

Original Article

The Ninth Annual George R. Daicoff Lecture†: The Morality of Innovation: A Twentieth Century Surgical Legacy

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IT IS A GREAT HONOUR TO HAVE BEEN ASKED TO deliver the Ninth Annual George R. Daicoff Lecture. I met Dr Daicoff 18 years ago, when I first attended a meeting of the Congenital Heart Surgeons' Society. He had been one of the sixteen pioneers of congenital cardiac surgery who had founded that organization many years earlier. Some of the earliest contributions of Dr Daicoff date back to an era when congenital heart surgery was truly in its infancy. An example of these contributions is an often cited report published in *Circulation* by Dr Daicoff and Dr John Kirklin of the Mayo Clinic in 1967 entitled "Results of Operation for Atrial Septal Defect in Patients Forty-five Years of Age and Older," which established that adult patients have significantly longer survival with closure of their defects.¹ This pattern of innovation and productivity continued as Dr Daicoff imported paediatric heart surgery to Florida. It is in the spirit of honouring this history of innovation that I have chosen the topic of this presentation.

As physicians and related health care professionals of the 21st century, we have inherited from our predecessors a legacy of progress and innovation of here-to-for unknown magnitude. To act responsibly as the custodians of this knowledge, we must also be mindful of another legacy – that of the morality of innovation. Morality is kind of a

complicated concept: it has to do with our values – the values of our society. And those values have a tendency to change with the times. The dictionary definition of innovation is quite simple: *to create something new*. But in the fields of medicine and surgery, innovation is conceptually quite different today from what it was in the last century. Today there exist guidelines by which new therapies are evaluated and introduced into clinical practice. During much of the last century, to be an innovator involved not only the discovery or development of new therapies, but also the creation of guidelines, where none existed. In reflecting on the Morality of Innovation, I've chosen to share with you an anecdotal account of the life of a twentieth century surgeon.

Ernest Amory Codman was born into a family of Boston "Brahmins" in 1869, just after the American Civil War. As a young man, he attended Harvard College and then Harvard Medical School, from which he graduated in 1895. While in medical school, he served as a "house pupil" at the Massachusetts General Hospital, where one of his responsibilities was the administration of ether anaesthesia for surgeries. Codman shared this responsibility with a medical school classmate named Harvey Cushing, who was later to become one of the great pioneers of neurosurgery. Together Codman and Cushing created what they referred to as the "ether chart" – a record with the patient's name, diagnosis, operation, vital signs and remarks. At the time, such things as medical records were nearly non-existent. Codman and Cushing created a record on paper of the condition of each patient during the administration of anaesthesia and throughout the course of each surgical procedure. When Codman presented to his superiors a thesis on the subject of ether anaesthesia, a senior surgeon at

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the Massachusetts General Hospital described it as “Too frank for the good of the hospital, for it described in detail the cases which I lost.”

Following graduation from medical school, Codman studied briefly in Europe, and then returned to Boston and established a surgical practice at the Massachusetts General Hospital. Interestingly, he also served as the first radiologist at Boston’s Children’s Hospital beginning in 1899, four years after the introduction of X-ray imaging in medicine. In his first years on staff at the Massachusetts General Hospital, he showed a strong interest in surgery for duodenal ulcer disease, a subject which had fascinated him during his time in Germany. He published 30 papers on the subject. He made a proposal to the senior staff of the hospital that each surgeon should focus on an area of specialization, to develop maximum expertise. He suggested that duodenal ulcer surgery be assigned to him. In response to this proposal he was informed by his superiors that he was to specialize in surgery of the shoulder. Disappointed to have been turned down for his chosen specialty of ulcer disease, with which he, himself was said to have been afflicted, Codman nonetheless embodied the spirit captured in the expression, “If life gives you lemons, make lemonade!” He made the most of his assignment to the field of orthopaedic surgery. He published a book on bone tumours, and went on to create the Registry of Bone Sarcoma at the Harvard Medical School. This “database” was the first Cancer Registry in the United States. In addition he described chondroblastoma, which today is known as known as “Codman’s Tumor”. He also described the triangular periosteal elevation of chondrosarcama, a radiologic sign known as “Codman’s Triangle”.

