History of Anesthesia Records

Gerald L. Zeitlin, M.D., F.R.C.A.

Historians believe that the first consistent recording of physiological variables during anesthesia was the work of E.A. Codman and Harvey Cushing when they were "Junior House Pupils" at Massachusetts General Hospital in 1895. Codman later developed the modern outcomes assessment movement in medicine, and Cushing is considered one of the founders of modern neurosurgery.

Years later, Dr. Cushing described how they came to keep records when they gave ether.[1] *"Dr. Codman and I having entered the hospital together … we gave the anesthesia. I hesitate to recall what an awful business it was and how many fatalities there were.*

I was called down from the seats (of the surgical amphitheater) and told to put the patient to sleep. I proceeded as best I could under the orderly's directions. The operation was started … there was a sudden great gush of fluid from the patient's mouth, most of which he inhaled and he died."

Cushing then described how he slunk out of the hospital guilty and ashamed, only to be told later that these things were frequent and inevitable. He continues, *"Codman and I resolved that we would improve our technique of giving ether. We made a wager of a dinner as to who could give the best anesthesia. We both became very much more skillful … than we otherwise would have become but it was particularly due to the detailed attention which we had to put upon the patient by the careful recording of the pulse rate throughout the operation. On going abroad and getting interested in blood pressure, I discovered in Padua a simple recording instrument in Riva-Rocci's clinic.* On returning home I came to utilize this always during the course of my neurological operations."* Cushing concludes:

"A much more elaborate ether chart was thereupon prepared, on which not only pulse rate and respiration but the systolic blood pressure was recorded."

It remained until 1905 for Korotkov to describe the sounds he heard with a stethoscope as the cuff was deflated, for the diastolic to become measurable. Inspection of one of Cushing's records (Figure 1, next page) shows only the systolic as felt at the radial pulse. Riva-Rocci's method was by no means the first attempt to measure blood pressure; it was just the simplest and most reliable to that date.

In a fascinating letter, A.J. Wright describes how record-keeping of vital signs gradually spread into everyday anesthesia practice.[2] A Dr. Rogan used charting in Selma, Alabama as early as 1901. Wright has also published a meticulous chronology for the serious student of anesthesia records.[3] Two important histories of anesthesia were published just after World War II. They also reflect the gradual adoption of record-keeping. The American book, Thomas Keys' *History of Surgical Anesthesia*[4], gives us a full description of the later developments in anesthesia record-keeping, whereas the British author Barbara Duncum (*Development of Inhalation Anaesthesia*),[5] who ends her story in 1900, makes no reference to it.

Looking at early textbooks about anesthesia might be another way to elicit whether record-keeping became universal in a way analogous to the rapid worldwide spread of the use of ether within a year of Morton's demonstration.

Four books published in the United Kingdom make *no* mention of routine blood pressure recording. Please note their dates of publication. They are *Practical Anaesthetics* by J. Edmund Boyle (of Boyle Machine fame) in 1907, *Handbook of Anaesthetics* (1912) by J. Stuart Ross, a proponent of the dry-cleaning agent ethyl chloride as a general anesthetic in 1924, and *Anaesthesia and Anaesthetics* by Rood and Webber in 1929. This last book was also sold in the U.S.

Gerald L. Zeitlin, M.D., F.R.C.A., is retired and lives in Boston, Massachusetts.

