

Book Reviews

Medical Care: Issues of Evaluation

Costs, Risks, and Benefits of Surgery. JOHN P. BUNKER, BENJAMIN A. BARNES, and FREDERICK MOSTELLER, Eds. Oxford University Press, New York, 1977. xxvi, 402 pp., illus. \$22.50.

In the current wave of concern about quality, costs, availability, and accessibility of health care, surgery stands out as a target for scrutiny. There are many reasons for this. The technology of surgery has expanded greatly, it is costly, some risk for the patient is inherent in it, its outcome is heavily dependent on the judgment and skill of the surgical team, and differences of opinion often exist about whether to operate and what is the best procedure.

In one way or another efforts have been made to address all these issues. For example, a national study of variations among hospitals in quality of surgery performed and of the extent to which the variations are due to organizational and medical staff characteristics is now under way (1). The criteria being used for measuring quality are post-surgical mortality and morbidity, an "end result" approach to assessment which was advocated unsuccessfully 60 or 70 years ago by Codman (2) and whose time has come despite the concern about malpractice suits. Other studies have placed necessity for surgery under review. The questions being addressed bear primarily on overutilization, an orientation dictated by the demonstration that rates of elective surgery are influenced by the supply of physicians practicing surgery and the way the delivery of medical care is organized and paid for (3). Also, a large-scale study of surgery in the United States sponsored by the American College of Surgeons and the American Surgical Association has produced information and recommendations pertaining to the training, availability, distribution, qualifications, and content of practice of surgeons (4). The report of the study also gives attention to the organization, delivery, and fi-

nancing of surgical services, research, allied surgical manpower, legal and ethical issues in surgery, community relations, and quality of care.

A major extension of the inquiry into surgery, which can be expected to have far-reaching influence, is achieved by *Costs, Risks and Benefits of Surgery*. The book consists of 22 chapters and other commentary prepared by 34 experienced investigators from many fields, including, in addition to surgery and closely associated branches of medicine, statistics, economics, administration, political science, and social medicine. It is the product of the Seminar in Health and Medicine conducted over a period of two years under theegis of the Center for the Analysis of Health Practices and the department of statistics at Harvard University, with support from foundations.

The papers presented were criticized and revised both during and after the seminar sessions. None of the exchanges among the participants, in which divergent views on the issues discussed must have surfaced, are included in the book, and the reader will miss this aspect of the seminar series. However, the editors, experts respectively in anesthesiology and community medicine, surgery, and statistics, have done an exceptional job in bringing together a well-balanced consideration of the difficult questions involved in attempting to quantify costs and benefits attendant on surgery. Their brief but perceptive introductions to each of the four analytic sections of the book and their final Summary, Conclusions, and Recommendations, where they are joined by other participants, help to unify the volume and greatly enhance its value.

Part 1, Background and General Principles, concentrates on demonstrating the utility of conditional probability, decision trees that identify nodes for branching decisions, and economic analysis in reducing the uncertainty in surgical and related diagnostic decision-mak-

ing. Here and in subsequent sections of the volume, emphasis is placed on measures of benefits and risks that extend beyond the immediate postoperative period. These include effects on life expectancy, morbidity, physical and psychosocial functioning, and other indicators of quality of life. Cost-benefit analysis in which dollar values are assigned to expected benefits is of special interest, although cost-effectiveness measures in which benefit is expressed in units of mortality or morbidity are also utilized in the examples given. Attention is drawn to the inadequacy of data on outcome, problems in and approaches to the selection of dollar values for a diverse range of benefits, and the relevance of public policy, provider, and patient considerations.

The final chapter in part 1 departs from the cost-benefit approach to show that for several of the more prevalent surgical procedures (for example tonsillectomy and adenoidectomy, hysterectomy) "demand, as measured by utilization, is defined and conditioned by supply [of physicians]." The geographic variations in surgical procedure rates (in the state of Vermont) that lead to this conclusion also point to the need for population-based studies that measure "health needs in terms of the prevalence and incidence of the generic conditions."

