The End Results of Health Care: Ernest Codman's Contribution to Quality Assessment and Beyond

AVEDIS DONABEDIAN

University of Michigan

IN THIS ARTICLE I INTEND TO SUMMON FROM A shadowy past someone who should have been recognized always as a towering figure in the history of our field. It is Ernest Amory Codman whom I invoke, hoping to discover the man as well as his thought. In particular, I hope to show how, from rather modest beginnings, the "end result idea" grew shoots and flourished, eventually to become a construct of remarkably diverse applications. In this way, I hope to celebrate the man, making amends, in my small way, for the neglect he has so long unjustly suffered. But I also wish to demonstrate, holding up Codman as the exemplar, how central a role the notion of end results can play in addressing some of the most vexing problems in health care organization.

Highlights of His Life

Codman has given us a convenient directory to the milestones of his life. He was born during Christmastide 1869, at 23 West Cedar Street, Boston, the last of four children, to William Codman and Elizabeth Hurd. By his own description "thoroughly Bostonian," of "Pure English Puritan Stock on both sides," he had all the educational advantages of his caste: private school as a boy; St. Marks Boarding School as

The Milbank Quarterly, Vol. 67, No. 2, 1989

an adolescent; then, in a smooth succession, through Harvard College, through Harvard Medical School, and on to an internship at the Massachusetts General Hospital. Later—"through family position, acquaintances, well-wishers on the Staff and Board of Trustees," he says, meaning to disparage—he was appointed assistant surgeon there. "Often at the head of my school," he tells us, and enjoying opportunities that he describes as "exceptional, in [that] particular period of history, in the stage of [the] development of surgery, and in social and educational advantages," he was fashioned for success, as the world reckons success, but for one inveterate flaw: the "end result idea," as he was to call it.

It came to him as this century dawned, taking hold and slowly growing in his mind, and also finding benign, practical applications in his early work at the Massachusetts General. There was, then, a turning point, an experience such as Saul might have had on the road to Damascus. Codman fixes precisely the time and the circumstances. It is a day in the summer of 1910. Ernest Codman and Edward Martin are in a hansom cab on the way back to London from the Tuberculosis Sanatorium at Frimly, where they had gone for a visit. Codman describes the "end result idea," and Martin, himself a driven man, seizes upon it as the "catalyst to crystallize" his own obsession: the formation of an American College of Surgeons. It strikes both men that the measurement of end results is the tool by which all claims to special surgical competence would be verified, and the practice of surgery in hospitals "standardized."

From here on, the end result idea was to become for Codman, as he openly says, a "dominant idea," a "monomania." So consuming was this preoccupation that Codman, beginning to doubt his own sanity, consulted two friends whom he describes as "distinguished alienists"; he received the oracular reply that only the soundness of the obsessing idea distinguishes the healthy from the sick.

The story of Codman's life documents many other interests and accomplishments, among them pioneering work on the radiology of normal and diseased bones, early studies of duodenal ulcer, a registry of bone sarcoma, and a treatise on injuries of the shoulder. But it is the end result idea, he says, when already a man of 60, that was "the great and still unsuccessful interest of my life." It impelled him to ventures remarkable for their honesty and courage, but also to actions that seemed needlessly rash, provocative, and ostentatious. It led him to

disgrace, notoriety, isolation, and near financial ruin. It also set him, as I hope to show, on the road to immortality.

As the summer of 1911 drew to a close, Codman, beginning to doubt the likelihood of advancement for himself, or of implementation for his ideas, at the Massachusetts General Hospital, opened a small hospital of his own. Three years later, after 15 years of service, and immediately after his "senior" had been "moved . . . up a step," he resigned his post at the Massachusetts General Hospital, only to reapply on the very day he received notice that his resignation had been accepted. He asked "to be appointed Surgeon-in-Chief on the ground that the results of my treatment of patients at their hospital during the last ten years, had been better than those of other surgeons. . . ." It was a calculatingly dramatic, even provocative, act, meant to bring "to the notice of the trustees" his "protest against the seniority system of promotion, which was obviously incompatible with the End Result Idea." It did not make him friends.

He achieved even greater notoriety when, in the following year, he chaired a meeting of the Suffolk County Medical Society dedicated to a "Discussion of Hospital Efficiency." At this meeting, Codman arranged to have "unveiled with a great flourish," a "cartoon" which depicted the residents of Boston's Back Bay as an ostrich with its head deep in the sand, kicking back golden eggs of remunerative surgical interventions in the direction of Harvard's doctors, while the trustees of the Massachusetts General Hospital on one side of the river, and the president of the university on the other, cannot decide whether or not the truth about the inappropriateness of these interventions can be disclosed (Fig. 1). Codman describes the reaction: the audience at first open mouthed, "aghast," then in an "uproar," some walking out, others rising to protest in anger, but a "great majority" simply "amused." Later, for Codman, there was to be "disgrace," a loss of friends, resignation as chairman of the local medical society, separation from his post as instructor of surgery at Harvard, and a noticeable dip in income. Disillusioned and embittered, he had only his hospital to fall back upon.

This little hospital, sometimes described as having 10 beds and sometimes 12, was "a modified apartment house in a rather crowded part of the city . . . a decided contrast to the marble halls and spotless corridors of the Charitable Hospitals," those lofty institutions he so loved to castigate. "There is often dust in our corners," he admits, "the floors are wood, the instrument boiler cost $0.87, the hot-water

FIG. 1. Codman's cartoon.

sterilizers are commercial utensils (price, $13.55), and both our X-ray machines are second-hand." Yet, it was here that Codman, now his "own master," with no "trustees to consult or other members of the staff to placate," hoped to demonstrate both the feasibility and superiority of the end result idea, and of the end result system which was its operative expression.

It was, from the start, an uphill fight. Perceived to be "an outlaw institution," largely excluded from the network of professional referrals, the hospital was, on average, no more than half full; and it was so costly to run that Codman declared it would serve him better to pay for doing operations at some other hospital than to run his own! But he persevered and, by degrees, seemed to be making headway: in his own hospital, at some other hospitals where his end result system was being tried out, and even at the Massachusetts General, where, he says, end result cards were being maintained, and "the follow-up system and the special assignment policy were flourishing." "I often think," he concludes, "that had it not been for the War my plans would have reached a real fruition."