**Cushing is in error here. Riva-Rocci practiced medicine in Pavia.*

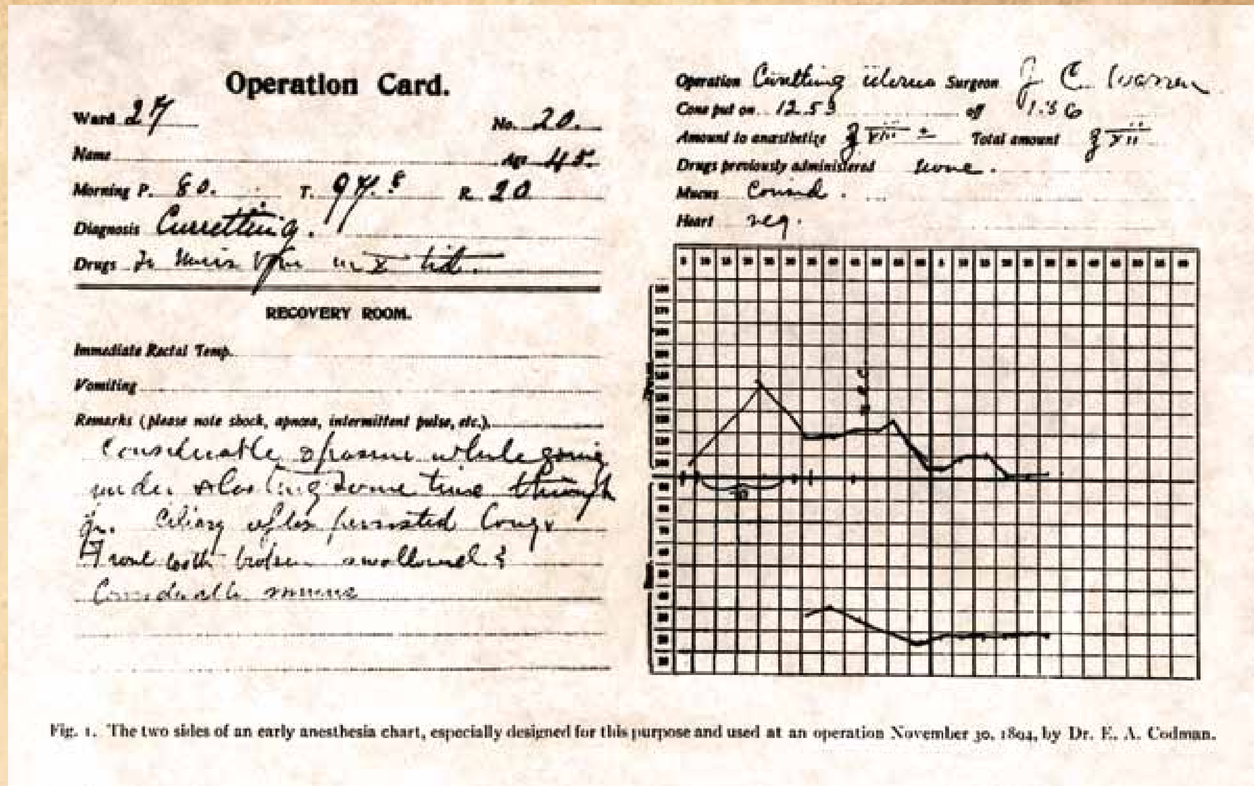

Fig. 1. The two sides of an early anesthesia chart, especially designed for this purpose and used at an operation November 30, 1894, by Dr. E. A. Codman.

Figure 1 *(above): Two sides of an anesthesia chart kept by E.A. Codman, M.D., November 30, 1894. From: Beecher HK. The first anesthesia records (Codman, Cushing). 1940;* Surg Gyn & Obs. *71:689.*

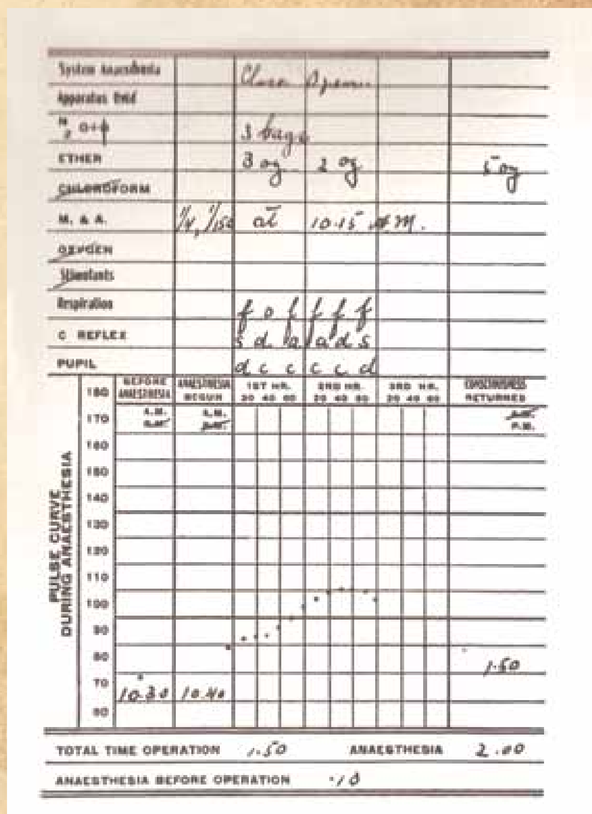

Figure 2 *(at right): Anesthesia record from Flagg, PJ* The Art of Anesthesia, *5th Edition. Philadelphia, J.B. Lippincott and Co; 1932.*

In 1920, J.F.W. Silk in London in his *Modern Anaesthetics* wrote the following:

"The importance of observing the variations in blood pressure of a patient while under an anaesthetic has been suggested. In fact it is insisted upon in some quarters that such observation should be made as a matter of routine … and that the necessary apparatus should form part of the equipment of the anaesthetist."