Part 2, Surgical Innovation and Its Evaluation, provides strong support for the use of randomized controlled trials for judging and comparing the efficacy of many surgical procedures. The more distant past is drawn upon to illustrate the dominant role played by expert opinion in the acceptance of new procedures and the frequency with which such procedures have been discarded as advances have been made in biological knowledge. An analysis of the approaches taken in recent years to the appraisal of surgical and anesthetic procedures indicates that the days of trial and error may be largely gone. The account of progress made toward the establishment of a scientific basis for assessment is able to cite an impressive number of randomized controlled trials that have been carried out.

Nevertheless, the merits of many evaluation studies being conducted are open to question, and we do not know how many new procedures are being introduced without prior tests of efficacy or how many "established" procedures remain unexplored with respect to efficacy despite doubts or questions that have arisen about them. This is in no way a criticism of the volume. The main purpose of part 2 is to demonstrate through examples both the importance of broad-

ening the application of rigorous methodologies for assessment and the availability of the tools to do so. Technical issues in the design, conduct, and analysis of a study are discussed in sufficient detail to convince us that, although the problems are extraordinarily difficult, statistical means for dealing with many of them exist and the move from the theoretical to the practical can be successfully accomplished. The examples presented are taken from experiments in the treatment of duodenal ulcers by surgery and by gastric freezing and in the treatment of angina pectoris by internal mammary artery ligation, an enthusiastically adopted procedure that was rapidly abandoned as a result of a randomized trial.

The arguments are directed at the superiority of the randomized controlled experiments, and almost no attention is given to alternatives. Some will take exception to the preoccupation with this design because of its complexity, the problems of getting providers of medical care to agree to the participation of patients, difficulties in replicating studies, and questions related to informed consent and other ethical issues. However, readers of *Science* will recall the special treatment of the subject in the issue of 18 November 1977, which reinforces the advocacy in this volume of the randomized controlled trial (5).

Part 3, Assessment of Costs, Risks, and Benefits of Established Procedures, and part 4, Assessment of Costs, Risks, and Benefits of New Procedures, enlarge on the analytic methods set forth in the previous sections of the volume. Part 3 concentrates on applications of decision analysis that clarify the effects of age and preoperative condition of the patient on risks and benefits where surgery is elective, as is often the case in the frequently performed operations of herniorrhaphy, cholecystectomy, and hysterectomy. Probabilities of mortality are the most extensively used measures in the models presented, but, as the authors of the chapters indicate, quality-of-life considerations may be the determining factors in deciding between alternatives.

The discussion of treatment of suspected appendicitis in part 1 is extended in part 3. Probabilities of appendicitis for 24 symptom combinations derived from an application of Bayes's theorem and estimates of the distribution of cases by severity of symptoms are used as a basis for measuring the effect on mortality and morbidity of changing the degree of symptom severity as an indicator for surgery. The consequences of varying the degree of discrimination are clarified by means of the ratio between the "true

positive" rate for appendicitis and the "false positive" rate. In epidemiological terms, the former is the sensitivity rate, the latter the complement of the specificity rate. The effect of improved discrimination on cost-effectiveness measures is quite dramatic, and the analysis demonstrates the importance of completeness and accuracy of information about the patient.

The less well developed and in many ways more difficult matter of decision theory as applied to breast cancer is expounded in the final chapter of part 3. The need for greater knowledge about the disease process itself is stressed as a precondition for application of the analytic approach. There are clinical trials under way, however, and others have recommended new investigations to measure net benefits from screening that would change the picture. Incidentally, this reviewer has doubts about the interpretation of the results from the Health Insurance Plan randomized trial in screening, but for the present review that is not an important issue.

Part 4 applies decision analysis to the treatment of end-stage renal disease, coronary artery bypass surgery, and treatment in intensive care units. All involve high technology, large costs, and conditions associated with high mortality or impairment in functioning of long duration. The analytic techniques are similar to those found in earlier sections, but the conflict between the interests of society and those of the individual is more sharply drawn. A point of interest in end-stage renal disease is that the nature of the alternatives available—home or hospital dialysis, living-donor or cadaveric-donor transplantation—gives public policy and cost-effectiveness analysis special relevance. In coronary artery bypass surgery, hypothetical patients are used to demonstrate the extent to which cost-effectiveness of surgical as compared to medical management is influenced by a patient's characteristics. Intensive care units pose perhaps the largest problem because of the wide variety of cases that reach them. Cost-benefit analysis would lead logically to the exclusion of certain categories of patients from the intensive care unit, but the services of the unit when available cannot be easily refused. However, an objective of the analysis would be to guide decisions on how many intensive care units there should be and where, and that would in turn affect the alternatives open to patients.