But war there was to be, and at first, arguing that his work at home was of greater importance, Codman resisted the urge to volunteer. Then, on December 6, 1917, there came, as he describes it, "the great disaster at Halifax." A ship loaded with explosives blew up in the harbor, devastating the northern part of the city, killing over 1,600, and injuring thousands. Codman, commissioned a major in the Canadian army, rushed to the scene, helping to organize an emergency hospital "which when we left two weeks later," he says, "was running smoothly with an End Result Card for every patient."

Upon his return, "an indescribable restlessness came over me," he tells us, "until in September, I found myself in our own Medical Corps, wrestling, as Senior Surgeon of the Coast Defences of the Delaware, with the impossible 'paper work' of the Army, in the midst of the Influenza." Here, conditions were too chaotic for the installation of the end result system, but later, first as regimental surgeon general in the artillery, and then as surgeon-in-chief at the base hospital at Camp Taylor, there was ample opportunity to demonstrate that his system was feasible and useful.

"In June, 1919," Codman goes on to say, "I returned to my closed hospital, in debt, with no borrowing capacity, and somewhat disillu-

sioned as to the possibility of altering the ways of human nature by my intellectual efforts." A period of remunerative work and relative prosperity followed, and a rehabilitation of sorts, marked by a rapprochement to both the Harvard Medical School and the Massachusetts General Hospital. Then, the dormant passions caught fire again. "I subtly drifted," he says, "into the organization of the Registry of Bone Sarcoma"; and later he undertook the work, to last four years, of writing his treatise on *The Shoulder*, which he privately published in 1934. His purpose in embarking on these projects, he tells us in a marvelous preface and an epilogue to his book, was to demonstrate once again, the fecundity of the end result idea. It was, he maintained, the chief achievement of his life and, childless himself, his legacy to his family and the world. "I shall have left," he wrote, anticipating his death a scant seven years later, "to the children of my great nieces and nephews, more than a money value, although they will share it with all the other heirs of the world."

The End Result Idea and System

Like so many profound insights, the end result idea is simplicity itself. In Codman's own words, it is "merely 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 a similar failure in the future."

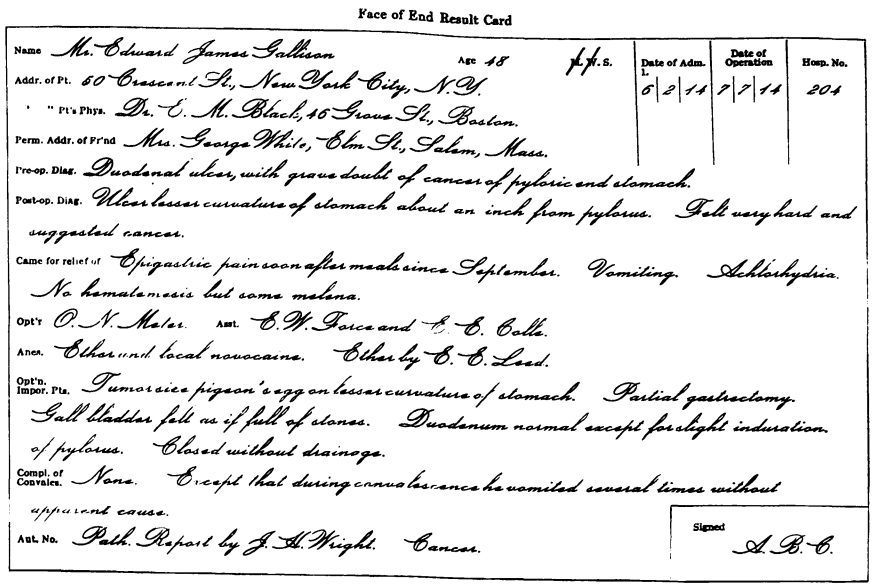
To implement the idea, Codman devised what he called the end result system. Each patient was to have an "end result card" on which were to be entered "in the briefest possible terms," the symptoms, the diagnosis that governed the treatment, the treatment plan, the complications that occurred in the hospital, the diagnosis at discharge, and "the result each year afterward," until a definitive determination of the results could be made. Thus, both the accuracy of the initial diagnosis and the results of treatment were to be recorded and assessed. But if lengthy follow-up were not possible, at least the events during the hospitalization could be recorded and reviewed; and if all cases could not be studied, much could still be learned from an investigation of in-hospital deaths alone.

To review and assess the care briefly recorded on the end result cards, there was to be in each hospital an "efficiency committee" repre-

senting the board of trustees, the administrators, and the medical staff. The committee would note the occurrence of unsatisfactory results, determine the reasons for failing to attain "perfection," and take appropriate action, both to deal with individual instances of failure, and to guide the policies, organization, and operations of the hospital in general. The committee would keep a written account of its proceedings, and perhaps publish a periodic summary of its observations and actions.

It is easy to conclude, on the face of it, that Codman advocated a monitoring of what we would now call "outcomes." Yet, in the more detailed accounting that Codman gives of each of the 141 deaths that occurred under his care during his 15 years at the Massachusetts General Hospital, and of each of the 337 cases he cared for in his own hospital during its first few years, the "results" of care are never described alone. There is always a judgment as to whether or not the result in each case might have been improved, and a statement of the probable causes of failing to attain perfection. It is the concurrent assessment of the care and of its consequences that is the hallmark of Codman's method. In his system, the occurrence of adverse outcomes is only the occasion for an assessment of what we would now call "process." In this way, it anticipates much subsequent work, including the notable studies of maternal and prenatal mortality under the aegis of the New York Academy of Medicine during the 1930s and 1950s, respectively (Hooker 1933; Kohl 1955), as well as the current work at the Rand Corporation intended to decipher the meaning of hospital mortality data (for example, Dubois and Brook 1988). In particular, the current emphasis by the Joint Commission on Accreditation of Healthcare Organizations on indicators of hospital performance is a return, after long years of unfortunate neglect, to the principles that an initial band of reformers, headed by Codman, persistently advanced as a basis for the "standardization of hospitals" (Codman 1914b, 1916a; Lembcke 1967; Lehman 1987).

