The Impact of Information Technology on Health Care

By Barry Chaiken, MD, MPH

A look back at the advancement of modern medicine over the last 20 years is breathtaking. Who could have foreseen the introduction of computer axial tomography, magnetic resonance imaging, laparoscopic surgery with fiber optics, Teflon arterial graphs, or the numerous pharmaceutical treatments for previously incurable diseases? The list of these miracles goes on and on, with new technology introduced each day. Americans have gained so much from the advancement of technology. In addition to the medical gains already noted, our lives are filled with new reliable devices that provide us with convenience, entertainment and safety: microwave ovens cook without heat, 35" televisions access 500 channels and automobiles stop on ice without skidding.

we must look back at what we have already accomplished. Work in the management and distribution of medical information has been going on for some time. Many organizations and individuals have contributed greatly to this effort. With the new technology available, the challenges have become even greater.
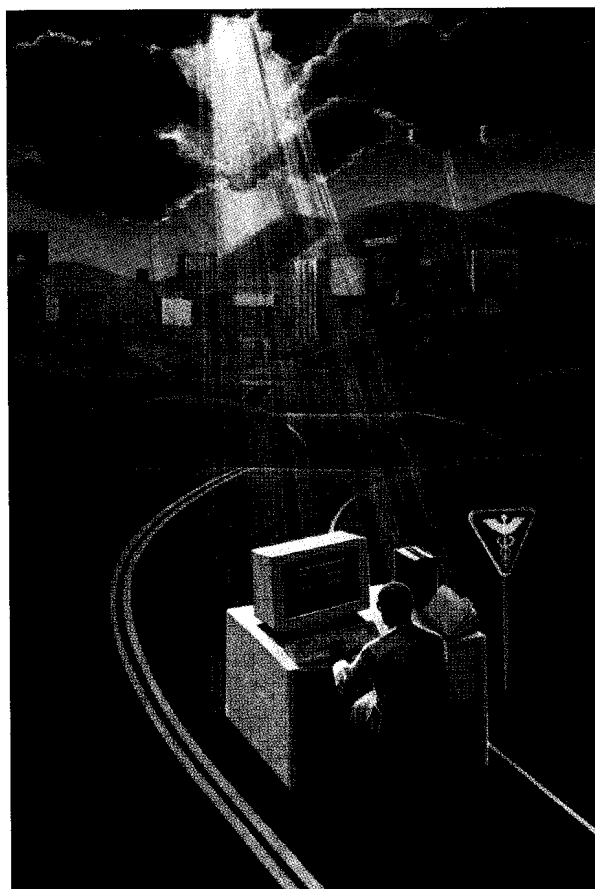
The impact of technology on the transfer of information is evident each day on television. Anything that occurs in the world can be telecast instantly to almost everyone's living room. Surely, the fall of the communist nations resulted at least in part from the loss of control of information by those authoritarian states, for he who controls information has the power to influence and change behavior.

It is through the management of information, in particular its dissemination, that we can address some of our health care challenges. We need to use new information technologies to provide physicians, patients, providers and payors with the appropriate, relevant information to produce good, acceptable outcomes from appropriate cost-effective care.

To understand where we must go,

Criteria, Guidelines and Protocols

Technology has been used in several ways to address quality of care issues included in the development of criteria, guidelines and protocols. Criteria, a term often used to describe any medical information summary that assists in the direction or review of care, have been in wide use for many years. In the late 1970s and early 1980s, many health care providers used criteria such as length of stay tables or severity indexing/ intensity of service checklists to identify gross misuse of resources. Utilization review companies formed to help providers manage health care resources more effectively. Although many of these systems developed from questionable methodologies, they generally helped reduce resource use. Unfortunately, they failed to adequately address the important issues around quality and appropriateness.

In the 1980s, as managed care became more widespread and interest in quality care increased, organizations developed guidelines and standards to manage quality and utilization of care. The Federal Agency for Health Care Policy Research (AHCPR) contributes greatly to guidelines research. The Centers for Disease Control and Prevention provides immunization standards that are used all over the world. The American Cancer Society and other medical societies develop standards for cancer screening. Several commercial guideline efforts produced systems that can identify grossly inappropriate care, poor quality of care, and resource waste.

Guidelines and standards work well for tests and procedures for which the proper plan of care is well known and usually followed. However, in instances in which this is not the case, appropriateness protocols are useful. This includes procedures that involve high risk to the patient and high costs, and in which evidence of inappropriateness exists. In the late 1980s, advances in computer technology and information systems research allowed the development of this type of protocol.

Appropriateness protocols use both physician and patient information (including patient preference where applicable) to quickly identify the value of care. These programs are logic-based expert systems that attempt to reproduce the clinical thinking that leads to a decision to proceed with a particular therapy or test. The use of this "knowledge engineering" process allows the development and testing of expert systems that provide assistance to physicians in making clinical decisions.

Unlike the 1970s, during which criteria were developed without rigorous methodologies, appropriateness protocols use accepted research methods that include medical literature review, broad-based expert panel selection, and knowledge engineering techniques. Both physicians and their patients now demand protocols that are clinically valid and defensible.