What about the U.S? In the first edition of Gwathmey's tome *Anesthesia* (1914), he displays many blood pressure diagrams from laboratory studies but does not mention recording during clinical anesthesia; nor does he in his discussion of the medicolegal difficulties of anesthesiologists. On the other hand, nearly two decades later, Dr. Paluel Flagg of New York in the 5th edition (1932) of his *The Art of Anaesthesia* devotes a short but complete chapter to charting (Figure 2).

There were some exceptions. In 1903, Crile, the Cleveland surgeon who conceived the idea of blocking noxious surgical stimuli in addition to the use of general anesthesia (anoci-association), quickly adopted Cushing's records. In 1907, Elmer McKesson in Toledo, Ohio began to

Continued on page 28

Continued from page 27

keep accurate blood pressure records during anesthesia. In the next 25 years, leaders in the specialty such as Brown in Adelaide, Australia, Lundy in 1923 in the Pacific Northwest, and later, Ralph Waters and E.A. Rovenstine, followed suit.

McKesson was an inventive genius who developed the first piece of equipment that automatically recorded intraoperative blood pressures. He called this device a Nargraf (Figure 3).

By the late 1930s, custom-made charts were developed on both sides of the Atlantic. The example in Figure 4 (page 29) by the British anesthesiologist Nosworthy is striking both for its completeness and for the use of the explosive agent cyclopropane. In the U.S., conventional anesthesia records were transferred to adaptations of Hollerith punched cards at the Doctors Mayo's Clinic. These had been brought into industrial use by IBM in the 1920s. Anesthetists used them for later analysis of outcomes in groups of patients. The Committee of Records and Statistics of the American Association of Anesthetists lent its authority to this.

Nowadays, observing and recording vital signs each five minutes have become routine in addition to the notation of drugs and their dosages and all other intraoperative events. Developments in electronics have allowed all this to become increasingly automated, supposedly allowing the anesthesiologist to concentrate on the patient's condition by not having to write something every five minutes. One of the assumptions here is that the machine is objective and neutral. It is interesting that although automatic recording devices first appeared about 20 years ago, recent estimates reveal only one in three anesthesiologists uses them.

The question remains: why do we continue this ritual? One answer is that it is fundamental to teaching our residents that close and precise observation of the patient is vital. That is inarguable.

Does an experienced Board-certified anesthesiologist need to continue doing something that *was once* central to the scientific development of our specialty? I wonder.

A patient suffers a myocardial infarction and for several hours is much more unstable than are most patients we anesthetize these days. His cardiologist pays close attention, and with precise therapeutic maneuvers helped his patient to survive. But he does *not* keep a five-minute handwritten record of my many variables during those early frightening hours. Later that evening, she goes to the dictation machine and gives a literate and comprehensible description of the evening's drama.

I believe we anesthesiologists should abandon our "squiggle" or "railroad track" charts and learn to dictate what happened during each anesthetic we give. Those pieces of literature in the patient's hospital chart would illustrate the *reasons* for each of the drugs given and the moves made in response to both the patient's vital signs and our surgical colleagues' maneuvers. The ultimate question is: why do we act differently from all other physicians practicing acute medicine? Are we not as well qualified to express our observations as the average cardiologist? The current anesthesia record, whether handwritten or automatic, is mindless.

Figure 3: *McKesson's Nargraf Recording Machine. Image courtesy Wood Library-Museum of Anesthesiology, Park Ridge, Illinois.*

The other reason given for keeping five-minute records is that they could act as a defensive shield in the event we become defendants in a malpractice suit. Is this true?

Karen L. Posner, Ph.D., who is Laura Cheney Professor in Anesthesia Patient Safety, kindly researched this question from the database of the ASA Closed Claims Project.[7] In part she wrote:

"While our data do not allow us to easily assess the role of inadequate, changed and multiple records in these claims, we did observe a significant correlation between inadequate records and appropriateness of care. In general, 59 percent of claims with inadequate records were assessed as evidencing substandard *anesthesia care, while 63 percent of claims with adequate records were assessed as evidencing* appropriate *anesthesia care."*

Later in her report, Professor Posner makes the following comment:

"We were unable to assess the specific role of the records in these payment outcomes beyond the observed correlations." And further, *"However, many of these claims revealed multiple problems with the care provided and the records were one of many issues in the claim resolution process."*

Despite their fascinating history, has the time not come for anesthesiologists to rethink the place of the current recording system and substitute more intelligent reporting of perioperative care?

This article was written to honor the late Ellison C. Pierce, M.D.