To establish more clearly the relation between care and its results it is necessary to record the findings of a larger number of observations. Codman offers us two aids to accomplish this. The first is a classification of the causes for not attaining perfection. These are as follows: "lack of technical knowledge or skill," "lack of surgical judgment," "lack of diagnostic skill," "lack of care or equipment," "personal or social conditions preventing cooperation of the patient," "the patient's unconquerable disease," and "the calamities of surgery or the accidents



Face of End Result Card

Name Mr. Edward James Gallivan Age 48 M. W. S. Date of Adm. 6/2/11 Date of Operation 7/7/11 Hosp. No. 204

Addr. of Pt. 60 Crescent St., New York City, N.Y.

" Pt's Phys. Dr. C. M. Black, 46 Grove St., Boston.

Perm. Addr. of Fr'nd Mrs. George White, Elm St., Salem, Mass.

Pre-op. Diag. Duodenal ulcer, with grave doubt of cancer of pyloric end stomach.

Post-op. Diag. Ulcer lesser curvature of stomach about an inch from pylorus. Felt very hard and suggested cancer.

Came for relief of Epigastric pain soon after meals since September. Vomiting. Achlorhydria. No hematemesis but some melena.

Opt'r O. N. Meier. Asst. E. W. Force and E. C. Colle.

Anes. Ether and local novocaine. Ether by E. E. Lund.

Opt'n. Impor. Pts. Tumor size pigeon's egg on lesser curvature of stomach. Partial gastrectomy. Gall bladder felt as if full of stones. Duodenum normal except for slight induration of pylorus. Closed without drainage.

Compl. of Convales. None. Except that during convalescence he vomited several times without apparent cause.

Aut. No. Path. Report by J. H. Wright. Cancer.

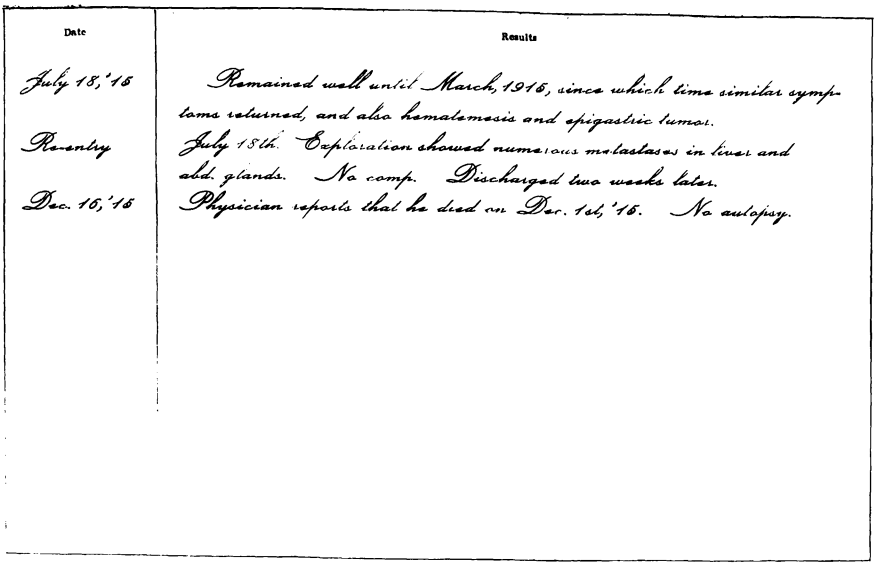
Signed A. B. C.

FIG. 2A.

and complications over which we have no known control." Clearly, some of these are attributable to the doctor, some to the hospital, some to the patient or his circumstances, and some to the nature of the illness itself; some are remediable, while others are not.

The second aid to the compilation and analysis of cases that Codman devised was a classification of cases. This was a matrix of 29 vertical divisions he called "anatomic," and of nine horizontal divisions he called "pathologic," creating 261 cells in all. In each cell would be entered the cases that belonged there, each designated by its own distinguishing number. Codman developed his classification at much sacrifice of time and income. He dwells lovingly on it, describing the satisfaction it gave him to enter his cases, marked in several distinguishing ways, hoping that none of its little squares would remain unoccupied. He offered it as a means for rapidly finding similar cases whose end results could be studied, perhaps by comparison to similar cases elsewhere, or, at intervals, in the same hospital.

Although Codman understood the relation between the nature and severity of illness, on the one hand, and the likelihood of improvement, on the other, case-mix standardization, as we know it today, did



Date	Results
July 18, '15	Remained well until March, 1916, since which time similar symptoms returned, and also hematemesis and epigastric tumor.
Recently	July 18th. Exploration showed numerous metastases in liver and abd. glands. No comp. Discharged two weeks later.
Dec. 16, '16	Physician reports that he died on Dec. 1st, '16. No autopsy.

FIG. 2B.

not occur to him. Perhaps this is because statistical standardization is redundant when judgments about the appropriateness or goodness of care are made case by case, on clinical grounds. Even now, we have no system of case-mix adjustment that fully obviates the necessity for that final, clinical ascertainment.

End Results as the Product of Care

Having come so far, Codman might well have stopped. What is to explain his not doing so? To what is to be attributed the remarkable force and fecundity of the end result idea, its capacity to proliferate in so many directions, to appear in such diverse guises, until it obsesses its creator and seems to pervade the health care system as a whole? Very simply, it is because the end result, as Codman perceived, was the only true product of health care.

In a remarkable paper, "The Product of a Hospital," described as the "opening gun" in the campaign to promote the end result system as the vehicle for standardizing hospitals, Codman (1914b) recognizes that a hospital has many products, including new knowledge and educated health care professionals. But when it comes to health care,

whether provided by an individual practitioner or purveyed by an institution, it is the end result that counts. Concretely, the desired product is "the satisfied and relieved patient"; more abstractly, the product is the improvement in health attributable to care.

By specifying the product in this way, Codman intends to demystify health care, to rid it of the "humbug" with which, he said, it was universally infested. Some instances of care, Codman admits, are "like a priceless painting, incomparable in value," but much care, in his opinion, is "an ordinary commercial article," whose quality can be standardized, and that can be produced more efficiently, as a "boot" might be, by specialization and division of labor, and by adjusting the volume of production to the laborer's capacity to work well. Thus, the end result idea becomes, for Codman, the vital link between the science of medicine and the science of management. In his own words, "the end result system means the introduction of the Comparative Principle into Clinical Science, and it means the use of the Principles of Scientific Management in Hospital Organization."