Because these are computer-based systems, the inherent logic can quickly be processed, resulting in a clinically valid recommendation. Without the use of this

> Appropriateness protocols use both physician and patient information (including patient preference where applicable) to quickly identify the value of care.

technology, the flowchart needed to represent the internal complexity of a protocol would cover a moderate-sized wall, and even then be functionally unusable. In addition to the information itself, the method of delivery of the information is key to its usefulness. Only systems that deliver relevant information at the time that it is needed are truly helpful. It is information physicians strive for, not data.

There are several systems available that use these technologies. Great value, through improved quality of care and reduced costs, could be obtained from using them more actively. In addition, building a trusting and mutually respectful relationship among physicians, patients, providers and payors assists in the use of clinically valid and established appropriateness protocols. Their delivery on a technologically sophisticated platform makes them useful.

Outcomes

Much attention has been directed to the benefits that outcomes research can have on directing good quality care. Research is ongoing at the AHCPR, academic institutions and commercial organizations. Several managed care organizations, hospitals and other facilities use outcomes measures to monitor the benefit their care provides.

Outcomes measures look at the clinical results of treatment, functional health status and patient satisfaction. Some organizations are developing instruments to measure how patient lives have changed since receiving care, while others are evaluating how satisfied patients are with their treatment and measuring their level of improvement in terms that the *patient* can understand. Thanks to outcomes research, even if a surgical procedure is executed flawlessly, we no longer think of it as being successful if the patient is debilitated or dies.

To be sure, outcomes measures are not "magic bullets" for solving our health care quality and cost problems. Methodology challenges exist in outcomes research, and there are the additional problems of study costs, study length and changes in medical treatment that make the findings of the studies less useful. Despite the limitations cited, these new research areas take great advantage of the many new information technology tools.

Profiling

The development of huge health payment claims databases provide a vast source of mostly untapped physician performance data. Even with their inherent methodology and reliability problems, claims data can be used to profile care provided by health care institutions, managed care networks, physician groups and even individual physicians. Using both software and hardware tools unavailable only a few years ago, developers can use these claims data to identify patterns of quality and utilization.

Profiling tools often look at episodes of care, which include the health care process a patient goes through, from first becoming ill to finally returning to their baseline health status. In addition, key performance indicators, similar to the standards mentioned earlier, are used to evaluate physician performance.

Standard treatment protocols help monitor quality and resource use for categories of diagnostically equivalent illnesses. With all this, statistical adjustments, using case mix or severity of illness measures, are made to equitably compare physicians using normative databases in an effort to identify areas where further evaluation is needed.

Outliers or problem areas are not definitively identified because profiling systems are limited by the data they collect. If properly used, they focus in-depth evaluations on areas that are most likely to identify a problem area. This allows continuous quality improvement to take place as physicians and organizations receive relevant feedback on the care they are providing, while identifying specific areas that require improvement. This improvement can be in the form of education, retraining, or changing of systems (e.g., the way in which things are done). If improperly used, profiling tools can incorrectly label some physicians or institutions as "problems" when in reality they may be treating more difficult patients.

Without the latest tools in information technology, such sophisticated analysis and evaluation of complicated systems would be impossible.

> It is information physicians strive for, not data.

Medical Databases

Vice President Gore has made popular the phrase "information highway." With the advent of this information highway, medical information and the exploration of medical databases are no longer left solely to clinicians and medical researchers. Recently, I heard a story about a woman who suffered from disruptive sleep patterns and enhanced dreaming. Being familiar with information technology, she and a friend used the available professional and consumer health and medical databases to determine the probable diagnosis of and necessary testing and treatment for her condition. When the woman subsequently visited a sleep specialist, she was able to provide the physician with important information that was used to further diagnose and successfully treat her condition. This is just one example of how information technology can have a significant effect on the delivery of health care.

Challenges

There is a very big difference between data and information. Whether using criteria, guidelines, protocols, profiles, outcomes, or medical databases, it is the way in which the data are presented, packaged and delivered that turn data into information. Information about mycoplasma pneumonia is not very helpful to a physician who is currently treating someone for Lyme arthritis. Likewise, information about Lyme arthritis is equally unhelpful to the physician when the next patient

he or she examines has mycoplasma pneumonia. Data become information only when they are relevant to the situation at hand and available on a real-time basis. Our medical system does not lack data, it lacks information. These new information technologies convert data to information.

Physicians

Physicians must step forward and take a leadership role in the development and use of these information systems to more efficiently manage high quality care. If physicians are to successfully provide leadership, they must embrace the concepts of education and retraining. The medical profession can set the clinical direction through work on the development of standards, guidelines, protocols and outcome measures. Physicians must accept the fact that utilization is an issue that must be addressed. There is a responsibility to manage utilization while protecting the quality and access to care. Who better to understand the inherent clinical issues than physicians?

Payors

Payors have a responsibility to use the best information technologies available to help ensure good quality patient care at a reasonable cost. This commitment must embrace the best tools, not just those tools that they currently use or with which they feel most comfortable. Even though these tools have some limitations, they are constantly being improved and their contribution is substantial.

