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THE ETHICS OF SURGICAL INNOVATION

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Introduction

Technological developments in surgery take place a dizzying speed. Over the forty years of my professional career, innovation after innovation has changed the landscape beyond recognition. My own experience as a general and trauma surgeon in the 1970s and 1980s was rooted in ‘open surgery’, where surgical teams make an incision into a patient’s body (usually under general anaesthetic) and see directly the organs and structures they need to work with. In the late 1980s a pivotal change took place, as minimally invasive (‘keyhole’) surgery was introduced and rapidly became widespread. Before long, this radical approach became widely adopted and soon formed part of everyday practice. Since then, more and more procedures are being carried out using minimally invasive techniques. For many surgeons, such approaches have become ‘normal’, and the techniques of open surgery are becoming unfamiliar. Yet the events surrounding the introduction of new surgical approaches quickly fade from view. The ‘dead ends and blind alleys’ of innovation - those technologies, instruments and procedures that were trialled but did not become mainstream, or which were superseded by further advances at a time of rapid change - are seldom documented. It is easy to have an oversimplified picture of technological advance, especially in retrospect.

Advances in imaging and the specialist skills of interventional radiologists have created new ways of thinking about surgical procedures. Many conditions that would previously have required open surgery (with the need for large incisions, extended stays in hospital and significant time off work to recover) can now be treated by introducing flexible wires into an artery under local anaesthesia and carrying out procedures on the heart, the brain or the vascular system. Previously clear-cut distinctions between surgical and non-surgical treatment are becoming blurred.

Innovation continues, and much current attention focuses on robotic (or robot-assisted) surgery. This too shows a cyclical path. The UK’s first robot-assisted laparoscopic cholecystectomy (removal of the gallbladder) was performed by Professor Lord Ara Darzi at St Mary’s Hospital (part of Imperial College London) in 2000. Since then, robot-assisted surgery has become mainstream, especially in some branches of surgery such as urology. These developments are taking place in a context of incessant technological advance in every area of life. Autonomous devices, from drones and self-driving cars, are becoming increasingly familiar in our society, while developments in machine learning are transforming many aspects of everyday life.

The surgical developments outlined above have been fuelled by constant advances in technology. These include energy sources, lasers, fibre optics and innovative imaging techniques. More recently, artificial intelligence and machine learning are changing our understanding of the process of diagnosis, while virtual and augmented reality bring new ways of visualising the human body and thinking about disease. Wider issues around the intersection of molecular biology, genetics and metabolic medicine are radically reshaping how surgeons think about prevention and treatment of conditions that formerly required major operations.



Yet alongside these technological advances has gone another radical shift - this time in the relationship between society and the medical profession, between patients and clinicians. Previously uncritical levels of trust and belief in authority have been replaced by a sense of unease and uncertainty. A succession of high-profile incidents and scandals has challenged the sense of unquestioning confidence in the clinical professions. Technological developments must take place within an ethical framework. Often the question is not ‘*can* we?’ address a clinical problem using a new technique, but ‘*should* we?’

This lecture explores the questions which new technologies raise. In it I examine how the shifting relationships between people and institutions play out against the increasing power of technology to bring about change and open new possibilities for treatment.

Looking back to the past

I begin by tracing some of the developments I have experienced in the course of my career. I have explored these by documenting the experiences of older clinicians. Drawing on a body of work with long-retired surgical teams, I look back to an earlier time when surgery seemed simpler, at least in retrospect. The repertoire of available operations was shaped by what could be done using instruments that were extensions of a surgeon’s hands - forceps, scalpels, needles and thread. Though such operations now seem limited in scope, they were often pressing up against the boundaries of what was possible at the time. Always too there were pioneers, and always there was risk. Always there was tension between what could be done technically and what was acceptable in a wider sense.

An instance was the world’s first heart transplant (performed in December 1967 by Christiaan Barnard and his team at Groote Schuur Hospital in Cape Town), which led to a flurry of similar operations across the world. This initial enthusiasm was soon dampened by a series of failures and disappointing results which brought a sense of realism. It became clear that successful transplantation required enormous experience and highly experienced multidisciplinary teams. Early failures in the UK led to the temporary shut-down of cardiac transplantation in this country, and it was years later that the current highly successful programme became established.

John Wickham (whose work I explored in an earlier Gresham Lecture) was a lifelong pioneer, whose contributions helped to reshape notions of surgical intervention. A revolutionary thinker, Wickham had a profound influence over the development of keyhole surgery in the 1980s. But his innovations continued throughout his career. After establishing the potential of laparoscopic surgery in urology, he argued for its widespread adoption within other branches of surgery. He became an early advocate for extracorporeal shockwave lithotripsy for urinary tract stones, and he developed an autonomous robot for performing prostatectomy (removal of the prostate gland). Well aware of the need to provide his patients with a clear understanding of the risks and benefits of ground-breaking techniques, he told me that his patients would often ask to be treated by the latest technique he was developing, without having any clear idea of its advantages or possible drawbacks. The challenges he described in providing a balanced picture of the risks and potential benefits of new technology are even more pressing today.

Looking ahead to the future

After setting the scene by describing this background of continual innovation, the lecture will move to a conversation with a leading surgeon, Mr Chris Peters. A consultant at St Mary’s Hospital, Paddington (part of Imperial College London), Peters specialises in treating cancer and other conditions affecting the upper gastrointestinal tract, especially the stomach and oesophagus (gullet). He has a longstanding fascination with surgical technology and is especially interested in the potential of surgical robotics and the issues and challenges as well as the opportunities raised by new



technologies. For example, advances in robotic surgery are bound up with the vested interests of commercial companies who develop new systems and wish to market them.

In this conversation we will explore how the historical currents outlined above are playing out in contemporary healthcare, and how the continual evolution of innovative approaches from ‘new’ to ‘normal’ to ‘old’ must become part of every surgeon’s skill set as their career progresses. We will discuss how ethical considerations are a crucial part of surgical practice and investigate some of the challenges as well as the opportunities which surgical innovation presents, both to individuals and society. In our discussion we will examine how clinicians might navigate the conflicting tensions of scientific research, technological development and pressures from industry as they try to provide the best possible care for their patients.

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