Part 5 presents four recommendations that call for additional studies of the effectiveness of surgical treatments and improvement in information systems;

improvement of techniques for cost-benefit analysis and methodologies for experimental design; inclusion in the medical school curriculum and in continuing education programs of economic, social, and epidemiological principles of medical care; and increasing public understanding of outcomes and costs of medical care through better presentation of information.

Clearly, the volume is a significant contribution. The reservations this reviewer has concern matters of emphasis, and in almost every instance some rationale for the choices made can be found in the book. Two issues in addition to those discussed earlier in the review are worth mentioning, however. One concerns cost-benefit analysis in which dollar values are applied to such diverse outcomes as survival and functional capacity. The generalizability of a model in which the choice between treatments is affected by, for example, equating economically a 10 percent surgical-mortality risk with a specified period of disability cannot be great. Further, cost-benefit analysis makes the questionable assumptions of stability in time and place of the economic values used and an ability to develop a wide enough consensus on preferences and values for long-term policy decisions. Because of these and other issues, many individuals, including this reviewer, have concluded that cost-benefit analysis is useful only in very special circumstances. It is interesting that the authors of several chapters opt for the cost-effectiveness approach where dollar equivalents for benefits are not applied.

Attention is given in the volume to the need for better data. However, the attractiveness of mathematical treatment of costs and benefits could obscure basic problems that arise from poor quality of information, and it is easy to overlook weaknesses of prior probabilities in applying Bayes's theorem as we focus on the development of posterior probabilities. A detailed discussion of the effect of variations in the estimates of prior probabilities on decisions related to specific treatments would have been a useful addition to the book.

Inevitably events have occurred that would require modification of some of the material presented. An outstanding example is the reporting of results from the Veterans Administration randomized trial on coronary bypass surgery and the criticisms of it that have appeared (6). However, the volume will deservedly have great durability. The interplay of conceptual, analytical, and mathematical approaches to the subject and the extensive use of examples should make it use-

ful to academicians and policy-makers, although the often complex treatment of its subject will pose problems for the reader with no prior exposure to the technical issues. Finally, the book should attract researchers to the difficult areas of investigation mapped out. We can hope that there will be increased funding for these efforts.

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3. J. Wennberg and A. Gittelsohn, *Science* **182**, 1102 (1973); P. M. Densen *et al.*, *Am J. Public Health* **50**, 1710 (1960); G. Perrott, *ibid.* **56**, 57 (1966).
4. "Surgery in the United States," A Summary Report of the Study on Surgical Services for the United States, sponsored jointly by the American College of Surgeons and the American Surgical Association (1975).
5. See the series of articles headed "Medical Research: Statistics and Ethics," *Science* **198**, No. 4318 (18 November 1977), pp. 677-705, and the editorial "Biostatistics in medicine," L. Thomas, *ibid.*, p. 675.
6. See "A Debate on Coronary Bypass," *N. Engl. J. Med.* **297**, 1464 (1977).

The Politics of the War on Cancer

Cancer Crusade. The Story of the National Cancer Act of 1971. RICHARD A. RETTIG. Princeton University Press, Princeton, N.J., 1977. xxii, 382 pp. \$15.

"If this great country of ours can put a man on the moon," Ann Landers asked in her column of 20 April 1971, "why can't we find a cure for cancer?" The opportunity was at hand, she announced, in a pending bill that would be for cancer what NASA had been for space: "the mightiest offensive against a single disease in the history of our country. If enough citizens let their senators know they want bill S.34 passed it will pass." Let them know they did, by the thousands, and within eight months the National Cancer Act was indeed on the books.