Codman's Concept of Efficiency

Codman's adherence to these "principles" explains, as Reverby (1981) points out, his use of the word "efficiency" (which, she says, was "the keyword of his era") rather than "quality" in describing the structure, purposes, and consequences of his system. But "efficiency," in Codman's lexicon, is a word with many meanings. Most fundamentally, it is "therapeutic efficiency," a property that "demands the best possible application of recorded knowledge to each case," so that treatment can be "as successful as possible." Codman is also concerned with avoiding "useless" visits, unnecessarily prolonged hospital stays, and, in particular, those "avoidable errors" whose cumulative cost, he reminds us, "is greater than the cost of good medical care." Furthermore, inefficiency occurs not only because doctors fail, but also because, in organizations and systems, work is not conducted in a manner that accomplishes "maximum output per hour," patients are not assigned or referred to those best able to help them, and resources are not apportioned according to their contribution to end results. Thus, what today we might call "effectiveness," "clinical efficiency," "production efficiency," and

"efficiency of allocation," are all subsumed by Codman's sovereign concept—a concept that becomes almost a moral principle when Codman says, "Efficiency must acknowledge Truth and use it in a truthful way. It is the scientific use of science."

"I claim," Codman declared, "that the adoption of the End Result System by the hospitals of this country will at the same time render our work more scientific and our practice more efficient and honorable." By using the end result system, Codman hoped to propel the practice of medicine from "humbug," masquerading as "art," to a science, and from a craft to almost an industry—in short, from obscurantism to rationality; hence the diverse uses of the end result system.

The Uses of End Result Assessment

Monitoring Quality

The most obvious of the uses to which end result assessment was to be put is what we would call, today, "quality monitoring and assurance." Though Codman rarely used the word "quality," preferring to speak of "good results" and "efficiency," it is quite clear that a major purpose of the end result system, and of the efficiency committees that were to implement it, was to bring about those improvements in health care, in both its interpersonal and technical aspects, that the then current state of knowledge permitted. This would come about partly through the tactful, but firm, leadership of clinical chiefs, as they discussed with each member of their staffs his record of performance. But largely, change was to be induced by modifications in the organization of health care and the management of health care institutions. Codman was acutely aware of the profound effect the incentives offered by organizations, as well as their other properties, could have on individual behavior, that of physicians included.

Advancing Clinical Science

As a second contribution of even more far-reaching importance, the study of end results would help create that foundation of clinical knowledge upon which all practice depends. Most immediately, the

study of his own end results by each doctor would be a means for continuing education. Standing, as he did, with one foot in the academic world and the other in the realm of practice, and painfully aware of the deficiencies in the clinical science of his day, Codman saw much of surgical practice as a succession of "experiments," but experiments conducted haphazardly, their results unstudied, unrecorded, and undisclosed. The end result system would change all that, revealing to each doctor an undistorted picture of both his successes and failures, provided an unselected succession of cases were studied. He could then learn which cases he could treat better, which cases he should refer to others, and which subjects are deserving of further research. By this progression, the implementation of the end result system in the work of doctors and hospitals would get linked to the realm of more systematic, more rigorous research.

To effect this linkage, Codman devised a grand scheme for technology assessment and diffusion to be directed by a committee of the American College of Surgeons. The first inklings of a discovery would appear in the end results attained by individual physicians as they introduced their particular innovations. It would be the responsibility of the hospital, then, to take note of the events, and to subject those innovations that seemed promising to a more thorough test, always guided by end results. The innovations that survived would be referred to the committee of the college which, in its turn, would select the more worthy ones for further testing at other collaborating hospitals. Then, after more general discussion of the findings at scientific meetings of the college, descriptions of the surviving innovations would be published in a special issue of the college's journal, identifying, among other things, the persons already expert in the use of each innovation. As a final step, the American Medical Association might, in a special issue of its own journal, publish the subset of innovations that it officially endorsed or approved.

By means of this scheme Codman proposes to capture those improvements in care that often go unnoticed, to verify the relative value of competing claims, to hasten the adoption of proven innovations that languish in obscurity, sometimes for years, and to provide an authoritative directory of existing expertise. He reminds professional organizations of their responsibility to advance the science of medicine. He offers the prospect of multi-institutional, collaborative studies. He ex-

plicates neatly the relation between quality monitoring in operational settings and clinical research more broadly conceived. And he demonstrates a close relation between technology assessment and quality assessment of which, only recently, we have become more sharply aware.

Establishing Accountability

Just as the profession, generally speaking, is prompted by the end result system to discharge its responsibility to advance knowledge, so are the health care institutions enjoined by it to exercise accountability for the care they give. Accountability begins within the institution through a collaboration of medical staff, administrators, and members of the board of trustees; none "has the strength" to accomplish it alone. In this collaboration, the role of the trustees is critical; without, as laymen, entering into the details of clinical practice, it is their responsibility "to insist that the End Result System should be used . . . and that an efficiency committee be appointed to that purpose"; they are also "to authorize the expense and to guarantee the standard of work reported."

Codman understands, as Reverby (1981) amply documents, that this scheme disturbs the jealously guarded balance of privilege and power within the hospital, physicians losing while the "superintendent" and the board gain. But this readjustment, Codman believes, is necessary in the interests of the whole; it is also pursuant to his view of the hospital as an organically unified, almost utopian community. "My idea," he says, "is that the Hospital is a place for mutual help. The Patient, the Student, the Profession, the Chief of Service, the Trustee, the Community, and World-wide Medical Science—each are part owners of 'the case.' We must all be working to learn from, to teach from, to study, to organize to aid, to be trusted by, to contribute to, to record, and to analyze each 'case' and all 'cases.'" The end result system, Codman believes, "subordinates the individual interests of the staff, if those interests are incompatible with this ideal; it boldly encourages them, when they are not."

