Data Utilization, Not Data Acquisition, Is the Main Problem
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Previous studies focusing on the value of laboratory testing have sometimes been flawed because they had not always determined whether the data generated had been appropriately used by clinicians. It has been well documented that neither clinicians nor administrators always use objective data effectively. When data are not used appropriately by clinicians, not only are morbidity and mortality increased, but also care costs are higher. Failures by administrators result in lost opportunities to identify and correct system deficiencies. To provide information support to assure good data utilization, a prototype desktop workstation has been developed and partially implemented. Experience with such a system suggests that not only may it help provide better care more economically, but it can also aid in implementation of Practice Guidelines (Agency for Health Care Policy and Research) and Clinical Indicators (Joint Commission on Accreditation of Healthcare Organizations) programs. Laboratorians can be influential in this effort and promote the use of new knowledge in patient care in a timely and responsible manner.

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Does broad testing result in better patient outcomes long-term, or is it better for clinicians to “think more and test less”? This issue is especially timely now that many consider the laboratory primarily a cost center and an easy target for savings. That perception has developed because of a failure to appreciate the fundamental nature of medicine and a poor understanding of how to use the laboratory not only in the diagnostic and therapeutic monitoring processes but also in managing medical and administrative efficiency.

Stressing data acquisition may put the issue slightly out of focus because what is frequently at fault in our system is the clinician’s use of the data generated (1). The distinction between data utilization and data acquisition is important because the measures employed to correct problems in each are quite different and, moreover, because failure to distinguish between the two in studies intending to measure the value of laboratory activity has already contributed to the current misconception. Efforts by third-party payers and managed care companies to “correct” data acquisition problems without determining the potential effect of such changes on clinical care are almost certain to be counterproductive by worsening care, increasing costs, and making it impossible to study and improve the operational aspects of the system.

The logic of the argument in this presentation is as follows:

1) The practice of medicine consists largely of information management (2).
2) Despite the availability of a few relatively sophisticated information management systems (3-5), most clinicians have no system or only rudimentary ones available to them (9, 10).
3) Health professionals do not always use objective data appropriately (11).
4) When data are not used appropriately, care is often poorer and costs higher than they would otherwise be (12).
5) It is currently economically and technically feasible to provide sufficiently comprehensive data so that a sequential, expert-driven investigation is possible (13).
6) It may be timely to create these systems because the systems can also be used to implement Practice Guidelines (Agency for Health Care Policy and Research) (14) and Clinical Indicators (Joint Commission on Accreditation of Healthcare Organizations) (15) programs.
7) If creation of the systems is delayed, it may become impossible to gather sufficient objective data to study the system effectively in the future.
8) Finally, if effective systems are produced, they can also be used to diagnose, monitor, and improve the system itself in an ongoing manner.

The task, then, is to devise a system that will permit the gathering of appropriate data and assure their appropriate use.

Because many ill-advised partial “solutions” have failed in the past (16), I will approach this discussion from a system viewpoint. To do so, I have drawn much material from Peter Senge’s book, The Fifth Dimension (17), which deals with “system thinking.” Basically, Senge’s thesis is that, to evaluate a system meaningfully, one must look beyond single defects, bad luck, and individual mistakes. One must look for structural explanations and seek to leverage modest structural modifications to effect the desired changes. This is possible because the nature of a system largely affects behavior, and behavior, in turn, is causative of individual events.

Data Utilization

In studies on the utilization of clinical laboratory data done at St. Joseph’s Hospital in Milwaukee, the appear-
ance of characteristic objective laboratory data on the chart failed to elicit an appropriate clinical response—25–30% of the time (11, 12). That experience apparently must be fairly prevalent, having been noted whenever the subject has been examined—even in some of the nation's most prestigious institutions (18–21)—and are similar to the results for studies of activities other than those emanating from the laboratory (22–26). Institutions that believe they do not have a problem with appropriate data utilization are likely not to have studied the problem objectively.

Examination of the charts of those patients whose diagnoses were missed or unduly delayed identified specific inefficiencies. In our hospital, the main reasons for poor data utilization were found to be:

- inadequate data
- sensory overload (unmanageable charts, failure to recognize previous diagnoses, and failure to recognize the significance of previously obtained objective evidence)
- lack of pertinent knowledge and the "barbarism of specialization" (27)
- confusion and fragmentation of care when several physicians care for a patient at the same time
- late-arriving data, and
- failure to follow the patient appropriately—both poor patient compliance and physician failure.

Clearly, therefore, many of the problems relate to a failure in data handling and information management. This failure then represents, in the syntax of Senge, a "structural abnormality."

To correct this abnormality, the ideal system would have to include the following:

- a lifelong patient-oriented database and
- convenient access to operational information, knowledge-based information, experience-based information, and cost information, and
- ongoing methods to update the informational segments, evaluate outcomes, improve the logistics of case management (28, 29), and implement feedback loops.