But if it was predictable that Congress would find the cancer crusade irresistible, other aspects of the story call for more subtle explanations. Richard Rettig gives a thoughtful and plausible account of why the issue appeared on the national agenda when and in the form in which it did and of the forces that changed the bill as it made its way through the legislative process. The greatest strength of his study, however, lies in its critical probing of the factual assumptions underlying the policy initiative—that cancer research was facing unique opportunities for rapid advance, that a new program and a revised set of federal research priorities were needed to exploit these opportunities, and that the organizational status of the National Cancer Institute (NCI) was a critical determinant of the quality of the research effort. These assumptions, Rettig finds, were seldom straightforwardly addressed, even by the scientific community, whose contributions to the debate he describes as sporadic and "nonanalytical." Consequently, he argues, the program was bound

to generate false hopes and frustrated expectations.

The initial proposal was formulated in 1970 by the Senate Labor and Public Welfare Committee's Panel of Consultants on the Conquest of Cancer, a group appointed at the instigation of Mary Lasker and her associates, fabled promoters of major-disease research. The panel's most controversial recommendation, faithfully mirrored in the Senate bill, was that the war on cancer be coordinated by a new agency that would absorb all functions of the NCI and would operate independently of the National Institutes of Health (NIH). The plan thus reflected the conviction of the Lasker circle not only that the overall deceleration of federal research spending must be reversed but also that a vigorous program of clinical and categorical research could flourish only if removed from NIH control.

This seemed to represent a major switch from previous years, when the research lobby, top NIH administrators, and key appropriations chairmen in Congress had skillfully collaborated to boost presidential budget figures for research. But Rettig shows that the research lobby's disaffection in 1970 was rooted in long-standing conflicts over priorities and procedures within NIH and between NIH and the Lasker circle. These conflicts grew more acute with the coming of the Nixon Administration, but the NIH-Lasker-congressional alliance had been more fragile through the previous decade than it had appeared from afar.

It is a complicated story, and Rettig occasionally leaves questions dangling. He uncritically accepts the notion, for example, that a trade-off developed between the growing federal commitment to health care delivery and research funding. Lasker, he suggests, was not inclined to make such a trade-off and in fact "sought to go beyond research to-

wards the provision of patient care" in her instigation of the work of the President's Commission on Heart Disease, Cancer, and Stroke in 1964. The Lasker circle was disappointed, Rettig says, with what Congress and the Administration made of that program. But this hardly clarifies our sense of Lasker's "broader" objectives. For many of the changes made in the commission's recommendations—insuring NIH administration, for example, and moving the program away from delivery toward a primary emphasis on research—were approved, and in some cases engineered, by Lasker allies.

President Nixon sensed an issue in the making as the Panel of Consultants completed its work. He sought to gain the initiative by announcing the addition of \$100 million to his budget for cancer research in his 1971 State of the Union message. By May the White House, wary of being outflanked by Senate Health Subcommittee Chairman Edward Kennedy, had dismissed the scruples of the Department of Health, Education and Welfare and NIH and endorsed the separate-agency idea. Meanwhile Representative Paul Rogers and his House Commerce Subcommittee on Public Health were beginning work on the version of the bill that, in expressing the views of NIH, organized medicine, and much of the scientific community, was ultimately to prevail. The Rogers bill, Rettig rightly stresses, left the major premises of the Panel of Consultants uncontested. But Rogers left the new program in the hands of NCI, and NCI within NIH, albeit with substantial provisions for budgetary autonomy.

Rettig gives an insightful account of Rogers's motivation and strategy as a new subcommittee chairman seeking to establish himself, but he fails to develop a convincing explanation for his victory. He treats the autonomy Rogers enjoyed in running his subcommittee, for example, as a matter of general "congressional norms." But there were in fact wide variations within the House, and on the Commerce Committee, in the situation of subcommittee chairmen, as subsequent pressures for a "subcommittee bill of rights" attested. That Rogers would have a free hand, far from being self-evident, requires explanation. Nor does Rettig have a sure sense of which groups and individuals really counted in influencing Rogers and in bringing others to accept his position; the book contains too many recitals of who said what in public hearings, too little probing of political roles and relationships. And the account of Executive Branch politics is underdeveloped throughout; neither how