From this image of vigilance and harmony, one can also deduce a second direction in which accountability must flow: from the institution to the public it claims to serve. It would deeply surprise everyone, Codman believes, to know that end results are not consistently studied and documented. "They suppose that of course *somebody* is looking

into this important matter. They do not realize that the responsibility is not fixed upon any person or department." It follows that hospitals must formally and solemnly assume that responsibility, certifying to the public the standard of care they can expect to get, and even offering evidence to support the claim. In his views of the nature of the hospital, of its social responsibility, and of its accountability to a more exigent public, Codman seems more a man of our time than of his.

Allocating Resources and Managing Them Efficiently

Turning now to the internal operations of the hospital, we see the important role Codman assigned to the end result system in making financial decisions and establishing personnel policies crucial to the hospital's performance. Because the end result is the true product of health care, it needs to be measured if information about the productivity and efficiency of the hospital is to be obtained. Moreover, it is the contribution to desired end results that should determine how money is spent in equipping and running the hospital.

"In this hospital," Codman says, "I have to use my judgment in proportioning expenditure. . . . The prevention of waste and the judgment of the proportion which each item should take, in order to be sure of a product—the satisfied and relieved patient—is the essence of good hospital management. This idea of proportioning the expenditure *to the items necessary to obtain a perfect product* has never penetrated hospital managements. Their minds have been satisfied with *treatment, not* with the *good results* of treatment. Before Trustees vote more funds for new buildings and equipment, let them appoint Efficiency Committees to make analyses of the results that they are getting now. They can then decide whether to spend money for improvement in quality or in quantity—for products or waste products."

Setting Personnel Policies

That end results must govern the personnel policies of hospitals and the career prospects of physicians is a major tenet of Codman's creed. Nowhere is Codman more vehement in his condemnation than when he describes appointments by "nepotism" or special influence; assign-

ment of cases to their attendants "by the ward, by the calendar, or by the time of day"; and promotion by "seniority," a criterion that can advance the less qualified while their betters (himself among them) are unfairly held back. Verified information about the end results obtained by each doctor is the obvious antidote to this irrationality and injustice. Acting accordingly would encourage the less self-promoting, and reward the more meritorious, while it also improves the patient's prospects. With the Machiavellian subtlety that Codman often displays, he proposes to harness the selfish drive for advancement to the service of the good. "Unless we use a merit system of promotion instead of a seniority system," he argues, "there will be little incentive for clinical accuracy. *The struggle for existence must be utilized to give the truthful and efficient an opportunity to survive.*"

Promoting Functional Differentiation

The logical conclusion of Codman's scheme for case assignment according to end results is considerable differentiation within hospitals, to the point of assigning special wards to particular kinds of patients, to be cared for by persons who have demonstrated (based on end results, of course) special competence in the matter at hand. Perhaps Codman also has in mind that the larger number of similar cases treated in such units would also contribute to better results, seeing that he was aware of the relation between volume and quality, a subject that has attracted much attention of late.

The counterpart to functional differentiation within the hospital is a similar differentiation of institutions in a community or region, some hospitals limiting themselves to simpler cases that they are capable of handling perfectly well, while other hospitals accept the more difficult cases. "For instance," Codman says, "the standard of an ideal local hospital would be to accept no cases which it cannot cure or relieve." "*We have no obligation*," he goes on to say, speaking of his own hospital, "*to accept cases which we cannot diagnose, or those which we are not able to treat*. . . . Is there any other hospital which is willing to admit that it is second class, and sets its price according to its standard rather than according to the wealth of the patient?" Codman then gives a rather lengthy list of conditions that he has resolved not to treat because analysis of his own end results has revealed lack of success. The

into this important matter. They do not realize that the responsibility is not fixed upon any person or department." It follows that hospitals must formally and solemnly assume that responsibility, certifying to the public the standard of care they can expect to get, and even offering evidence to support the claim. In his views of the nature of the hospital, of its social responsibility, and of its accountability to a more exigent public, Codman seems more a man of our time than of his.

Allocating Resources and Managing Them Efficiently

Turning now to the internal operations of the hospital, we see the important role Codman assigned to the end result system in making financial decisions and establishing personnel policies crucial to the hospital's performance. Because the end result is the true product of health care, it needs to be measured if information about the productivity and efficiency of the hospital is to be obtained. Moreover, it is the contribution to desired end results that should determine how money is spent in equipping and running the hospital.

"In this hospital," Codman says, "I have to use my judgment in proportioning expenditure. . . . The prevention of waste and the judgment of the proportion which each item should take, in order to be sure of a product—the satisfied and relieved patient—is the essence of good hospital management. This idea of proportioning the expenditure *to the items necessary to obtain a perfect product* has never penetrated hospital managements. Their minds have been satisfied with *treatment, not* with the *good results* of treatment. Before Trustees vote more funds for new buildings and equipment, let them appoint Efficiency Committees to make analyses of the results that they are getting now. They can then decide whether to spend money for improvement in quality or in quantity—for products or waste products."

Setting Personnel Policies

That end results must govern the personnel policies of hospitals and the career prospects of physicians is a major tenet of Codman's creed. Nowhere is Codman more vehement in his condemnation than when he describes appointments by "nepotism" or special influence; assign-

ment of cases to their attendants "by the ward, by the calendar, or by the time of day"; and promotion by "seniority," a criterion that can advance the less qualified while their betters (himself among them) are unfairly held back. Verified information about the end results obtained by each doctor is the obvious antidote to this irrationality and injustice. Acting accordingly would encourage the less self-promoting, and reward the more meritorious, while it also improves the patient's prospects. With the Machiavellian subtlety that Codman often displays, he proposes to harness the selfish drive for advancement to the service of the good. "Unless we use a merit system of promotion instead of a seniority system," he argues, "there will be little incentive for clinical accuracy. *The struggle for existence must be utilized to give the truthful and efficient an opportunity to survive.*"

Promoting Functional Differentiation

The logical conclusion of Codman's scheme for case assignment according to end results is considerable differentiation within hospitals, to the point of assigning special wards to particular kinds of patients, to be cared for by persons who have demonstrated (based on end results, of course) special competence in the matter at hand. Perhaps Codman also has in mind that the larger number of similar cases treated in such units would also contribute to better results, seeing that he was aware of the relation between volume and quality, a subject that has attracted much attention of late.