If physicians embrace education and retraining as supported by these

information tools, payors must respect physician concerns. Doctors should not be removed from managed care networks solely because of the results of a profiling tool. There must be cooperation between payors and physicians so the information provided by these various tools can be used to improve the quality of care and limit inappropriate care. Physicians must be given the opportunity to understand their patterns of care, explore the reasons for them, and have the opportunity to receive education and retraining, if necessary, to modify those patterns so they are more consistent with what is expected. Payors must truly promote quality of care, recognizing that high quality care manages costs. They must encourage innovation in information technology and help physicians to convert data to information to enhance quality of care.

> Thanks to outcomes research, even if a surgical procedure is executed flawlessly, we no longer think of it as being successful if the patient is debilitated or dies.

Patients

Patients have a serious responsibility for their own care. As described earlier, the advancement of information technology allows nonclinical people to have access to huge amounts of medical information in a form they can understand. Several of the national on-line services, Internet, and local computer bulletin boards have forums in which patients with similar diseases can share information. As patients become more educated about their illnesses and potential treatment options, they must assist their physicians in developing treatment plans that are right for them. All the responsibility cannot be just on the treating physician. Patients also need to embrace preventive

services that can significantly impact on their morbidity and mortality. Finally, they must support the development of new technologies and techniques particularly through their participation in outcomes studies.

Industry

Industry has an important role to play whether their business is in the medical marketplace or not. Industry must underwrite innovation within the medical field through grants and financial support of programs that take advantage of new information technologies. Industry can help by encouraging further development and use of guidelines and protocols, and the proper use of profiling systems and supporting employee participation in outcome studies. Industry must also recognize the link between quality and cost, and not just focus on premiums. With or without managed competition or health care reform, industry has a leading role to play in reshaping health care in America.

Opportunities for Participation

There are many opportunities for clinical and nonclinical people to assist in the development and use of health care information tools for quality assurance and appropriate care. For example, the National Association of Managed Care Physicians, located in Glen Allen, Virginia, is a group of 17,000 physicians working to educate and prepare physicians to assume leadership roles in the changing health care delivery system. Its founder, William C. Williams III, MD, believes physicians must work to develop standards, guidelines, protocols and data analysis methodologies so that they can consistently provide good quality care. The Association is exploring partnerships with industry to use new information technologies to educate both physicians and patients. The Association's nonprofit educational foundation is

moving forward with an initiative to train health care professionals in managed care.

The American Board of Quality Assurance and Utilization Review located in Tampa, Florida, educates and certifies physicians, nurses, and other health care professionals in quality assurance and utilization review. The National Board of Medical Examiners was hired to revise and standardize the Board's certification examination to take into account the latest advances in the field of quality management. Regular continuing medical education programs and core courses offer health care professionals the opportunity to learn about the latest advances in quality assurance and utilization management.

> Our medical system does not lack data, it lacks information.

Other organizations that promote quality and cost containment through better use of information include the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), the American College of Medical Quality, the Utilization Review Accreditation Commission (URAC) and the National Committee for Quality Assurance (NCQA). The JCAHO inspects hospitals and other health care institutions while also offering educational sessions to professionals. URAC accredits organizations that provide utilization review services. NCQA inspects and accredits health maintenance organizations.

Many commercial organizations embrace the concepts of quality management. These organizations play a key role in the advancement of medical information technologies through their critical investment in development and maintenance of these technologies.

Consumer groups also do much to promote the dissemination of information. As noted already, illness-specific patient groups have formed to exchange information. The more established consumer protection organizations collect, package and distribute health care information, which allows people to make more informed choices. Without the existing communication and computer networks, none of this information sharing and education would be possible.

Government truly has a role in this information technology explosion. Through research, more can be learned about how to make our information systems better. Although government agencies should not set specific standards of care, which tend to quickly become outdated and unworkable, they could provide general targets that the private sector can work toward. This includes identifying levels of preventative services and encouragement of the appropriate use of standards, guidelines and profiling to monitor the delivery of health care services.

Conclusion

The information technology revolution is changing the way medical care is delivered. These new tools provide physicians with the opportunity to access relevant clinical information on a real-time basis thus allowing it to have a greater impact on patient care. Using standards, guidelines, protocols and information available from profiling performed using normative databases, physicians can obtain useful information on their patterns of care. Patients can obtain understandable information on their disease process, thereby becoming informed consumers of health care. Organizations exist to educate physi-cians and other health care professionals in the use of these systems. Finally, both for-profit and nonprofit organizations are developing the tools and making the investments needed to convert data into information. In summary, the commitment by these multiple players to employ appropriately the new information technologies that are emerging, will enable health care to more forward rapidly in its quest for high-quality patient care and optimal resource utilization. Ⓜ

Barry Chaiken, MD, MPH, Vice President, Clinical Marketing, Medical Intelligence, Inc./GMIS, in Brookline, MA, provides medical leadership and strategic planning support for MII and GMIS's medical management systems products.