Information Technology Enabled Service & Medicine

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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 health care providers and payers. Yet information is often found in isolated "islands of information" 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, transformation in the way of 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.

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, and inform the decision making of providers and administrators, and support delivery of health care at a distance.

Advanced information technologies—computer based patient records, structured data entry, advanced human computer interface technologies, portable computers, automated data capture, online query, knowledge-based information systems, and computer networks—can potentially improve the quality of health care by enhancing clinical decision support, and by improving data for assessing both the effectiveness of health services and the performance of health care providers and insurance claims.

Information technologies could facilitate faster and easier collection of information about the patient and the health problem at hand. Portions of that information could be entered by clinicians at or near the point of care, captured directly from diagnostic and monitoring equipment, or entered by the patient prior to care. Technologies such as relational databases with online query could support faster and easier search and retrieval of previously collected information about the patient, as well as information from local or remote knowledge bases. Development of computer based clinical protocols and other forms of clinical decision support systems (CDSSs) that apply decision rules and other knowledge-based approaches to information about the patient and health problem at hand could recommend diagnoses, tests, treatments and preventive care. They could also lead to more rigorous construction and analysis of measures of services effectiveness and performance of providers and plans. Computer networks, high capacity telecommunications, advanced human computer interface technologies, and improved graphics software could lead to more flexible organisation and display of this information as appropriate for individual clinicians, and more rapid and widespread dissemination of the results of performance measures to various parties.

Telemedicine can be broadly defined as the use of information technology to deliver medical services from one location to another. Recent technological advances such as fiber optics, integrated services digital networks, and compressed video have eliminated or minimized some of the problems e.g. poor quality images and slow transmission speeds that limited earlier applications.

Currently there is much interest in the potential of telemedicine to lower costs, improve quality, and increase access to health care, especially for those who live in remote or undeserved areas. Pilot tests are also under way to test the feasibility of delivering a variety of services directly to consumers in their homes.

Although there are no studies that prove the cost effectiveness of telemedicine, in some cases it would seem to have the potential to reduce costs for some participants. For example, telemedicine can eliminate the time and wages lost at

work and travelling expenses incurred when specialists and/or patients have to travel for consultations.

For the health care provider telemedicine can offer tools to assist in providing high-quality services. Having timely, convenient access to the most up-to-date information, continuing medical education programs, decision support systems, and consultations with specialists in large medical centers should increase the provider's options and improve his or her ability to accurately diagnose and effectively treat patients. The development of clinical practice guidelines for telemedicine could enable provider to deliver better care.

Information technology can be used to provide more health related information to consumers, "the largest untapped resource for health care," which is consumer health informatics. Consumer health informatics has been defined as "the study, development and implementation of computer and telecommunications applications and interfaces designed to be used by health consumers." The basic principle is that of empowering people to play a greater role in their own health care and to be active participants in decisions affecting their health. Taking measures to prevent illness and disease, by adjusting lifestyles or taking safety precautions, for example could have a positive impact on the health care delivery system and allow people to lead healthier lives.

Shared decision support systems are designed to inform patient /provider decisions regarding prevention, diagnosis, management and treatment, and ultimately to improve the quality of care and reduce costs. Choices are made collaboratively by patients and their care givers. An example is the interactive video disk system developed at Dartmouth Medical School that allows men with benign prostatic hyperplasia and early stage prostatic cancer to share in decisions on their cause of treatment. Some regard these computer based systems as transforming the culture of the health care system to one in which patient, physicians and other providers play equal roles in decision making.

Human services including health care are often delivered in a fragmented fashion, leading to duplication of effort on the part of providers and consumers. Telecommunication could be used to coordinate and streamline these services through community networking, enabling the providers of a wide variety of social services to share information and communicate with one another.

One example of a project using telecommunication and computer technologies to support and coordinate health and human services at the community level is the Community Services Network (CSN) in Washington DC. This is a joint effort of the US Public Health Service, Howard University School of

Social Work, Rice University and Baylor College of Medicine, Macro International, Inc., United Seniors Health Cooperative, and Bell Atlantic Corp.

This report discusses some of the challenges and opportunities for using information technology to improve the health care system. First, it addresses the potential impact of information technologies on health care delivery and introduces a few technologies that are being used to collect, organize and share clinical information needed for providing patient care.

It discusses how the quality of health care might be improved by providing health care professionals with high-quality information and decision support tools at the point of care. Finally, the report explores the potential for addressing the needs of those in rural or other underserved areas through telemedicine. Advanced information technologies offer an array of other possibilities for influencing delivery of health care services. It was impossible to address all applications in this report. Those selected were viewed as having the most potential for decreasing costs and improving quality and access in health care.

The report also briefly mentions the potential for telecommunication to assist consumers in becoming better informed and more involved in decisions affecting their health care.

Emerging applications of information technology, including remote surgery and virtual reality applications, were not considered, nor were issues related to the reform of medical education to include greater use of information technology. These are, however, fertile areas for future research.