The counterpart to functional differentiation within the hospital is a similar differentiation of institutions in a community or region, some hospitals limiting themselves to simpler cases that they are capable of handling perfectly well, while other hospitals accept the more difficult cases. "For instance," Codman says, "the standard of an ideal local hospital would be to accept no cases which it cannot cure or relieve." "*We have no obligation*," he goes on to say, speaking of his own hospital, "*to accept cases which we cannot diagnose, or those which we are not able to treat*. . . . Is there any other hospital which is willing to admit that it is second class, and sets its price according to its standard rather than according to the wealth of the patient?" Codman then gives a rather lengthy list of conditions that he has resolved not to treat because analysis of his own end results has revealed lack of success. The

list includes "oblique fractures of the clavicle in young ladies who wear low-neck gowns," itself a wryly self-deprecating reference to the unsightly callus he inflicted on such a patient in his own practice.

We might pause for a moment to contemplate how firmly the end result idea has taken hold of Codman's thought, and how thoroughly it has begun to reshape his images of health care. It is, now, the sovereign principle that, if embodied in the health care system, would enable it, almost without further intervention, to serve successfully the public good. It would do so, as one would expect, by generating the information that permits appropriate choices to be made by trustees, administrators, doctors, and consumers alike—a necessity as acute today as it ever was.

Effectuating Informed Choice by Physicians and Prospective Patients

As to the doctors, Codman recognizes the pivotal role of the general practitioner as the patient's adviser and, as he calls him, "the arbiter between patient and consultant." For that, he needs to be amply paid; but more important, he needs to be helped to match a patient's needs to the specialist's abilities. "The unexpurgated deluge of medical articles through medical journals and bulletins of commercial druggists, to the abyss of proprietary advertisements, is constantly increasing," Codman laments. "The most acute practitioner cannot distinguish the wheat from the chaff, and little organized effort is made to help him."

The consumer is even more perplexed. "Our profession," Codman observes, "is being more or less justly criticised in our own journals and in the lay press because we have provided no satisfactory method whereby the layman may be promptly and economically attended by the particular specialist best qualified to treat each of his ills." "No one, be he rich or poor, knows whether he really has the services of a good surgeon. This is because our Charitable Hospitals, *which could do so*, do not find out which surgeons get the best results, and let the public know."

As to the specialist who claims, as Codman did, some special competence, a "dense wall" of convention forbids him to intervene. "Could this wall be penetrated by any form of advertisement consistent with medical ethics?" Codman asks. The answers he provides are far-

reaching and complex. They clearly reveal the pull of two contrary forces on Codman's thought: on the one hand, his continuing allegiance to professional dominance and, on the other hand, his vision of a freer market in health care. Being the innovator he was, he hoped to harness both to his larger purposes.

Better to inform all health care professionals, but general practitioners in particular, Codman proposed the grand scheme of technology assessment and diffusion that I have already described. As a more immediate remedy, he urges all hospitals to subscribe to the end result system, so that the "hospital positions held by consultants," as well as "the general standing of the hospitals themselves," would become a more truthful guide to both consumers and referring doctors. But, though he did not insist upon it, he also hoped for more: that the charitable hospitals, at least, would publish their end results, so everyone would know what standard of care to expect.

Determined, as always, to make an object lesson of himself, no matter the penalty, Codman went on to demonstrate in his own hospital the feasibility of what he preached. First, he proposed to keep track of the publications of young physicians as well-established specialists in Boston, to note what kinds of cases they had special knowledge of, to enter the information in a "card catalogue," and to make referrals accordingly. In a much bolder, perhaps unprecedented, move, he compiled information about all the deaths that had occurred under his care and about all the cases treated by him at his hospital. Many copies of his report (Codman 1916b) he distributed free of charge; others he offered at a dollar each, hoping that at least a copy would find its way, however circuitously, to that mythicized trustee of a charitable hospital who was ever Codman's bête noire. "Why should not the layman see them if he cares to?" Codman asks, speaking of his reports. "Why should he not look farther and study the reports of the large hospitals for himself, to learn where such and such a branch of surgery is well done?"

Though Codman was anything but self-effacing, he seems driven to offer many arguments in favor of advertising, perhaps to overcome his own inbred repugnance for it, and also to justify it to his peers, an audience he always had in mind. First, he conceives of "advertising" very broadly, to include all publications, lectures, and other public appearances, whether in professional meetings or elsewhere. Even all positions

and titles in universities or hospitals, by declaring merit, are included as publicity. By thinking so, Codman seems to want to blur the boundary between the approved and the frowned upon.

Then, Codman argues, advertising is a necessity when the established mechanisms of professional control have failed to foster quality or to guide consumers to it. In his own case, excluded from the network of professional referrals, "isolated as though I had come from another city," he complains, it is necessary for survival. "I shall advertise extensively to the laity," he concludes.

Above all, it is by serving the public good that advertising seems to Codman not only necessary, but commendable. "For I consider that truthful advertising may be an honest act, and recommend it to the Charitable Hospitals, which have nothing to lose by being honest," says Codman, livening conviction with sarcasm. "Secrecy," he concludes, in a grander vein, "is the peculiar disease of Efficiency. . . . Publicity is the cure of the disease, Secrecy."

Pricing Services and Remunerating Providers

The "standard" of end results that a doctor or a hospital can regularly maintain is, of course, only one consideration in informed choice. The other is price, not only per unit of service, but for the entirety of care, so the buyer can compare his expected losses and gains. Codman himself published in his report the standard of end results that he offered for sale, as well as his maximum and minimum fees. He gave the added surety of a "Fixed Fee, not over $120 for two weeks," perhaps foretelling the per case reimbursement of today. And on the title page of the report itself, as on a banner from his masthead, appeared this motto: "A Hundred Dollar Hospital with a Hundred Dollar Surgeon."

But prices had an even deeper meaning for Codman; they touched on a moral principle that preoccupied him: that of justice or fairness. According to Codman, there was no defensible basis for the differences in prevailing fees. "The difference in surgeons' results," he observed, "is not as demonstrable as in their incomes." Codman concluded that for "the ordinary commercial article" that can be standardized, and produced with equal assurance of good results, fees should be comparable everywhere. "At this hospital," he said, "we have done, and can do

routine operations just as successfully as the brilliant operators, and we only ask payment for our actual work. Why pay a high price for speed of production of an unstandardized article, when you can obtain at reasonable price a guaranteed standard article?"

