The Practice of Informatics

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A Vision of Health Care and Informatics in 2008

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A b s t r a c t   By the year 2008, a major reorganization of health care services in the United States will have evolved from the solo- and group-practice models of the 1940s, with fee-for-service and insurer-indemnification financing and paper-based information systems, to nationwide managed care plans employing enhanced computer-based information systems.

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Evolution of Managed Care Plans

In the 1940s medical care in the United States was provided mostly on a fee-for-service or insurer-reimbursement (indemnity) basis by physicians practicing alone or in a group practice, and patients could select almost any physicians they chose. In the mid-1940s a group practice, capitation prepayment plan for medical care services was initiated in California by the Kaiser Permanente Medical Care Program, and plan members were required to use group-practice physicians and hospitals provided by the nonprofit health plan.[1,2] The periodic prepayment of dues by members of the plan permitted identification by the plan of its target population, and it furnished denominator data for determining rates of utilization for all resources and patient care services. The use of such utilization-rate data, combined with the revenues from prepayment of dues, permitted reliable forecasting and budgeting of all resources needed by the plan, including physicians, nurses, facilities, tests, and procedures; all were based on per-member per-month, or per–1,000-members per-year data. The capitation prepayment mechanism required physicians to accept, for contractual periodic fixed payments, the responsibility for furnishing all services specified in the health plans' contracts with its members. Capitation prepayment for medical care became a very powerful tool to obtain and maintain a desired balance among quality (good care process and outcomes), services (good access and patient satisfaction), and costs (competitive and affordable).

In the 1970s, capitation prepayment began to diffuse throughout the United States as a result of the Health Maintenance Organizations Act passed by Congress in 1973 to encourage approved health maintenance organizations (HMOs), modeled after the Kaiser Permanente plan. Federally qualified HMOs were required to expand their medical services to encourage "well care" (the maintenance of health) in addition to providing comprehensive sick care.

In the 1980s the increasing expectations and strong demands of patients for technology innovations that can extend life and support or replace worn-out or-

gans, limbs, and joints resulted in significant increases in the costs of medical care.

In the 1990s attempts to improve the quality of care by exploiting modern technology and to increase the efficiency of the health care process, yet maintain health care costs at a level the public could afford, resulted in a major restructuring of the financing and organization of most health care plans in the United States. Efficiencies in the care process resulted from mergers of organizations and produced very large health care plans that used several hospitals with associated medical offices and clinical support services (such as clinical laboratory, radiology, and pharmacy services). Compared with single institutions, the expected advantages of large multifacility health care programs included economic benefits from improved access to capital (such as by public ownership of stock), increased efficiency, economies of scale, and a greater ability to diversify; personnel and management benefits, such as improved recruiting and retention of a high-quality staff; and planning, program, and organizational benefits with a regional rather than a local perspective on health needs.

In the early 1990s the increasing demands by plan members for health care services began to exceed the supply of available revenues and resources, so health care plans attempted to limit this demand by more closely managing the provision of medical services through the process of managed care—a concept designed to increase the efficiency of the delivery of capitation prepayment care by controlling the total costs paid for care on a per-person per-year basis. By the mid-1990s more than 60 percent of the total population in the United States belonged to some form of managed health care plan.[3] Many managed care plans (MCPs) were formed as for-profit plans, and some sold stock, thereby becoming investor-owned by their stock holders. Less restrictive options gave some members a choice in selecting nonplan physicians, and contract physicians generally were required to discount their rates and assume more financial risk.

In the first half of the 1990s most MCPs focused their efforts on controlling the costs of care, and were helped by computer-based business and accounting data that were readily available.

In the mid-1990s, since medical practice is very labor-intensive, MCPs also directed their efforts to improving the productivity of their health care professionals (who account for about one half of all patient care costs) by decreasing the numbers of their professional staff and demanding a faster throughput of patients. However, this resulted in poorer quality of patient care and services and produced a decrease in satisfaction of both patients and professionals.

In the late 1990s, since medical practice is also very information-intensive, MCPs began to enhance their systems for information processing by employing more advanced computing applications to attempt to increase the efficiency of health care professionals. However, computer-based patient records in the late 1990s still contained mostly administrative and accounting data and little clinical data. Consequently, it was not possible to determine from electronic patient records the effectiveness and efficiency of specific clinical actions. Administrators therefore sought to contain costs by monitoring and limiting utilization. Managed care plans used a combination of noncoverage of services and products and direct financial incentives and penalties to physicians to limit hospital admissions, lengths of stay, and the use of expensive prescriptions, laboratory tests, imaging procedures, and surgical procedures. A greater emphasis on personal preventive medicine, health-risk appraisal, and predictive medicine based on a patient's genetic data was meant to decrease the costs of patient care through the earlier detection of preventable conditions using computer-based practice guidelines employing evidence-based recommendations for appropriate tests, procedures, and case management.

