Introduction, Summary, and Options 1

Information technologies are transforming the way health care is delivered. Innovations such as computer-based patient records, hospital information systems, computer-based decision support tools, community health information networks, telemedicine, and new ways of distributing health information to consumers are beginning to affect the cost, quality, and accessibility of health care. The technologies that support these applications—relational databases, network communications, distributed processing architectures, optical disk storage, and others—are used today by some health care providers and payers. Yet information technology is often found in isolated "islands of automation" in health care provider and payer institutions. Despite the incorporation of high technology into almost every other aspect of clinical practice, information technologies have not been fully embraced.

Meanwhile, transformations in the way health care is delivered are creating new opportunities for innovative applications of information technologies. The health care delivery system is currently undergoing many changes, including the emergence of managed health care and integrated delivery systems that are breaking down the organizational barriers that have stood between care providers, insurers, medical researchers, and public health professionals. These barriers have supported a clear demarcation between clinical health information and administrative health information and reinforced a long-standing distinction between treatment of disease and preservation of health. These distinctions are gradually eroding as new health care delivery patterns emerge that are supported by, and in some cases reliant on, the widespread use of networked computers and telecommunications.

This report discusses the synergy between information technologies and new trends in the health care delivery system as health care is brought online. It identifies some of the opportunities to improve health care delivery through increased use of information technology, and discusses some of the conceptual, organizational, and technical barriers that have made its adoption so uneven. The report identifies key technologies and shows how they are being used to communicate clinical information, simplify administration of health care delivery, assess the quality of health care, inform the decisionmaking of providers and administrators, and support delivery of health care at a distance.

CHALLENGES AND OPPORTUNITIES FOR INFORMATION TECHNOLOGIES

The technologies used for collecting, distilling, storing, protecting, and communicating data are widely used throughout American industry. In the health care industry, however, their application has been limited to scattered islands of automation, usually limited to discrete departments within hospitals. Computers are widely deployed, but not widely connected. Clinical and administrative health information are rarely commingled. Both types of health information are still stored and conveyed primarily in paper form. Health information is rarely converted to digital form and shared among the clinics and primary care offices where most health care occurs, the hospitals and critical care units where most health care dollars are spent, or the population-based health services that address community-wide health issues. Computers are typically used to organize and administer specific, limited types of health information, but are not linked into an infrastructure that might allow broader efficiencies or higher quality health care.

Figure 1-1 shows the level of adoption of some selected information technology applications as reported by chief information officers (CIOs) of primarily large health care institutions. As the figure indicates, almost 70 percent of those responding have introduced electronic systems for submitting insurance claims, and more are in the process of adopting them. Technologies that allow communication between computers at disparate locations, for example physician-hospital data networks or enterprise-wide networks, are being adopted or planned by a substantial number of these institutions as well. Computer-based patient record (CPR) systems, which are difficult to implement because they require such close integration between many different systems, are at least in the planning process, according to 50 percent of responding CIOs, but so far only about 20 percent consider that they have CPRs operating at least at an experimental level. When asked which technologies they were currently evaluating conceptually for future implementation, the two most frequently mentioned by CIOs were community health information networks and telemedicine.[1]

The health care delivery system has several unique characteristics that discourage the spread of information technologies. Health professionals perform a wide variety of tasks including rapidly changing combinations of "hands-on" care, inductive and diagnostic thinking, detailed recordkeeping, patient education, and communication with colleagues. Most of the hardware and software approaches that address one of these aspects of medical practice intrude unacceptably on some other aspect: computers are not yet as useful, ubiquitous, and handy as the stethoscope and other common medical technologies. In addition, medical practice is extraordinarily complex and it changes rapidly. Systematizing even the process of performing medical procedures, much less rationalizing the language and scientific knowledge underlying those procedures, is an almost intractable problem. Despite the ongoing efforts of standards-setting bodies, no unified conceptual model exists that is powerful enough to construct the mapping between the information that must be

[1] College of Healthcare Information Management, *Telecommunications in Health Care Survey, 1994* (Ann Arbor, MI: 1994), pp. 20-21.