

# Balancing the paradox of medical-surgical advances: a historical perspective on the current situation in thoracic surgery

Diego Gonzalez-Rivas<sup>1,2</sup>, Humberto Aymerich<sup>3</sup>, Kristin Eckland<sup>4</sup>

<sup>1</sup>Department of Thoracic Surgery and Minimally Invasive Thoracic Surgery Unit (UCTMI), Coruña University Hospital, Coruña, Spain;

<sup>2</sup>Department of Thoracic Surgery, Shanghai Pulmonary Hospital, Tongji University School of Medicine, Shanghai 200433, China; <sup>3</sup>Department of Anesthesia, Quirón Hospital, Coruña, Spain; <sup>4</sup>Department of Nursery, Baptist Medical Center, Memphis, Tennessee, USA

*Correspondence to:* Diego Gonzalez-Rivas. Department of Thoracic Surgery, Coruña University Hospital, Xubias 84, Coruña 15006, Spain.

Email: diego.gonzalez.rivas@sergas.es.

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Technical innovations and medical progress derived from this technology has produced enormous health and societal benefits. Millions of people today, including some readers of this article, are alive owing to these developments. The vast majority of people currently living owe their health to technology; whether from the ability to diagnose illness through radiographs and the work of Madame Curie, cure infection via antibiotics, treat injury and disease using surgery, medications and chemotherapy or the ability to avoid illness altogether, through the development of vaccines.

## The medical renaissance

According to most historians, the modern medical and surgical renaissance began in the mid-19th century with the American dentist, Horace Wells' discovery of anesthesia in 1844. Notably, Dr. Wells did not attempt to patent his discovery, as he believed that the knowledge behind analgesia and pain relief for his patients should be "as free as the air" (1). The author, Jurgen Thorwald likens this discovery to Prometheus's gift of fire, with surgery before that date as a time of "ignorance, suffering and sterile groping in the dark" (2).

Following this discovery, during the late 19th and early 20th centuries came a period of almost endless optimism and idealism as discovery after discovery and innovation after innovation rapidly changed the course of human history, illness and disease, as we seemed poised on the very verge of conquering death itself.

Ironically, many of our greatest triumphs in medical innovation came at the cost of the devastation of generations, through the might of military medicine. The Crimean War brought us the knowledge of regarding the basics of hygiene, just as the American Civil War led to the development of the first modern prosthesis (3). The Great War was a boon to the development of modern trauma, orthopedics and plastic surgery as well as infectious disease, and pulmonary medicine as a result of both the influenza epidemic and the first widespread use of chemical warfare. Modern machine guns and life in the trenches gave surgeons amply opportunities to hone their skills. The Second World War expanded this knowledge base, as well as the repercussions of the decision to use the atomic bomb on Nagasaki and Hiroshima well-before the long-term effects of radiation were fully understood. Korea brought the development of modern day medical units, and more challenges to our understanding of infectious disease (Hantavirus) and the limitations to newly discovered antibiotics. At the same time, by mid-century, these great technological leaps in medicine and surgery brought forth a sense of societal wide disappointments about the limitations of medicine, as well as the limits of humanity itself, to overcome the tragedies of pain and suffering of illness, disease and disability in its many forms. Whereas previous generations better understood and accepted the frailty of human existence in the era before vaccines, antibiotics, and other treatments for common infections, this new generation struggled to understand concepts like overwhelming sepsis. When cancer was always a death

sentence, people understood. But once cancer (and other illnesses) became battles to fight against, doctors and patients struggled with failure when the skirmishes were ultimately lost. Stefan Zweig characterized this continuum as “faith in the uninterrupted and unstoppable progress towards the best of all worlds” to “pessimism reflecting the programmatic and deliberate dogma of anti-humanity” (4).

As a society, as we continue to pursue technology to improve the health, wellness and longevity of our citizens, we encounter several obstacles. These obstacles include balancing costs with benefits and the role of proprietary interests versus shared knowledge in advancing technologies.

