

The Prospect of Data-based Medicine in the Light of ECPC

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BESIDES STEADILY INFUSING THEIR CONTRIBUTIONS to medicine over the last century, scientific researchers increasingly have applied their methods to assess new medical technologies (Institute of Medicine 1985). Physicians learned that predictions from basic science alone were not enough; they had to find out whether innovations actually helped the patient. Often, new treatments did help, as demonstrated by the examples of vaccination, insulin, and anesthetics; sometimes, as in the experiments with gastric freezing, they did not; in other situations, like routine iron and folate supplements for pregnant women, we still do not know whether benefits follow from the innovation (Chalmers, Enkin, and Keirse 1989). Assessment techniques are many and include data-gathering methods such as randomized clinical trials (RCTs), controlled observational studies, case-controlled studies, sample surveys, studies of claims records, and laboratory analyses. Although differing in how well they assess interventions, these methods nevertheless provide the findings that make it possible to base a practice of medicine on data or evidence.

What Is ECPC?

One group at Oxford, led by Iain Chalmers, has collected the results of empirical investigations in a particular field—obstetrics—and has orga-

nized the experimental, epidemiologic, and other data for the field. The group tries to keep the collection up to date. This massive effort has produced (1) a huge two-volume work, *Effective Care in Pregnancy and Childbirth* (Chalmers, Enkin, and Keirse 1989), containing the syntheses provided by scores of meta-analyses of randomized and quasi-randomized trials, as well as many chapters on specific areas of obstetrics; (2) a small book, *Guide to Effective Care in Pregnancy and Childbirth* (Enkin, Keirse, and Chalmers 1989), which gives the recommendations from the larger work without the detailed data; and (3) the Oxford Data Base of Perinatal Trials (data from the trials updated and entered on computer disks) (Chalmers 1988).

I shall speak of this whole effort as ECPC. It presents the most advanced current example of a basis for practicing medicine founded on both empirical evidence and theory. To decide whether we can or should try to produce corresponding information in all areas of medicine, I will examine ECPC as a case study to see whether it should be generalized. So great is the magnitude of the task that we can afford to take a hard look at the case before proceeding.

Why Do We Need a Special Program for the Data-based Practice of Medicine?

To state the matter baldly, physicians need to know what interventions work. Evidence is widespread that some treatments in common use are ineffective, wasteful, costly, and even harmful. For the same reasons that new medical practices must be assessed for their safety and efficacy, we cannot depend on the good intentions, beliefs, and unaided memories of physicians for the evaluation of technologies. Systematic collection and processing of information assures that alternative procedures are fairly examined, without the bias of selective memory and personal preferences. Safeguards against bias are the same as for ordinary medical technology assessments.

Much of medical practice has never been scrutinized in a systematic way. Most knowledgeable people estimate that the unassessed portion is well over 50 percent. This is not to say or imply that unassessed treatments and procedures are bad, or even that they are worse than other available treatments. Probably most are beneficial even if they are not the best available. The point is that systematic empirical evidence often

is not available. What is notable about ECPC, however, is that it illustrates what can be done; as mathematicians say, it is an existence proof.

In the field of medicine thousands of RCTS are published each year—between five and ten thousand (Thomas C. Chalmers 1992: personal communication)—to say nothing of all the other kinds of controlled studies and relevant laboratory investigations; thus, the magnitude of the clinician's task of staying informed appears to be overwhelming. Even were clinicians to try to keep up with only their specialties, the demands of patient care allow them little time to do so.

It is not only the amount of work, but also the kind of work that complicates such a task. Most clinicians are trained to give care rather than to produce or interpret research, and therefore they often are only barely familiar with research tools. Why are special tools needed? Multiple studies of the same question often produce different answers. Trying to reconcile the several answers produced by researchers to what is apparently the same question can be a technical and time-consuming task.

First, the effort of finding all the literature and processing it, even with the aid of computers, is long and hard. The ECPC group has created teams of researchers and maintained a correspondence with investigators all over the world regarding obstetric studies. They monitor the entire field and process new information as it emerges, an endeavor that could not be completed by single physicians or medical workers. The variety of skills and the amount of time needed require the resources of an information-gathering industry.