Evolution of Health Care Informatics

In the 1950s, when automobiles and telephones were already among the day-to-day tools of physicians,[4] hospitals began to use punched cards and unit-record equipment for some of their business and accounting functions.

In the 1960s, large mainframe, time-sharing computers began to be used for some applications of information processing in hospitals but almost exclusively for administrative and business functions.[5]

In the early 1970s, some clinical applications used display terminals connected to central mainframe computers and located at nursing stations. In the mid-1970s lower-cost minicomputers were introduced, and these smaller, special-purpose computers were distributed in various hospital departments. Electronic interfacility communication was stimulated by the Department of Defense's creation of the national ARPANET, which linked some academic institutions in the United States. ARPANET gradually evolved into the global Internet.

In the 1980s local area networks permitted users of multiple, inexpensive, mini- and microcomputers

within a hospital to link their departmental local databases in distributed database systems. Some computer users in affiliated hospitals began to employ communication networks to link their various hospital information systems. The combination of powerful mini- and microcomputers in expanding communication networks resulted in the diffusion of medical information systems supporting both hospital and office practice. By the end of the 1980s, about 80 percent of physicians had some type of computer in their offices. Information systems in large hospitals using more advanced database-management systems began to use a mix of large, mini-, and microcomputers linked by local area networks.[6]

In the 1990s hospital managers could use their computers to monitor online some of the patient care processes as they were happening, rather than retrospectively reviewing paper records. With information derived from computerized databases, programs of utilization review and quality assurance began to impose rules to monitor and control hospital admissions and discharges and to guide some patient care plans. More powerful clinical workstations implemented guidelines to support clinical decision making in direct patient care. By furnishing clinical reminders and alerts and suggesting alternative therapies during the clinical encounter, these systems made the quality of care more uniform. By the end of the 1990s evolving clinical workstations were beginning to use voice and handwriting capabilities and linkages to database servers to meet the increasing requirements for standardized electronic filing of claims for payment of services. Growing explosively in the late 1990s, the Internet replaced intranets in some hospitals. Patients began to use the Internet for enlightened self-care and health education and for communicating with health care professionals. Especially in home care, telemedicine became a means of bringing the expertise of health care professionals to patients and to less expert care providers in remote locations.

Evolving information technologies both enabled and benefited from widespread mergers and acquisitions of health care enterprises. With large numbers of patients receiving services in multiple, geographically scattered facilities, these merged enterprises required a sophisticated information infrastructure to balance support for patient care, cost containment, and quality control. Managed care plans expanded their information systems to include more clinical data so that they could better monitor and control clinical processes and outcomes. Concomitant advances and investments in medical informatics provided tools to re-engineer patient care.

Predictions for 2008

One can realistically predict that by the year 2008, only very large, multistate MCPs will provide health care to most of the U.S. population. Most MCPs will have merged to provide patient care services within vertically and horizontally integrated hospital and medical office facilities. About half of these MCPs will probably be organized as privately owned not-for-profit plans modeled after Kaiser Permanente. To be eligible for the Internal Revenue Service's tax-exempt status, these not-for-profit MCPs will have eleemosynary budgets of about 5 per cent of their annual revenues to support education, research, and charity. The other MCPs will be privately owned for-profit plans. Of the private, investor-owned for-profit plans that originated in the 1990s, most of those that depended on selling stock to raise capital for their facilities and equipment will not have survived the early 2000s. Their demise is likely because stockholders will demand continual increases in annual dividends, even though employer groups will aggressively negotiate lower health care premiums for their employees, decreasing revenues; members will reject MCPs that use less than 80 percent of their prepaid dues for direct patient services; and MCPs with a healthier financial structure will compete aggressively for members. Facing bankruptcy, these financially distressed MCPs will be bought out by large, privately owned for-profit MCPs that acquired their needed capital by incurring long-term loans from banks or by issuing bonds, thereby enabling them to include a defined indebtedness in their annual budgets.

By the early 2000s, surviving MCPs will contain a greater proportion of older members and chronically ill members, creating a rising demand for services. To maintain their own financial health, MCPs will have to offer efficient services that are effective not only in treating illness but also in promoting health and preventing disease and complications. To identify and disseminate the best services through research, decision support, and quality control, MCPs will depend on the growing availability of clinical data in computer-stored patient records. Informaticians will respond to the challenge to support improved clinical practice by enhancing the basic applications already operational to develop and distribute guidelines for care. The implementation of standards will aid their efforts.