As to the cases that require a particular expertness, the fee would correspond, Codman proposes, to each surgeon's ability to obtain better results. "It is in such cases that the difference would show. . . . He might have saved 5 per cent, 10 per cent, or 50 per cent, but the value of his services compared to mine would vary with this percentage—but only in these extremely sick cases." Codman went so far as to suggest that no payment be made unless the patient gets well; and he offered to be governed by this precept himself.

Having identified the probability of attaining better end results as the determinant of fair pricing, both in and outside hospitals, Codman turns to the problem of assigning a money value to that probability. He hits upon yet another principle much in fashion today: the value of the life saved and of the suffering relieved. He realizes, however, that this could reintroduce that variability according to ability to pay that he wished to avoid. He ponders the question for a while. In his words, "There are certain conditions under which an operation will save life. The financial value of such an operation will depend to a certain extent on how much the person who pays the bill values the life that is saved. It depends on whether it is your own life (and how much you enjoy it), your wife's life (and how much you care for it), or some 'poor relation's life (and how worthless you think it is). . . . The same may be said of those operations which do not save life, but merely relieve suffering. Most persons value an operation which relieves their suffering more than one which saves their life. . . . If you needed an operation, you might be willing to pay $1,000 or more for a 1 per cent better chance, but how much more are you willing to pay for an increased 1 per cent chance in the case of your poor relation?"

In the end, perhaps discouraged by the complexity of his scheme, and possibly also reluctant to endorse invidious valuations of human life, Codman cuts through the Gordian knot with a grand proposal. "The proper way to pay for a successful operation," he concludes, "is to pay the surgeon a reasonable sum for his expert labor, and then give a large sum to some endowed institution for the advancement of surgical science. You owe much more to surgical science than you do to the sur-

geon." It is as if the institutions responsible for advancing the science of health care were to be paid a royalty for contributions that Codman (1914b) recognized to be one of their "products."

Stimulating Fair Competition

Much of Codman's thinking on all the matters I have described was conditioned by his awareness of the high mission of the medical profession and its responsibility to serve. But he recognized, as well, that the practice of medicine is also a business, that physicians respond to pecuniary incentives, that health care services are, so to speak, manufactured, and are offered for sale in a marketplace. He strived, therefore, to introduce those changes that would harness the drive for financial success to achieving the more altruistic mission of the profession.

Accordingly, Codman imagined a market that was to be more free and more fair. He fulminated, in particular, against the "Charitable Institutions," regarding them as "Combinations in the Restraint of Trade," and their doctors as greedy competitors intent on using "the prestige of the hospital to corner the 'material,'" meaning patients. Certified as expert by virtue of their clinical ranks and academic titles, using the hospital's resources to care for their own patients, they had an unfair advantage, while refusing to reveal their end results in return for the privileges they enjoyed. "I would gladly be beaten *in fact*," Codman says, comparing himself to such a competitor, "if he can and *does* do better work than I do; but not because his Hospital, *without looking into his work*, guarantees him."

Codman's little hospital was meant to be his slingshot against Goliath, but it was clearly failing. So Codman dreamed of bigger things: of surgeons banding together in groups to counter the organized outpatient services of the charitable hospitals; of physicians, surgeons, and specialists raising capital (perhaps cooperatively), building and equipping a large hospital, and forcing "the cliques who run the Charitable Hospitals out into the open, so the Public can compare our results." In this way, Codman's vision foreshadowed the resurgence of private investment and other market forces in the health care system of today.

As I have already shown, Codman believed that adoption of the end result system would, in itself, propel formal organizations and markets alike toward the two objectives he so ardently sought: efficiency and

fairness. In the meantime, in the face of opposition, he fought back—with publicity, pursuasion, and, if necessary, ridicule, for "Harvard is sensitive to ridicule," he shrewdly observed, "and also, I sincerely believe," he added, "to presentation of facts." It is these facts that we see more clearly today.

Codman the Man

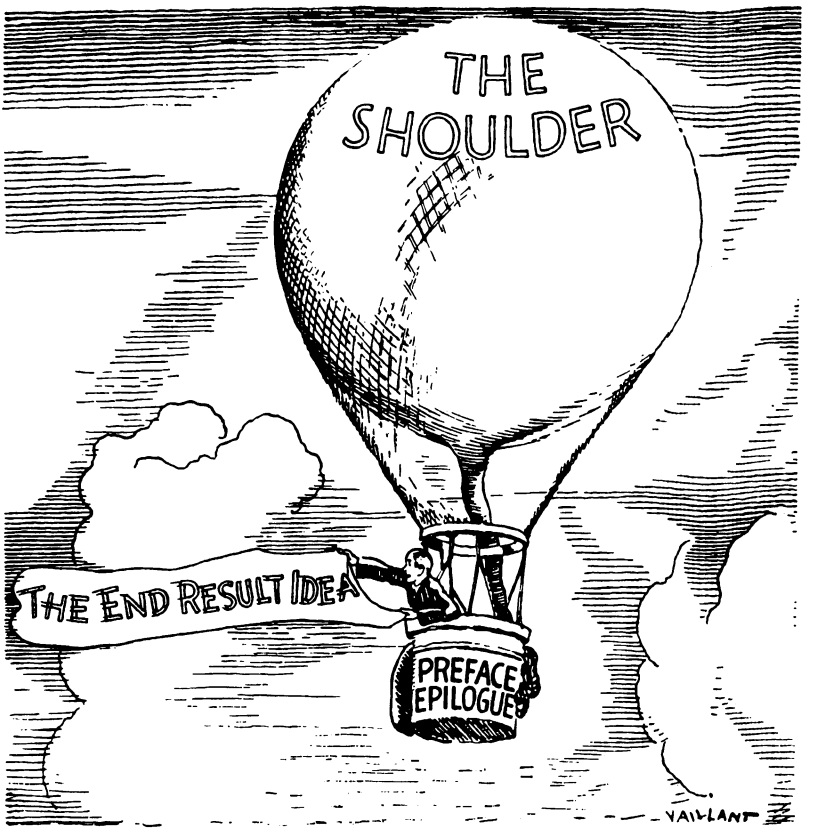
Everywhere in his writings, even as he expounds the meaning of his "dominant idea," Codman wishes us to know him as a man—confident yet burdened with doubt; hopeful, yet despairing; assertive, yet resigned—a man we would have dearly wished to know. "Through much of my life," he tells us when already a man of 60, "I have suffered somewhat from a sense of isolation, because I have always been thinking, or saying, one thing or another, with which other doctors did not agree. This, in my early years, made me suspect myself of being peculiar. . . . Even now I have this sense of isolation, although I have become more and more content to wait for acceptance of my views." Rebuffed in his own time by those he respected most, he looked to future generations for vindication. Yet, he muses (one imagines wistfully), "The man who works for this generation is the practical, successful, beloved person. . . . The man who works for the next generation is the dreaming, unsuccessful, often embittered person, who fights the faults of his friends and backs up the virtues of their enemies. Do you blame them for spreading and exaggerating the unfortunate fact that I am not a skillful operator, that I am hard to get along with, aggressive, independent, idealistic, and a monomaniac on the End Result Idea? Even my friends damn me with faint praise. Perhaps I have not worked hard enough, been gracious enough, or taken enough personal interest in my patients," he conjectures in the throes of self-doubt. He has been called an "eccentric," he knows; he is a "zealot," he confesses; he is "driven by his Puritan conscience . . . to preach the doctrine I had expounded," he admits. For a while even his own sanity seems to him to be in doubt.