As the amount of information grows, medicine needs updated summaries, which means sorting the studies into sets that address the same question. This may require a substantial effort to prevent distortion by the synthesizers. Summarizing comparable studies requires a multiplicity of skills. The synthesizer must consider the potential systematic differences among the studies and take into account the fluctuations caused by sampling variation and size of study. Appropriate methods of analysis must be chosen from among the many that are available; after the analysis is complete, the results must be carefully interpreted, ideally with the aid of critics in the field.

The authors of review articles usually do not have the time for such an exhaustive search, nor do they have the support and skills to gather and analyze the accumulated data and write them up for dissemination. Consequently, important therapies may be slow to be reported in reviews even after they have received considerable study (Antman et al.

1992). The issue is not whether reviewers recommend the treatments, but whether the reader of the review is apprised of the new methods in a timely fashion. Yet these tasks are all required if we are to develop the practice of data-based medicine. We have to expect a division of labor among the librarians, the research workers, the research synthesists, and the disseminators of the information.

Of course, the concept of ECPC and evidence-based medicine rests on the original studies, and for ECPC this means primarily RCTs that are executed throughout the world. Both this database and its continuation are valuable for the program. We cannot synthesize unorganized empirical information.

As a result of organizing all the RCTs and much other information, each clinical chapter of the two-volume work offers a sketch of research still needed. One appendix to the book lists 63 “forms of care that appear promising but require evaluation”; another lists 146 “forms of care with unknown effects which require further evaluation.”

Availability of Randomized Trials

Depending on RCTs appearing in the medical literature for advice on treatment is not always practical. For many procedures no such trials have been carried out. The reasons are various: the question raised may be too new to have led to systematic research; perhaps the financing has not been available; RCTs may not be appropriate because of legal, moral, or other constraints; the condition may be so rare that a trial may not be practical; or the questions raised may require other kinds of investigations, such as sample surveys or laboratory investigations, for their solutions. Because of the many variations in procedures and in the types of patient who might require them, it would be useless to expect a randomized trial for every procedure. Physicians still have to generalize, interpolate, and extrapolate using their medical knowledge. Thus, valuable as they are when available, RCTs cannot be counted on in all instances.

A special weakness arises in early trials when patients with diseases other than the one being treated are excluded because of the researchers' desire to determine whether the treatment works at least under ideal conditions. An unfortunate consequence often is that the treatment may not be initially studied in the groups of patients who need it most. For

instance, old people with multiple ailments are often excluded from a trial, even when the treatment is intended for the elderly.

The two-volume ECPC includes many additional kinds of studies from the literature: epidemiologic studies, historical surveys, and laboratory information. Consequently, a proper appreciation of ECPC should not overlook its comprehensive character, although the census of randomized trials and corresponding meta-analyses may be its hallmark.

Limitations of Research Summaries

The availability of data does not produce automatic medical decisions, though it may improve them. Mentioning a few reasons for not choosing the seemingly "best" treatment may underline this point: (1) The clinician must consider the special risks presented by the patient's condition. Often studies evaluating procedures have not been tried in patients who have special risks. Clinicians must use their own judgment to take special risks into account, even if research has not provided data on patients with special risks. (2) A recommended procedure may not properly consider the facilities and skills available for treating a patient. Treatments using medical personnel who have special skills and equipment for patient management may offer better outcomes than those designed to be handled by nonspecialists. (3) The physician often must integrate the consequences of the treatment's intensity, the suffering associated with it, and the gains likely to be achieved from that particular method of care in order to best serve the patient's preferences and interests.

Thus, data-based practice of medicine should aid physicians in decisions and may sometimes strongly indicate certain procedures, but we are happily far from automatic science or technology. Clinical practice must still be guided by the special characteristics of individual patients.

