

Saws and Scalpels to Lasers and Robots – Advances in Surgery

Clinical Case for Change: Report by

Professor Sir Ara Darzi, National Advisor on Surgery



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Saws and Scalpels to Lasers and Robots – Advances in Surgery

The way surgery is organised must change so that patients benefit from surgical advances says Professor Sir Ara Darzi, National Advisor on Surgery.

Introduction

Ten years ago I used to get to know my patients as they convalesced on wards. Now, most of them are gone the day after the operation.

Two decades ago the only way to deal with gastric ulcers was to spend hours removing large parts of a patient's stomach. Now, drugs have made such operations redundant.

Cutting people open is no longer the focus of modern surgery. Professional merit is measured by the precision of an incision, not its breadth. In the early 19th Century it would have been fair to describe surgery as butchery but in the early 21st it is a fast moving technological science.

In the last two decades surgeons have concentrated on reducing the physical and psychological impact of surgery on patients by minimising the size of the cuts we make or finding new ways to produce the same results.

And the growth of faster, more effective, minimally invasive surgery is forcing the NHS to look at the way it organises its surgical services.

One major change in recent years has been the separation of planned surgery (known as elective surgery) from emergency surgery. Traditionally, surgeons have covered emergencies whilst performing planned work. This meant that if patients who had been admitted as emergencies over night needed emergency surgery the following day, that surgeon's planned operations would have to be postponed.

Emergency surgery is now recognised as highly specialised and best kept separate from planned care. To achieve this separation, in the late 90s the NHS began opening treatment centres that did nothing but planned hip and knee operations.

Benefits of Keyhole Surgery

1. Smaller incision means less physical and psychological trauma for the patient
2. Reduced chances of complications like infections
3. Patient regains mobility quicker and recovers faster
4. Increased cost balanced by shorter hospital stays and fewer readmissions

This kept apart emergency and elective care, preventing continual disruption and enhancing quality. There are now 33 NHS treatment centres in the UK alongside 22 independent sector treatment centres.

Planned Surgery

Planned surgery can incorporate everything from small procedures such as removing moles to organ transplantation and the people who need these operations make up the majority of the NHS's waiting lists.

In recent years there have been dramatic reductions both in the size of the overall waiting list and in the length of time people are waiting.

The number of people on inpatient waiting lists has fallen from 1,158,000 in 1997 to 736,500 in February 2007.

To build on these improvements the Government has now said that no-one should wait more than 18 weeks for treatment after being referred by a GP.

How we approach planned surgery will play an important part in achieving this target.

The increased use of day surgery is crucial. As operations have become less invasive, patient turnover has increased without any loss of safety or quality, and patients have been able to recover quicker.

Surgery in Numbers

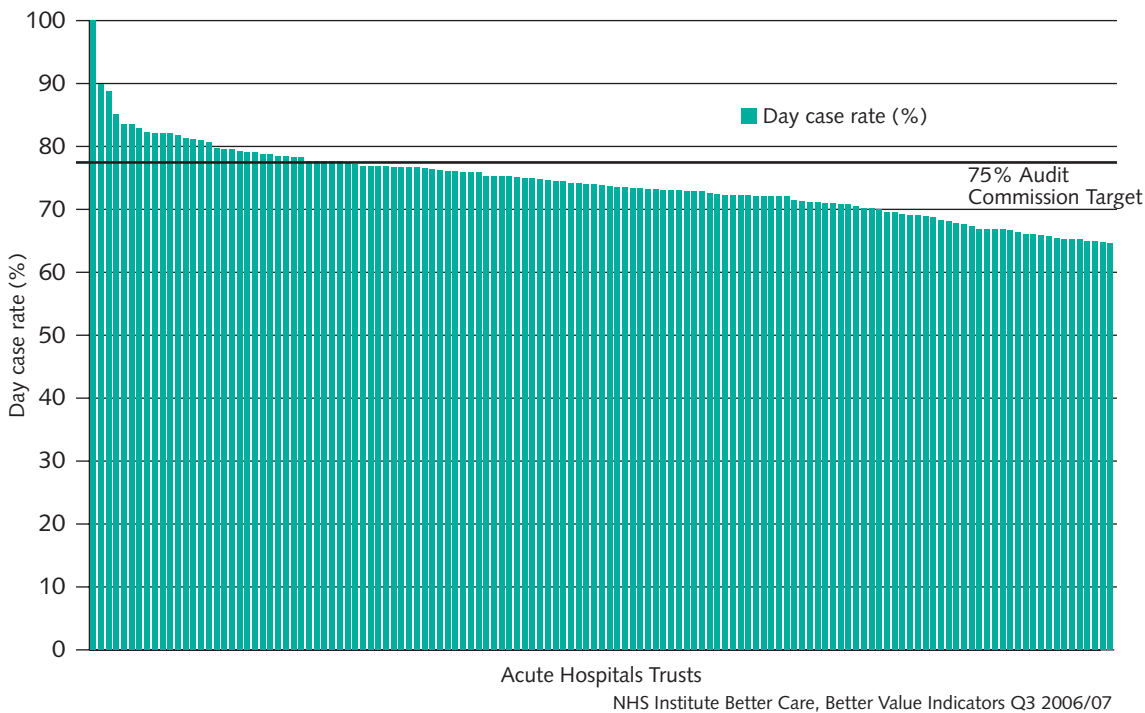
1. Cataract operations have risen from 216,741 (1999/0) to 309,552 (2004/5)
2. Consultants posts have risen from 21,470 (1997) to 31,990 (2007)
3. Waiting – 1988 10% of people waited more than 2 years now standard maximum wait is six months
4. Some trusts have increased day case rates by 6%–10% in a single year