Yet, all this anguish notwithstanding, Codman knew very well the value of his discovery. So he hoped, at times angrily impatient and at other times philosophically resigned, for eventual vindication. "Although the End Result Idea may not achieve its entire fulfillment for

several generations," he said, "I hope to be as content when dying as any soldier on the battlefield. . . . Honors, except those I have thrust on myself, are conspicuously absent on my chart, but I am able to enjoy the hypothesis that I may receive some from a more receptive generation."

Above all, Codman sought recognition by the hospital in which he had trained, where the end result idea had first occurred to him, and where for 15 years he had tried to implant it; and from Harvard, the institution that had nurtured and shaped him, only, it seemed, to fail him in his hour of need. "I was confident," Codman tells us, "that the End Result Idea would become an intellectual landmark of which my university would be proud, and which, in time, Harvard would claim as a jewel in her crown, and set it with the diamonds of ether anaesthesia and social service." In a poignant gesture, Codman shows in one corner of that infamous cartoon he used to ridicule the Harvard establishment, a long line of tiny figures, hardly distinguishable in the reproduction he had published. They are "armies of medical students," Codman explains, "coming to Harvard because they have heard that the End Result System will be installed in her affiliated hospitals."

I like to picture him setting out into the great outdoors whose call, from earliest childhood, he could not resist. I see him, as he himself describes, on a summer day, adrift "on some out-of-the-way pond in [his] portable boat, watching the cotton wool in the clouds, and momentarily expecting a strike from 'a big one.'" Or, perhaps he is out hunting, surrounded by the happy crowd of all the dogs he ever owned. But, most vividly, I see him reenact that marvelous drawing with which he concludes his book on *The Shoulder*: a balloon high against what I imagine to be a deep-blue summer sky, decked with billowing clouds, Codman, himself, a little figure standing in the basket dangling beneath, unfurling a huge banner in the breeze. On it, in large letters, are the words by which he lived, and with which he bids us farewell: "The End Result Idea."



References

Unless otherwise noted, the biographical details of E.A. Codman's life and all direct quotations are drawn from the publications of 1916 and 1934 (below). Specific page references and citations can be obtained from the author. All italicized words or phrases indicate Codman's own emphases, as does the occasional idiosyncratic capitalization of words.

Codman, E.A. 1914a. Report of the Committee on the Standardization of Hospitals. *Surgery, Gynecology and Obstetrics* 18:7–12.

———. 1914b. The Product of a Hospital. *Surgery, Gynecology and Obstetrics* 18:491–96.

———. 1916a. Report of the Committee on the Standardization of Hospitals. *Surgery, Gynecology and Obstetrics* 22:119–20.

———. 1916b. *A Study in Hospital Efficiency: As Demonstrated by the Case Report of the First Five Years of a Private Hospital.* Boston: Thomas Todd.

———. 1934. *The Shoulder: Rupture of the Supraspinatus Tendon and Other Lesions in or about the Subacromial Bursa.* Boston: Thomas Todd.

Dubois, R.W., and R.N. Brook. 1988. Preventable Deaths: Who, How Often, and Why? *Annals of Internal Medicine* 109:582–89.

Hooker, R.S. 1933. *Maternal Mortality in New York City: A Study of All Puerperal Deaths 1930–1932.* New York: Oxford University Press, for the Commonwealth Fund.

Kohl, S.G. 1955. *Perinatal Mortality in New York City: Responsible Factors.* Cambridge: Harvard University Press, for the Commonwealth Fund.

Lehman, R.D. 1987. Joint Commission Sets Agenda for Change. *Quality Review Bulletin* 13:148–50.

Lembcke, P.A. 1967. Evolution of the Medical Audit. *Journal of the American Medical Association* 199:543–50.

Reverby, S. 1981. Stealing the Golden Eggs: Ernest Amory Codman and the Science and Management of Medicine. *Bulletin of the History of Medicine* 55:156–71.

Acknowledgments: This article is a revised and expanded version of a speech made at the Harvard School of Public Health on November 15, 1988. I intended it to be a symbolic act meant to vindicate the man, to celebrate his contributions, and to note the relevance of his work to current research at the school and its sister institutions. I am grateful to Dean Harvey V. Fineberg for extending the invitation to a former student at the school, to Associate Dean R. Heather Palmer for taking charge of all the arrangements for the session, to Donald M. Berwick, Barbara McNeil, and Albert Mulley for commenting on my talk, and, most especially, to the Henry J. Kaiser Family Foundation for the financial support without which the best of intentions are often unrealized.

Address correspondence to: Avedis Donabedian, M.D., Nathan Sinai Distinguished Professor Emeritus of Public Health, Department of Health Services Management & Policy, School of Public Health, Building #2, University of Michigan, 1420 Washington Heights, Ann Arbor, MI 48109.