Considering the actual deficiencies in practice and what it would take to correct these deficiencies, it is unrealistic to expect gatekeepers (i.e., primary-care physicians) to function effectively without computer assistance—no matter what the financial incentives or threatened penalties.

The passage of PL101-239, which created the Agency for Health Care Policy and Research, in December of 1989 was followed by the development of several hundred guidelines—mostly by specialty medical societies. While that development activity continues, little progress has been made with regard to the corollary problems of dissemination and determination of compliance and validity.

Because of the large number and diversity of guidelines and this need to document compliance and validity, it again becomes apparent that computer assistance is required. In partial recognition of this need, the American Medical Association is currently planning to provide guidelines on CD-ROM and the National Library of Medicine may make them available electronically, full text, in its Health Services Technology Assessment Research (HSTAR) program sometime in 1994. Unfortunately, no way of documenting compliance and (or) validity seems to be currently available. Whatever system is ultimately devised, however, it should be flexible (30) and compatible with the proposed computer-based patients' record (13).

If medicine were to be further computerized, what would have to be done? How would one go about it? What help could the health professional reasonably expect from it?

It may be useful to think of the development of the necessary computer system(s) as follows. On the one hand, because hospitals have formed or will form large potentially integrated provider groups (as directed in the Health Security Act of 1993), including other hospitals, clinics, doctor offices, nursing homes, home health services, etc., it has become increasingly important to integrate the flow of information to avoid further fragmentation of care. The data gathered by such systems might include component charges, insurance carriers, current and previous diagnoses, current and historical x-ray and laboratory reports, scheduling systems, and messages. Systems of this type would be expected to be relatively large.

On the other hand, smaller systems are needed to support the patient–physician relationship so that individual clinical decisions can be optimised. These smaller systems would be expected to use both data gathered by the large systems and those locally generated. Information support of this type is probably best provided on a desktop workstation (31–37). The two tasks, then, reminds one of the building of the tunnel under the English channel: Work progressed from either end with the devout hope that they would meet in the middle.

For several years an attempt has been made to build a prototype workstation at St. Joseph's Hospital in Milwaukee. That experience taught us that

- developments in computer hardware and software make implementation both feasible and affordable
- development can be modular
- much clinically valuable data can be provided relatively easily
- some practice problems can be identified by readily available objective data gathered in the normal course of practice
- the system can be used to correct some of the inefficiencies identified and
- the critical components of the corrective measures appear to be a lifelong patient-oriented database, a message system, and a scheduling system based on diagnosis and results.

Databases

While it is true that creating national and regional databases is necessary so that the nature of health care
can be measured nationally (16, 38), developing local and intramural databases is also important. We can expect that developing national databases will be relatively difficult and costly; and, even if successful, their clinical value to and use by an individual physician may be problematic. Local databases, on the other hand, should be easier to create, are more likely to be useful, are more readily implemented, and can be expected to have more of an immediate impact on the practice of medicine because

1) Diagnostic and monitoring decisions are basically local decisions and the information can be provided in time to affect a clinical decision.
2) Physicians are more likely to cooperate when the decision-making power is not removed from them.
3) The system can be used to identify and correct local problems.

Local and national database developments, of course, are not mutually exclusive. Rather, a realistic scenario might be that the contents of local databases would be regularly transmitted to a national medical facility for use in determining the national experience. Some commercial developments (e.g., Summit Systems, Minneapolis, MN) appear to represent efforts to create national databases in selected clinical areas by aggregating local experiences.

Response to Healthcare Reform

While the details of the healthcare reform package have not been determined, many have assumed that large-scale buying groups will be negotiating with large provider groups and that market forces such as economics of scale and competitive factors will be relied on to improve practice efficiency (Health Security Act of 1989). In other words, the approach appears to represent yet another partial solution—dealing with access and costs, perhaps, but giving only token attention to quality (39). In this national proposal, too, little distinction is made between administrative and medical efficiency. Apparently many economists and administrators either are not persuaded of the functional and economic importance of improving medical efficiency or think that correcting the medical aspects of the system would be too complicated or politically inexpedient. It is our responsibility as laboratorians and physicians to make sure that quality issues are not ignored or merely given token acknowledgement in the national efforts to provide access and control costs.

These considerations have important practical consequences. Milwaukee, for example, has two major groups of healthcare providers and several smaller ones. The two major providers apparently are employing similar but somewhat different strategies to prepare for the expected challenges. System A is aggressively creating alliances with other healthcare providers and purchasing many practices and clinics: in effect, creating a large provider network with the hope that their size will enhance their bargaining position. To my knowledge, no unusual effort has been made to improve medical information-handling or to integrate the medical activities of the diverse groups.

System B, while creating some looser alliances at a more measured pace, is also attempting to create an information network, one designed to improve data utilization both medically and administratively. The preliminary design stresses improved communicability and includes a common systemwide clinical repository so that outcomes measurements become possible.