Because ECPC is based in the United Kingdom, some may feel that it has a national bias and that its conclusions are inappropriate for another nation. Inevitably the ECPC books contain discussions that emphasize U.K. practices. What is more important is that the studies they present and synthesize come from all over the world. If national regulatory bodies, such as the Food and Drug Administration in the United States, or national physician or hospital organizations in another country, were to frown on a proposed procedure, then it is important to find out why, and to see whether the current national practice is in fact better. What

are the data? What we are discussing here is data-based medicine, not whether the specific recommendations of ECPC apply to all babies and mothers in every country. It is easy to dismiss a research finding by airily remarking, "It is not appropriate here, our payment system would not allow it." We may forget that "our payment system" may not represent the best that medicine can do for us even within our means.

Usage that diverges from the findings implied by a database can be justified by supportive information of its own or by prevailing special conditions.

Concern for Patient's Feelings

Insistence on data need not imply lack of compassion. An endearing feature of ECPC is the consistent concern that the authors express for the personal side of care. Although they adhere strictly to their position that treatments must be backed by empirical evidence, they are also concerned about the patient's feelings, autonomy, and happiness. Again and again their articles argue against unfeeling care and rigid rules that prevent patients from getting the most satisfaction from their care. A substantial fraction of the work in ECPC produces quantitative information about the social aspects of care.

What Are the Benefits and Needs?

Each society needs to make the most of its medical expenditures. To do so requires knowledge of the safety and efficacy of procedures, of their costs, and of individual and societal preferences for how the medical budget should be spent. No society can afford all the good things medicine can offer for all of its people, so this information is required to design a medical care system. Thus costs and cost effectiveness form dimensions that must be joined to the ECPC program, particularly as medicine continues to develop costly new procedures. We must consider which are most effective and which we can afford. The issues are complicated and difficult.

We need to recognize the distinctions between slogans and realizable policies. A typical slogan states, "The best care at the lowest cost." When we ask that two or more extremes take place concurrently—here,

“best” and “lowest”—we are requesting a mathematical impossibility. This outcome can only be achieved by lucky accidents instead of good planning because we cannot ordinarily optimize two desirable variables simultaneously. For instance, in appendectomy, we cannot minimize the number of operations performed on patients who do not have the disease while minimizing the total deaths from appendicitis. Because many unneeded operations will be required to reduce these deaths, practical decisions have to be made based on information about the costs and benefits of procedures and about social and personal preferences. This explains why the slogan “the greatest good for the greatest number” cannot be achieved.

Often the hope expressed is that new research in assessment will reduce or contain costs. I do not think history or reason supports that view. Research on human ills widens the opportunities and varieties of treatment and appears to be an ever-diverging process. We can hope that assessment will lead to better results for the money spent, after we have chosen what to spend it on. This offers a kind of efficiency, but it does not address the issue of the total health bill.

Broadening to All of Medicine?

Although I am discussing ECPC here as a case study, it should be viewed also as a first step in the development of databases for other areas of medical practice. Consequently, the difficulties and features of such an innovation need to be considered in the light of differences in various fields of medicine and in other countries' medical systems as the authors in this issue have discussed. Similarly, disseminating information to practitioners is important for data-based medical practice. The authors of the articles on ECPC in this issue have generally agreed that it is an important, though difficult, endeavor. Research in dissemination has focused almost exclusively on information about single items. Can there be new research on how to disseminate organized data from whole fields, like the information organized in ECPC, that could guide the dissemination process if the new program succeeds for new medical specialties? Obviously, change in physician practice is slow, which is not all bad. However, awareness of new technologies should not be so slow.

