

# Surgical challenges in the twenty-first century

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To know where we are going, it is important to understand where we have been. Remarkable advances took place in health care delivery during the last part of the twentieth century profoundly changing the practice of surgery. Such advances include the development of imaging techniques, minimal access operations, endoscopy, catheter-based therapies, laser, information technology, and computer-based surgery. The coalescence of these innovations with unique achievements in molecular biology, molecular genetics, and pharmacogenetics will pave the way for further improvement of the standard of surgical care and stimulate future surgeon-scientists to keep surgery at the pole position. The old days were good, but they are gone. Now we must rise to meet numerous challenges ahead as our world is developing not only in science and surgical technology but also in demography, health care structures, economy, communication and the public's overall knowledge, expectations and demands. Some of these challenges will be discussed in more detail in this paper.

## Societal and systemic forces

The development of high-speed communications has made the world smaller and human migration and mobility are on the point of equalizing the global diagnosis panorama. The travel time from the most distant country is shorter than the incubation period of most infections [1]. Thus, the perspective of surgery should also be global.

Among the changes which will have a significant impact on surgery is aging. People over 85 is a rapidly growing group in the

Western world and they are the most likely to have chronic care needs. As surgeons play and will continue to play an important role in the management of cardiovascular disease, cancer, diabetes, and joint- and neurodegenerative diseases we are encouraged to elaborate a strategic approach for these growing patient groups.

In Sweden like in many other Western countries there are since some ten years more women than men entering medical school. Still, however, there is a substantial gender gap in the composition of surgical staffs. We must, thus, build flexibility into residency work schedules so that women can incorporate pregnancy and motherhood into their years of surgical training. At the same time as there are proportionally more women in the medical school the overall number of applicants are decreasing as are those choosing surgery for residency. This is to some extent explained by the changes in lifestyle now openly adopted by young surgeons, irrespective of gender. They want shorter workweeks and more time for their families and other values in life. Here we have an urgent challenge to make any effort to attract the best young people back to surgery.

The advent of the internet, teleconferencing, and e-mail has dramatically changed the speed and quality of worldwide communications. Patients are now ready to present us with the "latest and greatest" information. The well-informed public will have profound effect on the practice of surgery and patients will play a more dominant role in their own care. They will choose those hospitals and doctors who in an evidence-based way show the best and safest outcome of their treatment programs.

## Surgical education and training

The knowledge explosion in medicine is a principal cause of development of the specialization seen during the last two decades. The rapid and profound advances in medical technology has increased the complexity of surgical, interventional and intensive care and fueled further specialization and sub-specialization. In countries like Sweden the limited workhours

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(40 hours a week) in addition have enforced subspecialization so that the surgeon get a reasonable volume of patients within his or her specific area of interest [2]. Thus, the general surgeon in the true sense of the word, is an endangered species in our country as in most other Western countries. Young surgeons start early focused training in upper abdominal, colorectal, endocrine, breast, or vascular surgery; in the university hospitals, upper abdominal surgery is often divided into hepatic/biliary/pancreatic surgery versus upper gastrointestinal surgery. Subspecialization is probably a major cause of the improved outcome after surgery, which we have achieved in recent years. It has, however, negatively influenced on call work because modern Swedish surgeons do not always possess sufficiently broad surgical experience. Furthermore, the newly hatched specialists (normally about five years resident training program) are not ready to take independent responsibility for hospitalized patients in general surgical wards. A training period as junior specialist of six to eight years is normally required before they gain promotion as consultants. This situation largely reflects the low resident caseload in Sweden. A challenge for the future is to find ways to secure both the quality of highly specialized surgical care and that of basal care and emergency surgery.

### Interdisciplinary care

As a consequence of the knowledge explosion and specialization/subspecialization health care has shifted form being specialty-based to be disease-diagnosis-or problem – based meaning that patients will be expected to be cared for in an environment based on disease rather than the method of treatment. It is logical to envisage surgeons as leaders of teams of specialists including e.g. HPB-surgeons, oncologists, radiologists and pathologists for the management of patients with liver, pancreas, bile duct, and gallbladder cancer. Even if the skill of the individual surgeon is important it seems to be even more crucial that the multidisciplinary treatment teams develop substantial experience in the management of the patients. It is becoming more and more difficult for the different specialists to defend their turfs and a future challenge is for all of us to open our minds and start walking side by side for the sake of our patients. This will link us together for a shared process of diagnosis, treatment, care and research.

