it has a vital interest in setting up systems where all new surgical technologies (the robot being no exception) are monitored, evaluated and reported on. Most such systems are currently somewhat ad hoc. One exception is the Australian Safety and Efficacy Register of New Interventional Procedures – Surgical (ASERNIP-S), an organisation run by the Royal Australasian College of Surgeons with funding from the Australian Government to evaluate new surgical technologies (http://www.surgeons.org/asernip-s/).

If we are to have cost-effective surgical care that is innovative and relevant, we need the Australian Government to recognise that for all important new technologies, trials are established, data collected and the information fed back to hospitals, doctors and patients. There is clearly a cost involved in such activities, but introducing a poor technology without clear patient outcomes in the long term is a much more expensive activity. The challenge for surgeons and government is to work together as a team, with the surgeons agreeing to appropriate protocols and careful evaluation, and the Australian Government recognising that this innovation needs to be funded from the public purse.

"Toys for boys" implies a somewhat frivolous approach to new technologies. This is probably not the case. Rather, surgeons — male or female — are excited by new technologies and the possibilities they offer for the care of their patients. Robotic surgery will become commonplace over the next 10 years. These machines will not replace surgeons, but will provide added precision and enable surgeons to work on difficult cases, regardless of location. The robots will become cheaper, smaller and easier to use. There will be tactile feedback mechanisms and instrumentation integrated into the robot's arms to enable imaging and sampling to occur at the same time as the procedure is being performed. Just as artificial hips, heart valves and heart/lung machines seemed far-fetched 50 years ago, so too we will look back on this first decade of robotic surgery as the beginning of a major change in the way in which surgery is evaluated and delivered, and care is managed for patients.

Competing interests

I am the Surgical Director and a member of the Management Committee of ASERNIP-S.

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