ECPC represents great progress in organizing clinical data for physicians. It spearheads the possibility of widening the areas of medicine

that could benefit from such data gathering and synthesis. The recent establishment of the Cochrane Centre, headed by Iain Chalmers, is a second major step toward this reality. The center is named for Archie Cochrane, whose book *Effectiveness and Efficiency* did much to stimulate technology assessment in health care. ECPC has taken more than a decade to reach its present state, suggesting that this program will require several decades to complete. We need to look for features that may improve dissemination; for example, are there characteristics of obstetrics that enable its practitioners to handle new evidence more easily than material from other specialities? The length of pregnancy, the interest of the patient, and social interest facilitate the dissemination of obstetric information. When a condition has a long time course, patients and their families tend to study up on medical practice. Because physicians try to stay ahead of their patients in medical knowledge, those specialties in which patients and their families avidly collect information are more likely than medical fields dealing with acute conditions to prod physicians into staying abreast of research developments. Chronic diseases may also elicit extra attention from patients and physicians because patients have the time and motivation to think about their own disease, and physicians have more opportunities to observe them. Conversely, acute ailments may result in physicians paying less attention to the patient. Speculation aside, we nevertheless need new ideas for further research on dissemination and how to channel the broadening ECPC effort into other areas of medicine.

Lessons from the Case Study

In extending the ECPC model to other branches of medicine, it will probably be effective to use medical groupings that physicians already find satisfactory, such as those represented by their professional societies: infectious diseases, surgery, gastroenterology, and so on. Their familiarity with such groupings should make it easier to organize the task forces required. The number of groupings that can be organized at one time depends on resources.

Voluntary work by professionals has been a key to much of what has been accomplished, and we might hope that similar voluntarism will contribute to future efforts. Clearly a staff and supportive research funds are important requirements, but voluntary work reduces the out-of-pocket costs.

Although the dream of Archie Cochrane focused on RCTs, the strength of ECPC depends partly on the vast amount of additional material that has been gathered. Some fields of medicine will require even more in the way of laboratory or other technical descriptions that do not fall under the rubric of randomized trials. Quantitative and technical information must continue to supplement clinical trial results. It is not clear how often this information needs updating as new publications are very expensive. This matter needs review.

The addition of cost and cost-effectiveness analyses would greatly strengthen the effort, but should not be undertaken casually because commercial interests may not accept a cost-oriented program as readily as a safety and efficacy program. Thus the good will from both industry and the profession for gathering this information could turn to powerful opposition to the whole program if the cost aspect were introduced. Therefore, the idea of adding this cost dimension must be cautiously considered. The study of economics and business requires skills that differ considerably from those required for studying safety and efficacy; the almost inevitable resistance to this endeavor might destroy the effectiveness of the original organization. Some organization ought to be assembling this information, but perhaps not under the same roof as the basic safety and efficacy program.

The idea of gathering, organizing, and analyzing the original data by now is familiar, and its worth is beginning to be recognized. More recently, we have recognized the need for new ways to make data accessible and understandable to physicians. ECPC is a superb example of how this might be done. However, many people from numerous disciplines must combine their efforts to achieve this. New ways of communicating more clearly the findings from multiple investigations to physicians are also needed. Closely linked is a need for better understanding of how to deliver this information so that it changes usage when it should. In sum, we have a good deal of new information and we have ways to organize and present it, but we must discover additional effective ways to disseminate it.

ECPC itself needs additional publicity and more work on dissemination. Even now, relatively few people seem to be aware of the program. Even among the aware, few know what kinds of findings have been produced, a situation that should be remedied.

Financing any ongoing effort that must be maintained and updated poses a problem. Universities, schools, libraries, and journals are enterprises that have been supported for long periods, but usually foundations

become down-hearted when projects continue for years. It is hard to find funding for old projects, however worthy. The hope always is that the worthy enterprise will become self-supporting. Few information-gathering enterprises are capable of this, especially when they give the information freely. Funding for this international effort may require long-term planning. To create the core material for all of medicine and then to maintain it, once achieved, will require substantial ongoing core support. It is an important international effort.

I look forward over the next decade to other fields of medicine making progress that parallels that of ECPC. By taking advantage of the experience and years of work that have gone into the preparation of ECPC products, future work can be speeded. The establishment of the Cochrane Centre implies a plan to carry out Archie Cochrane's program of organizing a critical summary and updating procedures of all relevant RCTs. When accompanied by the information from other forms of study, as has been the situation with ECPC, this will be an outstanding contribution. We can look forward to the millennium.

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