References are available at the back of the online version of this NEWSLETTER *at* ***www.asahq.org****, or by request by e-mailing* ***communications@asahq.org****.*

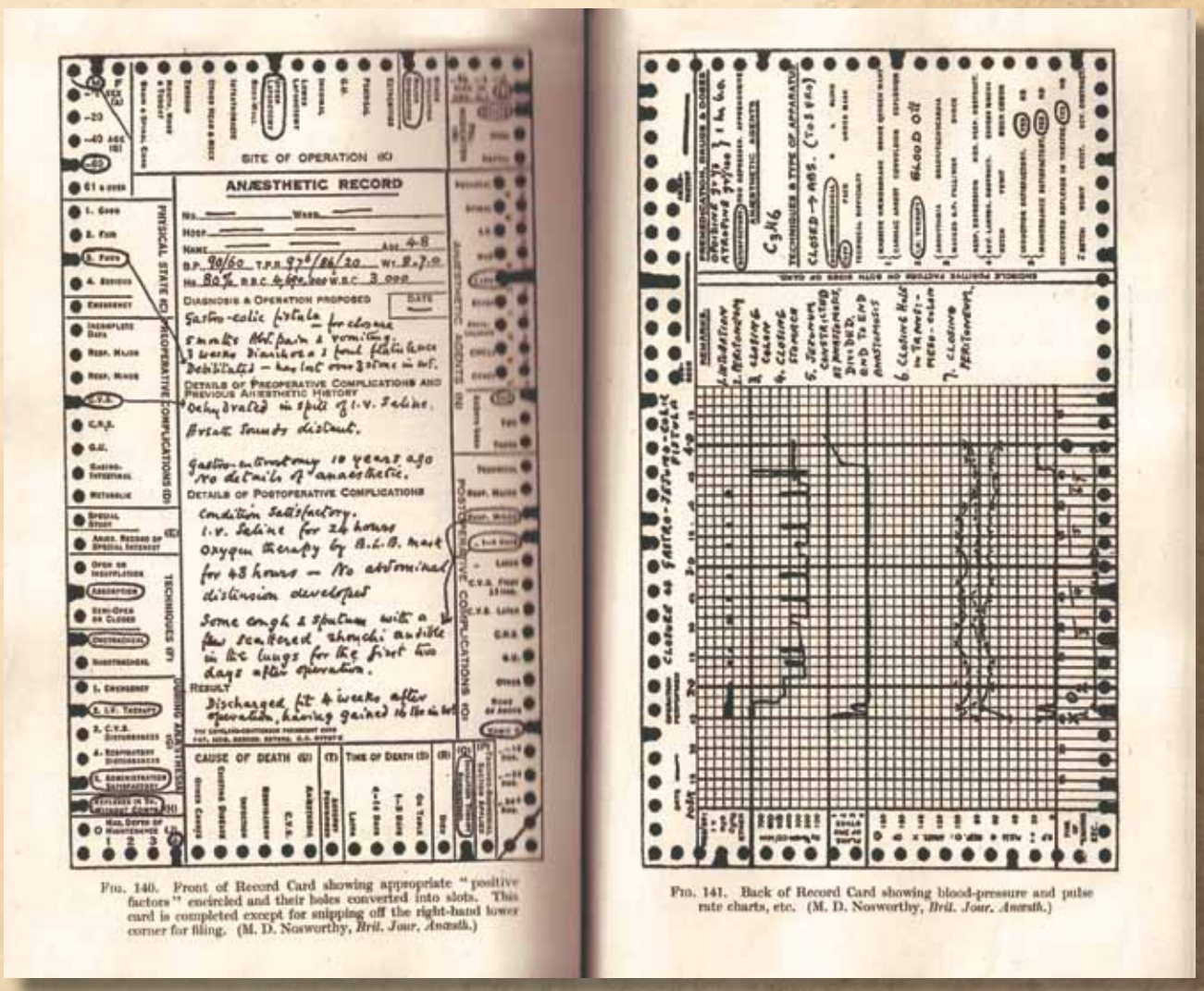

Fig. 140. Front of Record Card showing appropriate "positive factors" encircled and their holes converted into slots. This card is completed except for snipping off the right-hand lower corner for filing. (M. D. Nosworthy, *Brit. Jour. Anæsth.*)

Fig. 141. Back of Record Card showing blood-pressure and pulse rate charts, etc. (M. D. Nosworthy, *Brit. Jour. Anæsth.*)

Figure 4: *Anesthesia record from Nosworthy M.D. A method of keeping anaesthetic records and assessing results.* Brit J Anaesth. *1943; 18(4):160-179.*