The medical industry having failed to agree on uniform requirements for the computer-based patient record, the Health Care Financing Administration (HCFA) will have imposed national standards

through its requirements for electronic submission of standardized claims. By 2008, national regulations will have imposed uniform medicolegal requirements in all states for licensed health care professional practice, established standards for medical terminology and data definitions to permit nationwide integration of patient data, set minimum requirements for electronic claims reporting from computer-based patient records, and assigned universal identification numbers to all patients to permit linking individual patient records wherever the person receives care.

Although the standards may be onerous in some respects, they will make it possible not only to manage patient care better but also to learn from clinical data. Most multistate MCPs will employ a comprehensive, organization-wide, multimedia wide-band intranet for their medical information systems. These systems will include a large data repository containing clinical, administrative, accounting, and membership data; access to secure, confidential, comprehensive, integrated computer-based patient records; online clinical decision support, order-entry monitoring, and practice guidelines for health professionals; administrative decision support for managers who will use data about prepayment capitation, membership, accounting, and patient care; epidemiologic monitoring of large membership groups as populations; and communication via the Internet and wide-band multimedia intranets for professional needs, patient education, and home-care telemedicine. Plan members will hold personal smart cards that will contain their basic health care information, including genetic information, for the predictive practice of medicine.

The next-generation Internet will speed the transition of informatics from a support for health care to a means of transforming health care. Laser fiberoptics will furnish more acceptable rates of transmission of images between multistate medical facilities, making telemedicine a more practical and routine mode of care delivery. Information technology will penetrate every aspect of professional practice, as very small, inexpensive computers pervade clinicians' offices and examination rooms, nursing stations, procedure rooms, bedsides, clinics, and patients' homes.[7] These devices will become as familiar and as seemingly indispensable as the pen, the telephone, and the pocket calculator as means of recording, communicating, and extending the individual's ability to recall, find, calculate, store, and process information.

As informatics becomes fully integrated into health care delivery and management, it will account for about one third of hospital expenses. Administrators will evaluate information systems not in terms of the financial return on investment but in terms of patient outcomes and quality-years of extended life. Monetary benefits of the information infrastructure will take the form of decreased liability costs associated with enhanced quality control and decision support. Informatics will have come of age as a truly essential technology for health care. What form will the transformed health care system take?

The Optimistic Scenario: Physician-controlled MCPs

Having merged in the early 2000s, large physician groups will have the means, via private investments and bank loans, to purchase financially distressed, investor-owned MCPs. These megagroups, comprising several thousand physicians and several million members, will form vigorous for-profit MCPs that drive intermediary, third-party insurers from the marketplace. This arrangement will lower administrative costs and leave control of clinical practice and computer-based patient records in the hands of physicians.

The Pessimistic Scenario: Insurer-controlled MCPs

It will be increasingly clear that whoever owns the computer-based patient records, with their wealth of data about clinical processes and outcomes, controls patient care. Large insurer-owned, for-profit MCPs will continue to expand their control over their contract physicians' clinical practice by exploiting the clinical data. Patient care policies and guidelines designed to maximize business success may be different from those most likely to produce good clinical outcomes. Whether this model prevails will depend on the vigor of competing alternatives. Perhaps informatics itself, by increasing the public's access to information about health and health care, will help shape consumer choices and avert the most pessimistic eventualities.

In either scenario, by the year 2008 clinicians will function in a new and challenging environment. Their primary role will continue to be the provision of cost-effective, good-quality care, but informatics will continue to be a transforming force. Health care professionals will benefit from the expanding informatics technology to support clinical decisions. At the same time, their records will be satisfying management's need for a greater volume of data to monitor and control the processes and outcomes of health care.

References ■

1. Garfield SR. The delivery of medical care. Scientific Am. 1970;222:15–23.
2. Cutting CC, Collen MF. A historical review of the Kaiser Permanente Medical Care Program. J Soc Health Systems. 1992; 3:25–33.
3. Institute of Medicine. Managing Managed Care: Quality Improvement in Behavioral Health. Washington, D.C.: National Academy Press, 1996.
4. Starr P. The Social Transformation of American Medicine. New York: Basic Books, 1982.
5. Collen MF. Origins of medical informatics. West J Med. 1996; 145:778–85.
6. Collen MF. A History of Medical Informatics in the United States, 1950–1990. Washington, D.C.: American Medical Informatics Association, 1995.
7. Kaku M. Visions: How Science Will Revolutionize the 21st Century. New York: Anchor Books/Doubleday, 1997.