But Codman’s greatest contribution by far was the concept that he called “The End Results Approach” to surgical care. Codman kept an “End Result” card on each patient he treated. Among other recorded data, he classified the outcome as satisfactory or unsatisfactory, *and insisted on acquiring information concerning status at follow-up to a minimum of one year*. He introduced to his surgical colleagues at the Massachusetts General Hospital the idea of regular meetings or conferences to discuss outcomes. To the chagrin of his contemporaries, he defended the common sense notion that every hospital should follow every patient that it treats, long enough to determine whether or not the treatment has been successful, and then to inquire “if not, why not?” with a view to preventing similar failures in the future. Noting that most contemporary reports of surgery published in journals described only favourable outcomes, he rejected these, not as scholarly works, but as advertising. It is no surprise that the ideas of Codman were not

embraced enthusiastically by the prestigious fraternity of surgeons in Boston. Codman challenged the senior members of the surgical staff of the Massachusetts General Hospital with the proposal that, though still a young man, he should be appointed Surgeon-in-Chief. He argued that he had the best results of all surgeons on staff, and that he could advance this argument with confidence since he was the only one that tracked and documented his outcomes. None of his fellow surgeons joined in support of his immodest proposal.

Disappointed that his enthusiastic advocacy of accountability led to isolation from his peers, Codman resigned from the staff of the Massachusetts General Hospital, and opened his own private hospital, which he called “The End Result Hospital”. Codman used his own funds to publish a complete annual report of the outcomes achieved in his hospital, encouraging potential patients to judge the quality of care for themselves. He sent copies of his annual reports to major hospitals throughout the country, challenging them to follow suit. Codman published a monograph detailing the proceedings of “The End Result Hospital,” making it all a matter of public record. In all, 337 patients were discharged from The End Results Hospital between 1911 and 1916. Systematic measurement and reporting of the end results for all of these patients include the accounting of 123 errors. These errors were grouped into the following categories:

- errors due to lack of knowledge or skill,
- errors of surgical judgment,
- errors due to lack of care or equipment, or
- errors due to lack of diagnostic skill.

Codman also recorded “four calamities of surgery, or those accidents and complications over which we have no known control.” These events, he said, “should be acknowledged to ourselves and to the public, and study directed to their prevention.”

Acceptance of the ideas of Codman came slowly, and generally not from peers and colleagues close to him. At the meeting of the Clinical Congress of Surgeons of North America in 1912, Codman was appointed Chairman of a Committee on Hospital Standardization, which had been established with a goal of improving the quality of care of patients. At a meeting in Philadelphia in 1914, Codman stated “Hospitals are responsible for the care given by their staff and should carefully note the results of each surgeon, and all of that should be made public.” At home in Boston, Codman maintained a contentious relationship with his fellow surgeons. On January 8, 1915, at a meeting of the Suffolk County Medical Society, he unveiled a large cartoon (Fig. 2). This cartoon depicted an ostrich, representing the wealthy

gentry of Boston's Back Bay. In the drawing, the ostrich is shown kicking golden eggs to the outstretched hands of the physicians on the staff of the Massachusetts General Hospital. President Lowell of Harvard University looks on from above, saying "I wonder if clinical truth is incompatible



Figure 1.
Photograph of young Boston surgeon Dr Ernest Amory Codman. Reproduced from Mallon, Bill. *Ernest Amory Codman: The End Result of a Life in Medicine*. Philadelphia: W. B. Saunders, 1999.

with medical science? Could my clinical professors make a living without humbug?" The ostrich buries its head in the sand, eating "humbugs." The ostrich says, "If only I dared look and see, I might find a doctor who could cure my own ills." To the right sit the Board of Trustees of the Massachusetts General Hospital. Contemplating the ostrich and the golden eggs they ask, "If we let her know the truth about our patients, do you suppose she would still be willing to lay?" Following this exploit, Codman was removed from office in the Medical Society, and further ostracized by his colleagues in Boston.

