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AAOS Now, January/February 2007, pp 58-60  
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## **E. Amory Codman**

### **Codman considered father of evidence-based medicine**

*by William J. Mallon, MD*

E. Amory Codman was born the year that Stanley went to find Dr. Livingston (1869) and died as Hitler was overrunning much of Europe (1940). During his lifetime, X-rays were discovered and anesthesia became a reality, and he died just as the antibiotic era was upon us. To most modern orthopaedists he is simply a name attached to the triangular harbinger of osteosarcoma, or to shoulder pendulum exercises.

What possible significance could this simple Boston physician, who was never even a member of the AAOS, hold for the 21st century paradigm of accountability in medicine? What can we learn from Codman? Actually, quite a bit.

Ernest Amory Codman was a pioneer in six different fields of medicine. As a medical student at Harvard, he and his best friend Harvey Cushing, later to become a renowned neurosurgeon, developed “the ether record,” now the standard anesthesiology record kept on every case. He produced the first atlas of normal skeletal radiographs, and wrote several articles in the early days of radiology, including the first published case of a scaphoid fracture diagnosed by X-ray. As a general surgeon, he published more than 30 papers on the study of duodenal ulcers.



*E. Amory Codman was a pioneer in six different fields of medicine.*

### **Orthopaedic contributions**

Most orthopaedists who know of Codman usually consider him important for two other fields—shoulder surgery and bone sarcoma—where he is considered a pioneer. Codman developed his interest in the shoulder while a medical student in the 1890s in Germany. There he saw several operations on the rotator cuff and subacromial bursa, and spent time in the anatomy lab dissecting the shoulder.

In 1911 and 1912, Codman published the first two known cases (in English) of a rotator cuff tear repair. Throughout his career he continued his study of the shoulder, culminating in 1934 with the publication of *The Shoulder: Rupture of the Supraspinatus Tendon and Other Lesions in or about the Subacromial Bursa*, the first book ever written solely on the shoulder. The book is still pertinent today and should be studied by any practicing shoulder surgeon. It begins with an autobiographical preface, ends with a similar autobiographical epilogue, and in-between has more than 400 pages of shoulder wisdom.

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Codman's first book, Bone Sarcoma, had been published in 1925, the result of five years of study. It was followed by his formation of the Registry of Bone Sarcoma, the first cancer registry in the United States. Codman described the triangular periosteal elevation of osteosarcoma, now known as Codman's triangle, although he actually described it in Ewing's sarcoma. He also described what he termed "chondromatous epiphyseal giant cell tumors of the [proximal] humerus," or a chondroblastoma, now often called Codman's tumor. For his work on bone sarcoma, the AAOS presented him with a gold medal shortly before his death.

### **The "end results"**

The Registry of Bone Sarcoma was an attempt to look at a problem in detail and see how "end result idea." He knew it was revolutionary, but he continually challenged physicians to study and document their own end results. He defined the idea simply:

*The common sense notion that every hospital should follow every patient 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.*

Common sense it may have seemed, but it was simply not done. Codman was not only the first orthopaedist to suggest that we should study outcomes, he was the first physician to do so. Prior to him, only Florence Nightingale had made similar suggestions. To them, we owe the genesis of outcome studies and evidence-based medicine.

Through 1910 Codman wrote several papers on the End Result Idea. There was little response from local surgeons, but nationally there was some interest, mostly from Edward Martin, a Philadelphia gynecologist. He and Codman helped start the American College of Surgeons (ACS) in 1910. Together they also formed several committees, including the Committee for Hospital Standardization, which Codman chaired.

The Committee for Hospital Standardization began as an attempt to study hospital outcomes (end results) and see how they could be improved. Codman wrote, "We believe it is the duty of every hospital to establish a follow-up system, so that as far as possible the result of every case will be available at all times for investigation by members of the staff, the trustees, or administration, or by other authorized investigators or statisticians."

