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Acquisition and Use of New Medical Knowledge

THE SCIENTIFIC and technological imperatives of medicine, supported by an active system of biomedical research and development, have produced a steady, rapidly flowing stream of significant changes in the techniques of medical practice. The consequences of this constant evolution have been diverse and profound: many health scourges of past generations have been eliminated, to be replaced by currently intractable disease problems; the locus of medical care has shifted from the family home and physician's office to the technology- and specialist-rich hospital; the technical quality of medicine has increased and the cost of delivering care has skyrocketed; even the meaning of human existence has been challenged by scientific developments.

The speed and profundity of technical change in medicine have generated considerable interest in both academic and government policy circles. Medical technical change interests scholars of many disciplines concerned with the dynamics of social systems, processes of innovation, communication among professionals, and so on.¹⁻³ Policy issues, increasingly prominent in recent years, fall into two principal categories: 1) determining and facilitating optimal

production, distribution, and use of new knowledge and technology;⁴ 2) controlling the escalating cost of medical care.⁵⁻⁶

Needless to say, these two groups of policy issues are not independent. The widespread diffusion and use of expensive medical technologies is a source of medical cost inflation;⁷ the CT scanner is today's most popular example. Inappropriate or excessive use of procedures and technologies that are not expensive on a per-use basis is also a significant factor in cost inflation.⁸ For example, the proliferation of laboratory tests has added greatly to the charges for care without producing an obvious commensurate gain in health outcomes. Scitovsky and McCall found that from 1951 to 1971, the average number of laboratory tests for a set of common diagnoses grew from two to six times, while prognoses remained essentially unchanged.^{8*} The causes of such a profusion of technology adoption and use are numerous and complex. Undoubtedly, they include the medical scientific ethic (the sense that increases

* In some instances, diagnostic accuracy may have improved, but the justification for additional expenditures should rest on health outcomes and not simply the medically-perceived quality of inputs.

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in technical inputs inherently improve the quality of care⁸), third-party reimbursement, which removes both patient and physician from direct liability for the economic consequences of services rendered, and the practice of defensive medicine.

While the cost of care is the most publicized issue at the moment, there is a continuing concern with the quality of medicine practiced throughout the country. One obvious element of quality is modernity—keeping up with technical developments. Thus, there is concern about whether information about the fruits of biomedical research is adequately communicated to practitioners and whether, once communicated, such information is used to improve medical practice. Only in the present decade has recognition dawned that the existence of new knowledge does not mean that it will be disseminated widely among practitioners, that dissemination of information does not necessarily imply effective communication, and that communication does not invariably translate into a desired change in practice. Federal government policy reflects this new appreciation. Previously, the government's research and development activities were restricted to supporting research, occasionally followed by limited innovation demonstration or distribution of information. In recent years, several government agencies have expressed a desire to learn about and expedite the *effective* dissemination of research findings and the diffusion of relevant practice changes; resources are being allocated directly for such purposes.

The ultimate goal is to find ways to intervene in the processes of dissemination and communication to improve the diffusion of medical innovation. However, the first step remains to be achieved: we must develop an understanding of how practitioners learn about new knowledge or technologies and how and when they translate such learning into changes in their practices. What effect do journal articles have on physicians' awareness and use of new medical knowledge? Does continuing medical education have a significant impact on producing knowledge and practice changes? What causes some physicians to be "innovators" while others wait years to adopt new practices? How do informal professional communication networks function and to what effect? The article by Fineberg *et al.* in the current issue⁹ follows in a tradition of research directed toward developing an understanding of such issues. Having selected three medical findings that seem to be well established and relevant to the practice of anesthesiology, the authors surveyed Massachusetts anesthesiologists to learn when and

how they first became aware of each of the findings and when and whether they applied the new knowledge. Respondents who had changed practice were asked to indicate how influential various sources of information had been.

The authors' methodology and findings are basically consistent with those in the literature, including the acknowledged potential for self-selection bias among survey respondents and the limitations on ability to generalize from a case study. Of particular interest is the authors' conclusion that the source of information about each medical finding did not affect the likelihood of a practice change. This differs from the conclusion of the classic medical diffusion study³ that while physicians often learn of medical findings through journals, they are most likely to change behavior in response to experiences described by colleagues. The obvious practical import of this distinction lies in resolving how to expedite or retard a practice change effectively. If journals succeed in conveying information and altering behavior, they offer an inexpensive means of encouraging a desired practice change. On the other hand, if journals acquaint physicians with a finding but fail to alter behavior as effectively as collegial interactions, the latter may have to be facilitated. Of course, it may be that some types of innovations require the personal touch, while others diffuse directly in response to the availability of published reports. This issue is a basic one that warrants further study. The penetration, persuasion, and power ratios employed by Fineberg *et al.* constitute a particularly facile device for isolating and presenting the requisite information.

The authors report differential awareness-to-application lags for the three anesthesia findings. While the greatest lag is explained as a function of the demands of collective decision making and institutional action, we are left with the disquieting realization that the rationality and desirability of the lags are unestablished. Are the lags socially "just right" or too long or too short? The authors' failure to address such questions is not an indictment of their research, but rather a reflection of the state of the art. In order to design effective and efficient diffusion intervention strategies, we must answer two sets of questions. The first is positive: how are new knowledge and technology disseminated and effectively communicated to physicians? The second is normative: what constitutes, and how do we determine, socially optimal diffusion of practice and technology changes? This refers to the rate of diffusion and the lag between awareness and application, the

extent of diffusion, and the pattern of diffusion across physicians and institutions, geographic areas, and so on. The study by Fineberg *et al.* typifies the literature in that it provides empirical data helpful in answering the positive questions, but it contributes little to resolving the normative questions. Indeed, the very success with the former only serves to emphasize the difficulty, and importance, of addressing the latter.

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Erratum

An error appeared in line 2 in the Discussion section of the article, "Chloroprocaine Analgesia in a Patient Receiving Echothiophate Iodide Eye Drops" (*ANESTHESIOLOGY* 48:288-289, 1978). Dibucaine is incorrectly referred to as an ester-linked local anesthetic; it is an amide.