While each system has adopted some aspects of the strategy of the other, the underlying distinction still appears to be fairly clear and it will be interesting to observe the quality and economic outcomes, both short- and long-term, if the groups continue their current strategic plans.

There is one caveat. While the informational strategy appears to be more meaningful medically (and thus more likely to be successful in the long run), there is no assurance that the value of the informational strategy will be appreciated by payers at present. "Smart" buying is obviously critical.

The above considerations pertain to organizations and institutions. It is also important for us as laboratory scientists to have a clear understanding of what our role will be in the new scheme of things. That understanding is certain to be important in shaping the future of the laboratory and laboratorians. To reach that understanding, we must first ask ourselves whether we are service workers or knowledge workers (in the sense used by Drucker (40)). If we are knowledge workers, we must then be concerned with the following questions: How can we be assured that we are capturing appropriate data in an efficient and effective manner? Are the data being used appropriately? Are data being converted to information properly? Is information being aggregated effectively into knowledge, and is knowledge being disseminated efficiently?

In short, we must not only satisfy our responsibility to supply accurate and timely laboratory results but also make sure that the data are being used appropriately in the care of the patient.

Impact of New Technologies

At the same time, we must continue to fulfill our traditional role as a conduit of basic science developments to the practice of medicine. This requirement represents a critical need: Many physicians require help in using new technology appropriately, and cost-containment efforts run the risk of suppressing scientific creativity and the application of new knowledge to the care of the patient. Therefore, facilitating the introduction of appropriate new technology represents a real opportunity for laboratorians to both improve patient care and regain credibility, given the fundamental ways this new technology (especially molecular biology) can be expected to change clinical and laboratory practice (41). Some of the opportunities and difficulties of this situation are suggested by the following:

1. Because the techniques employed are quite new (e.g., restriction fragment length polymorphism, single-
strand conformation polymorphism, polymerase chain reaction, ligase amplification systems, ribonuclease protection assays), many practitioners are not even aware of their availability, let alone what kind of information they may provide.

2. These new techniques may enable the laboratory to become more involved in therapeutic decisions, particularly in areas such as drug resistance, antisense therapy, triplex therapy, ribozymes, anti-oncogene product therapy, effect of genotype determination on therapeutic decisions, monoclonal antibodies, catalytic antibodies, and gene-transfer procedures.

3. The laboratory may be expected to contribute to the investigation of the patient in the context of the family or the environment, or both.

4. Genetic tests may give an entirely new meaning to the concepts of preventive medicine. For example, tests of this type may be used to identify asymptomatic individuals likely to develop hemochromatosis, diabetes, coronary disease, interventricular septal hypertrophy, cardiomyopathy, Alzheimer disease, Huntington disease, retinoblastoma, cystic fibrosis, multiple endocrine neoplasia, Hirshprung disease, hypertension, emphysema, and osteoporosis. These developments give hospitals the opportunity to function as a health maintenance organization in a very literal sense.

5. Molecular biology technology also makes possible the study of archived material, a feature that should be able to provide important information on previously investigated patients so that, as new information is gathered, it may be used both in the care of an individual patient and to enhance the experience and knowledge databases. Archived material also may permit the rapid determination of the effectivity and the applicability of proposed diagnostic or therapeutic procedures. This can be expected to shorten the time and cost required to evaluate potential new procedures and techniques. Several questions will have to be answered, however, before attempting such activity—for example, how would patient privacy be protected? 42, 43; how should the archive be maintained and by whom? who should decide what material should be saved and studied, and how? who should pay for the sample preparation, storage, and studies? and how can the knowledge gained be applied to the care of an individual patient?

6. Given that improved clinical utilization of laboratory data is the desired goal, the laboratorian will need to understand fully the clinical implications of the data supplied. How is that going to affect the role of the pathologist? the PhD clinical chemist? the PhD microbiologist? the coagulationist? How will the need for clinical expertise affect the training of these specialists? If the current laboratorians cannot provide assurance that the data are being used appropriately, who will?

Another recent trend bound to have a significant effect on the pattern of care is that many patients desire to have greater control of their own healthcare (44, 45). This desire has developed partly because of a weakening of the traditional patient—physician relationship and probably can be ascribed to the depersonalization and fragmentation of care associated with specialization, the adversarial malpractice ambience, and the increasing influence of HMOs and other managed care companies with regard to physician selection. The patient—physician relationship may become further strained in the future as scientific advances make it more important to study the patient in the context of family and environment (46).

All in all, then, we can expect profound changes in the medical scene in the next few years. These changes will probably strain traditional relationships and will put a premium on access to more comprehensive and timely information by knowledge workers. We need information systems to help satisfy that need. As Eddy has stated (47), "The solution is not to remove the decision-making power from physicians, but to improve the capacity of physicians to make better decisions. We must give the physicians the information they need; institutionalize the skills to use that information and we must build processes that support, not dictate, decisions." I have tried to suggest ways in which those goals may be attained and, by doing so, maintain the creative genius of the past while containing the onerous costs of the present.

References