Procedures that used to require lengthy inpatient stays can now be done as day cases, with the patient going home after the operation.

For instance, over 90 per cent of cataract removals are now done as day cases – some even in mobile surgical units. It also means the threshold for treatment has been lowered. Many more older people now receive treatment because the risks have been dramatically reduced.

I remember during my surgical training in the early 1980s, patients were kept in bed after a hernia operation. Now, most routine hernia patients have their surgery and then go home the same day, although this is one of several areas where the day case rate could be even higher still.

The Audit Commission has identified 25 operations or admissions and estimates that 75 per cent of these should be carried out as day cases. The Commission estimates that if all trusts achieved an average 75 per cent day case rate across these procedures then at least 390,000 bed days could be freed up. This would save £78 million, based on £200 per elective patient bed day. The scope for improvement is illustrated in the following graph.



In 2008, planned surgery will also be affected by the introduction of free choice. Patients will be able to choose to have their operation at any NHS Acute Trust, Foundation Trust, independent sector treatment Centre or approved independent sector hospital they want.

It is unclear how this will affect demand at different hospitals but surgeons shouldn't be surprised if, given a choice, patients opt for smaller scars, shorter stays and greater immediate mobility.

Technological Revolution

Procedures such as laparoscopies and endoscopies (so-called "keyhole" surgery) are conducted with small instruments and a video camera probe, so they only require a small incision to the body. The use of lasers in surgery is also increasing and they are now a safe alternative to stripping out varicose veins.

These new, less invasive procedures are good news for patients. Minimally invasive surgery means smaller scars and less risk of a post-operative infection. Patients also recover more rapidly – if your abdomen has been cut open it obviously takes a lot longer for you to heal and recuperate than if you have a cut a few centimetres long. Because of these benefits to the patient a significant part of my practice is now performed laparoscopically.

Given a choice between a traditional open operation on her tummy and keyhole surgery Sarah Humphreys, 19, was certain she wanted the operation that would have the least impact on her body.

Sarah has Crohn's disease and needed a large section of her ulcerated bowel removed. She is studying Philosophy and Sports Science at university and didn't want to spend weeks in hospital recovering from the open procedure.

After keyhole surgery she was left with four one centimetre scars on her tummy and left St Mary's Hospital, London, after three days.



Keyhole techniques – the picture above shows the type of "keyhole" surgery Sarah Humphreys underwent

Sarah said: "It was uncomfortable for the next month but I was moving around almost immediately. Due to my condition of Crohn's disease, I know I'm likely to need more operations and I'm definitely going to choose keyhole surgery now I know it is available."

For surgical teams, advances have changed the way they work. On the one hand, routine surgical procedures can now be done safely outside large acute hospitals. On the other hand, to deal with the most complex cases surgeons have become more specialised.

Where once a surgeon may have performed many different procedures, now surgeons concentrate on specific organs and parts of the body. Increasingly, they will sub-specialise even further. To support this highly skilled work requires a multi-disciplinary approach using specialist anaesthetists and nurses.

Surgery Provided More Locally

Operations that can be done locally

1. Hernias
2. Cataract removal
3. Varicose vein treatments
4. Removal of small skin lesions
5. Removal of gallbladder

The ability to provide more surgery locally, coupled with greater specialisation for complex cases could result in an 80/20 split for planned surgery in future. Local hospitals could carry out 80 per cent of surgery, mainly as day cases and short stays, with the remaining 20 per cent of planned surgery being carried out at specialised centres, such as those for trauma and cancer.

Some of the 80 per cent, such as minor surgery under local anaesthesia, could be carried out in community hospitals, health centres or even large GP practices. This means patients will not have to travel to large acute hospitals for treatment.

David Colin-Thomé, in his report *Keeping it Personal*, gives the example of Epsom Day Surgery Ltd, a company run by GPs that carries out day surgery at the Old Cottage Hospital in Epsom. Consultants come out of their large hospitals to do the day case procedures at Epsom, so quality is high.

Centralising Complex Surgery

Best practice means ensuring the most complex cases are done by the most highly skilled surgeons and their teams. By doing this, specialist care will improve – it is common sense that a surgeon carrying out a large number of complex cancer operations a year will gain more experience than a surgeon carrying out a few and a growing body of medical evidence confirms this.