### The volume-outcome relation

There is considerable evidence that patients undergoing various kinds of complex treatments or high-risk surgical procedures have lower mortality rates and otherwise better outcomes if care is provided in centers that have a high caseload of patients with the same condition than if care is provided by hospitals with low caseload of such patients. In 1977 we reported that senior surgeons especially trained in pancreatic surgery had significantly lower hospital mortality after total pancreatectomy than the general surgeon undertaking such operations once in a while [3]. Two years later the first study dealing exclusively

with the volume-outcome association was published by Luft et al. [4]. Their seminal observations of a relation between higher volume and better outcome have been supported by approximately 300 reports in the English-language literature. Most of the studies have analysed the effect of volume on hospital mortality. Compilation of earlier studies suggested that hospital volume had a greater impact on the outcome than the volume of the individual surgeon [5]. Recently, however, Birkmeyer et al. in an extensive study on eight different surgical procedures convincingly showed that the observed association between hospital volume and operative mortality was largely mediated by surgeon volume, though, to a degree that varied according to the procedure [6]. Some of the studies have included information showing lower complication rate at high-volume hospitals after e.g. esophageal, pancreatic, prostatic and thyroid surgery. Other authors have reported shorter postoperative stay at high-volume centers. If complication rate is low and hospital stay short, the cost should be reduced as well. This has been documented for at least four cancer operations and recently also for bariatric surgery [7].

In addition to the influence of hospital volume on the early surgical outcome, there is an increasing bunch of evidence suggesting that patients live longer after operations at high-volume centers for cancer of e.g. the rectum, colon, pancreas, lung and breast [8].

The majority of studies on the topic are done in the USA [9]. Recent reports from Canada, UK, The Netherlands and Finland have, however, come to the same conclusions as the US ones [10-13]. Still the referral pattern has remained practically unchanged in most countries, and few if any signs of regionalization of complex procedures have been seen. In the Netherlands, 40% to 46% of pancreaticoduodenectomies continue to be done in low volume units [12] and such operations are practiced in 50% of Swedish hospital, most of which do less than three operations annually [14]. However, with more and more patients seeking information on the outcome of surgical treatment the reality is that regionalization will get going and will continue to evolve.

### Advances in science and technology

As mentioned above profound advances in science and technology during the last two to three decades is already changing and improving surgical practice. Technological innovations have previously had a major impact on the progress of clinical practice of orthopedics, neurosurgery, ophthalmology, otolaryngology, and urology, and more recently cardiac and vascular surgery. Advances in imaging, faster computers, and advanced software will influence the way we offer clinical solution to the patient's problem. The other side of the coin is the need for evaluation of the technology and its application, its introduction into practice, and the training of surgeons. For training medical simulators will be increasingly required and they will also have the capacity to assess the technical competence of the surgeons, which certainly will be a challenge to most of us as it was to pilots when similar measures were taken by the aviation industry a couple of decades ago.

## Increasing demands on risk-free operations

After the report, *To err is human*, was published by the Institute of Medicine in USA in 2001 there has been an increasing focus in the Western world on how to improve patient safety [15]. These efforts take place at the same time as diagnostic and therapeutic procedures due to the paramount advances in technology are becoming more and more complex and intricate putting increased demands on the competence, skill and judgement of those who deliver the care. We take as surgeons minor or major calculated risks almost every day e.g. when we operate on ruptured aortic aneurysm, myomatous uteri, gallbladders or on tumours in frail and elderly patients weighing the risks of the disease against the risks of the procedure. The increasing use of prophylactic operations for genetically predestined malignant disease is a new challenge to us that will request practically risk-free operations as we in fact are operating on healthy individuals. Will parents accept any risk either as hypoparathyroidism or recurrent nerve injury in a child less than five years with the RET proto-oncogene identified? This question was asked by Murray Brennan, who coined the word preemptive surgery to this kind of prophylactic operations [16].

The overwhelming challenges for the twenty-first century is to develop surgery in such a way that the patients will be managed with optimal safety and optimal outcome. I have discussed some areas in this paper which we need to tackle to be able to approach these goals. The ideas I have suggested are just presented as food for thought.

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