While Codman battled the entrenched attitudes of his fellow surgeons in Boston, the world was becoming embroiled in The Great War. On the morning of December 6, 1917, in Canada's Maritime Provinces, two munitions ships, the *Imo* and the *Mont Blanc*, collided while negotiating a narrow passage in Halifax Harbor. The result was the largest man-made explosion to date in the history of the world. Over 3000 people were killed. Among the many who went to provide emergency services, Codman travelled by train to Halifax with his nurses and set up a mobile surgical hospital. They remained in Canada for several weeks to treat survivors. Codman was but one of several surgeons from New England who contributed to the relief effort in Halifax. Another Boston surgeon, William Ladd, was impressed by the unique needs of the infants and children who suffered injuries from the blast. After returning to Boston, Ladd later became the first full-time surgeon on the staff of Boston's Children's Hospital, and its first Surgeon-in-Chief.

After the end of the First World War, Codman resumed his practice in Boston. He once again joined the surgical staff of the Massachusetts General Hospital. But he was ostracized by his peers and had very few patient referrals. He believed



Figure 2.
The cartoon unveiled by Ernest Codman on January 8, 1915 at a meeting of the Suffolk County Medical Society. Reproduced from: Hendren W.H., Chapter 1. Introduction and Historical Overview in: *Pediatric Surgery and Urology: Long-term Outcomes, Second Edition*, Edited by Mark D. Stringer, Keith T. Oldham and Pierre D. E. Mouriquand. Cambridge University Press.



Figure 3.
Photograph of Ernest Amory Codman. Reproduced from Mallon, Bill. Ernest Amory Codman: The End Result of a Life in Medicine. Philadelphia: W. B. Saunders, 1999.

this to be the consequence of his then radical ideas about accountability and reporting of outcomes. It may also have been the result of his general lack of inhibition and his inclination to challenge those who refused to embrace his goals. In his later professional years, largely isolated from his former colleagues, Codman reflected that “Honors, except those that I have thrust upon myself, are conspicuously absent, but I am able to enjoy the hypothesis that I may receive some more from a more receptive generation”.² When Codman died in 1940, the obituaries in the newspapers cited his contributions to surgery of the shoulder and sarcoma of the bone. There was no mention at all of his “End Result” concept. His pioneering efforts to advance surgical care through evaluation of outcomes, and his zealous advocacy for accountability,

transparency and improvement of quality, had brought him ridicule and isolation from many of his contemporaries. But, the prediction of Codman that his ideas would eventually be embraced by a more receptive generation was proven by time to be correct. Codman’s Committee on Hospital Standardization, established in 1912 by the Clinical Congress of Surgeons of North America, was subsequently adopted by the newly organized American College of Surgeons, and eventually became the *Joint Commission for Hospital Accreditation*. This non-profit, non-governmental agency in the United States of America espouses the mission of continuously improving the safety and quality of care provided to the public through the provision of accreditation of healthcare, and related services that support improvement in performance in organizations providing healthcare. The Ernest Amory Codman Award was established by the Joint Commission in 1996 to recognize achievement in the use of measures of process and outcomes to improve the quality and safety of care. In the 21st century, innovations are introduced into patient care with strictly monitored policies for the protection of human subjects. No concepts in medicine and surgery have captured the attention of the leaders of our professions, or of modern-day policy-makers, more than evaluation of performance, and improvement of quality, through research about outcomes.

Ernest Amory Codman was a man ahead of his time. He was the first to champion research about outcomes and the first in fact to really systematize accountability for outcomes. Certainly, he was an innovator. While we consider “the morality of innovation,” let it be recognized that his greatest contribution was “**the innovation of morality**” – the self-imposed discipline to inquire, and to acknowledge what was right and what was wrong about the care that he rendered, and its effect on the quality of life of his patient.

References

1. Daicoff GR, Brandenburg RO, Kirklin JW. Results of operation for atrial septal defects in patients forty-five years of age and older. *Circulation* 1967; 35 (4 Suppl): I143–I147.
2. Mallon Bill. Ernest Amory Codman: The End Result of a Life in Medicine. W. B. Saunders, Philadelphia, 1999.