In his 2001 article, Cutler argues that “Medical technology is valuable if the benefits of medical advances exceed the costs” (5). While this seems obvious to many clinicians, modern medicine ignores this caveat on a daily basis as we push the thresholds of financial sustainability and human longevity in the pursuit of individual survival with costly therapies such as ECMO, LVADs, and transplant along with target based chemotherapy regimens. From a global perspective, we all agree that medical progress should be tempered with fiscal responsibility when discussing skyrocketing health care costs, expanding technologies and shrinking resources. However, when it comes to our own individual practices, we are more along the lines with Joseph Stalin, “One single death is a tragedy; a million is a statistic of deaths.”

Physicians can no longer live outside this reality; instead, we need to assume an active role in both pursuing education in emerging technologies and fair and practical utilization of scarce healthcare resources.

However, we also need to temper the desire to control costs with the real benefits that technology brings. To use an example akin to that of Cutler *et al.*, comparisons between surgical resections in eligible patients with early lung cancers and chemo-radiation can be applied. Not only is surgery the most cost effective treatment, it also offers the best outcomes in terms of patient survival. It becomes more problematic when this same scenario is applied to later stage cancers, when deciding between the more expensive procedures such as pleural decortication with adjuvant chemotherapy versus the much cheaper, but essentially palliative options of PleurX-type catheters or bedside talc pleurodesis. This is where economists, financial managers and insurance companies’ opinions may differ significant from that of the clinician (or the patient,

for that matter). This is also where Stalin’s paradox between “the million” and “the one” becomes evident. Rationing surgical care among a faceless statistic group is very different from applying it to a living breathing patient, even when the application criteria are exactly the same. The successful marriage of cost-containment and surgical advancement is not unobtainable. In fact, uniportal surgery is an excellent example of this. Unlike other areas of emerging technology in thoracic surgery like robotic surgery, uniportal surgery does not require a huge upfront expense for additional equipment, nor does it require expensive upkeep. There are a handful of useful surgical tools that facilitate the conversion to uniportal VATS but the procedure otherwise builds on existing technology, allowing surgeons to use existing equipment. This is important for the second aspect of surgical advancement: knowledge-acquisition.

Essential to the advancement of thoracic surgery is the process of incorporating newer technologies; i.e., knowledge-acquisition. A basic principle of this knowledge-sharing is the free and unimpeded exchange of information including the technical aspect of new and advanced techniques. Knowledge-sharing needs to be separate from financial gain. Historically, in surgery, this has not always been the case, and this has been to the detriment of society at large. A famous example of proprietary hoarding of medical knowledge is the Chamberlain family of physicians (6). In the early 1600s, one of the sons of surgeon William Chamberlain developed a new surgical tool; the obstetric forceps. This was so shrouded in mystery that historians cannot even accurately state which son deserves the credit for its design. The family of surgeons steadfastly kept this instrument secret, while using it to care for the rich, well-born and royal families of Europe, during a time when both women and their off-spring faced graved risks merely from the act of childbirth itself. For over 100 years, the wealthy patients of the Chamberlain family received the benefits of these instruments which spared many of the traumatic and often fatal injuries caused by obstetrical hooks. In return for their services, the Chamberlains found much royal favor, including royal pardons for numerous offenses (7). It wasn’t until 1733, that other surgeons developed similar tools, perhaps based on information provided by the Hugh Chamberlain, on his deathbed (8).

This hoarding of specialty knowledge and skills continues to plague thoracic surgery. While few modern day surgeons practice on this level of secrecy, there still

exists unwillingness among many to freely share the shortcuts and observations based on their experiences. In many first world nations, thoracic surgery training, and medical education in general, remains incredibly expensive, placing out of reach for many interested students. In other cases, the acknowledged ‘masters’ of the field are unwilling to share their techniques outside of expensive courses, or limit the sharing of their experiences with students from other, less-advantaged nations. This is not just important in the acquisition of skills related to state of the art, or minimally invasive techniques, but for the basics, the principles of the specialty, like thoracotomies. If newer surgeons lack these basic skills, they are hindered from truly mastering the specialty, and have been reduced from master surgeon to the level of surgical technician; going through the steps without fully understanding or appreciating the process or its application. Until we can change these scenarios, address the paradox and clearly answer the question “Is there any place in surgery for withholding technology for financial gain?”, thoracic surgery will sit at the crossroads.

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### Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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