Operations that need to be centralised

1. Complex cancer surgery
2. Surgery of blood vessels
3. Transplantation
4. Removal of brain tumours
5. Open heart surgery

Prostate cancer is the second most common cancer for men. It is increasingly being treated laparoscopically and one new technique for doing this is a Robotic Prostatectomy. This uses the latest technology to operate on patients with prostate cancer. The equipment is very expensive and a lot of specialist training is required to use it. It clearly would not make sense for every hospital to offer such treatment.

Centralisation allows specialist teams to carry out more complex procedures and consequently improve the care that patients receive. It also creates the best environment for training new specialist staff. The specialist centres will want to move patients out of acute beds into more local intensive recuperation facilities within days, not weeks.

Emergency Surgery

Sir George Alberti made clear in his report on emergency access care that every service cannot be offered in every local hospital in the country. This is especially true of emergency surgery. In my experience relatively few accident and emergency (A&E) attendees need emergency surgery.

Just like complex planned surgery, emergency surgery needs specialised staff and 24-hours-a-day, 365-days-a-year access to specialised tests and scans to quickly assess a patient's needs. Alongside the surgical team you need high quality intensive care and high-dependency facilities when the patient comes out of surgery. This type of care is labour intensive and there are not enough patients to justify its provision in every hospital. It needs to be done at larger hospitals with the appropriate specialist services.

In future, emergency surgery should be provided in fewer, more specialised centres, where expertise can be developed and trauma treatments can be offered.

If Mr Smith suffers major internal injuries after being knocked off his motorbike at one o'clock in the morning he will be attended very quickly by an ambulance crew. They will stabilise his condition and take him to the nearest specialist emergency surgical centre – not necessarily the nearest hospital. His internal injuries will be quickly examined and the consultant-led surgical team will operate immediately. Recuperation will follow in intensive care followed by rehabilitation at his local or community hospital.

At present, if Mr Smith is taken to his local hospital at 1am the most appropriate surgical expertise would be unavailable, and there may not be the necessary infrastructure in place to treat him. He might be transferred, but by the time everything was organised Mr Smith would most likely have suffered further harm or even died from his internal injuries.

Hospitals with A&E departments that do not offer emergency surgery can still offer a surgical opinion where this is appropriate. This could be done in person; telemedicine may be used so that an A&E doctor can get surgical advice. For instance, Miss Jones' x-ray may reveal a fractured wrist and fragments of detached bone. In future, an A&E doctor could use the national Picture Archiving and Communication System (PACS) to send the x-ray to a surgical consultant at a specialist service. They will be able to say whether surgery is required or if the bone will heal naturally in a cast.

All emergency care will be managed in a network and if a patient needs to be transferred to a specialist service, this will be done quickly and safely.

Conclusion



The Da Vinci Robot – this is the state-of-the-art equipment currently used by Ara Darzi at St Mary's Hospital

In recent years we have seen the biggest changes to surgical practice since its inception as a medical and scientific discipline in the nineteenth century.

Advances will continue, with new technology and procedures being utilised almost daily. For instance, some hospitals are starting to 'fast track' surgical patients. This involves working in partnership with a hospital's home care team and incorporates the use of telemedicine.

Normally, following complex surgery a patient can stay in hospital for up to 10 days, but a 'fast track' patient having the same procedure can be discharged after four days and be monitored by visits from a

home care team who send electronic updates of the patient's physiological parameters to the surgical teams and GPs.

Minimally invasive techniques will continue to improve. In the next ten years, endoluminal surgery – entering the body through its natural “holes,” such as the throat – will become the standard method of treating many complex cases. Better diagnostics will also help most surgery to become non-invasive.

The sophistication of the instruments we use will develop rapidly. “Snake” robots are already being designed to weave their way around the human body equipped with lights, high frequency cutters and sealers.

Yet, as this report shows, for these advances to have the biggest impact, the services the NHS offers must change. Surgery now is radically different from in 1948 or 1980, so it follows that surgery should not be provided in the same way as in 1948 or 1980.

How and where surgery is provided by the NHS must develop to follow the most modern clinical practices. This means we must localise surgical care where possible and centralise it where necessary.

Short History of Surgery

C 600 BC – Sushruta practising plastic surgery in India

C 1180 – Rogerius publishes *Practica Chirurgiae*, a medieval treatise on surgery

1308 – Many barbers also practice surgery.

1800 – Royal College of Surgeons established

1846 – William Morton uses first modern anaesthetic in Boston

1867 – Joseph Lister publishes article on the use of antiseptic

1948 – Surgeons can amputate diseased limbs to save lives. Surgery is highly invasive

1980 – Organ transplantations are occurring. Surgery requires long stays in hospital.

2007 – Surgery makes use of micro-instruments and robotic technology. Many procedures done as day cases. Surgeons work in their own highly specialised niches.



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