1. Originally, the Committee asked that hospitals meet the following five simple guidelines:
2. Each hospital should have a medical staff.
3. The members of the medical staff should be chosen based on graduation from medical school (not a given in that era), competency, and character.

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4. There should be regular staff meetings to review cases (end results; these became the forerunner of morbidity and mortality conferences).
5. Medical records should be written and filed for all cases.  
Each hospital should have a clinical laboratory and radiology section.

When these guidelines were written, no medical records at all were produced for many patients. The patients were admitted and treated, but all the care was kept inside the physicians' head.

Though these guidelines now seem laughable, when the first trials of the ACS were produced, only 89 of 692 hospitals passed. The results were announced at the Waldorf Astoria in New York, and the papers were burned after the meeting so that the public could not know which hospitals had failed. The Committee still exists today, but over the passage of years has transmogrified into the Joint Commission for Accreditation of Hospital Organizations (JCAHO).

### **Practicing what he preached**

As Codman was starting what would become the JCAHO, he resigned from Massachusetts General to open his own Codman Hospital. He required all staff members to study and produce their own end results. Codman himself wrote three small pamphlets, all with the main title of A Study in Hospital Efficiency. In these pamphlets, he published the results of every one of his cases at the Codman Hospital. Stunning in their honesty, the reports would never be attempted today due to the fear of litigation. He classified his complications under such headings as "Errors Due to Lack of Judgment," and "Errors Due to Lack of Technical Skill."

But few doctors listened. During a meeting of the Suffolk (Mass.) District Surgical Society, Codman listened to several speakers, then stood and unveiled a cartoon he had drawn. It showed an ostrich with its head in the sand, kicking the sand behind him, all the while kicking up golden eggs. Codman explained that the ostrich typified surgeons and hospital administrators, who had their heads in the sand, never studied their own end results, but were content as long as they produced the "golden eggs."

Codman's comment was not well-received. He resigned as chairman of the Surgical Society and shortly thereafter served in the Army during World War I. He had spent more than a decade urging fellow physicians to study their own outcomes—their end results—all to no avail. He had alienated himself in the process, claiming his results were better than all others, because only he could produce any outcomes, which was likely true.

When he returned from the war, he had little medical practice remaining. Ostracized by his peers, he received no referrals, had few patients, and little income.

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### **Are we ready to remember?**

Codman struggled on. He began the Registry of Bone Sarcoma, surviving on his wife's family money. As he reached his 60s, there was little left. During his last months, he inquired about the cost of a headstone. It was seemingly more of a financial burden than he wished to leave his wife, as none was ever purchased. After dying from melanoma on November 23, 1940, he was interred in an unmarked grave at the Mount Auburn Cemetery in Cambridge, Mass.<sup>4</sup>

Codman did not expect much recognition from his colleagues, as he had predicted years before. He once noted, "Honors, except those 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." That generation may still await, but hopefully is now upon us.

In three areas of medicine, Codman was an important contributor; in two others, he was an absolute giant, and in the last, he was a revolutionary so far ahead of his time that his accomplishments could not, or would not, be appreciated by his peers. Any doctor of today making the contributions that Codman made in one or two fields would be long remembered. But as Donald Berwick noted, "Codman looked ahead. He looked, indeed, beyond us. Seventy-eight years ago he began his life's work; forty-eight years ago he died. Are we ready for him yet?"

E. Amory Codman received no appreciation in his lifetime. His efforts to reform medical science by starting the field of outcome studies and evidence-based medicine brought him mostly ridicule, censure and poverty. At his death, newspaper obituaries mentioned only two of the six fields to which he contributed—bone sarcoma and shoulder surgery. The end result idea was never mentioned.

William J. Mallon, MD, is the author of *Ernest Amory Codman: The End Result of a Life in Medicine*.

### **Additional Resources:**

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6. Donabedian A. "The end results of health care: Ernest Codman's contribution to quality assessment and beyond." *Milbank Quarterly*, 67(2): 233-256, 1989.
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