

Preface

Health care is an important industry that touches most, if not all of us at some time in our lives. Health care is noted for using leading edge technologies and embracing new scientific discoveries to enable better cures for diseases and better means to enable early detection of most life threatening diseases. However, the health care industry globally, and in the U.S. specifically, has been extremely slow to adopt technologies that focus on better practice management and administrative needs. Presently, health care is grappling with many challenges both nationally and globally, including escalating costs, a move to a preventative care environment, and a technology savvy patient with high expectations. The underlying goal for health care is to provide cost effective quality treatment, that is, realize its value proposition in this challenging environment. In order to do this, health care needs to maximize its information management and utilize information communication technologies (ICTs) prudently as has been noted by leaders of U.S. and the EU as well as leading bodies that focus on global health care issues and policy. During his State of the Union Address in January 2004, President George Bush affirmed the intention of the government to emphasize the role of technology in administration and delivery of health care in the United States (Bush, 2004) and allocated over \$200 million for research and development of information technologies in health care. Similar sentiments have been voiced by the European leaders (Global Medical Forum Foundation, 2005; The Oslo Declaration on Health, Dignity and Human Rights, 2003) and the World Health Organization (E-Health in the Eastern Mediterranean, 1997; World Health Organization, 1998). Both European and U.S. authorities define their initiatives primarily in terms of medical information technology centering on computerized patient record (CPR) or, in more acceptable parlance, the HER electronic health record (Brailer & Terasawa, 2003). WHO's platform statement (World Health Organization, 1998) speaks of "health telematics policy," an all inclusive term that incorporates not only HER but essentially all health care services provided at a distance and based on the use of information communications technologies (ICT).

It is useful to think of the major challenges facing today's health care organizations in terms of the categories of demographics, technology, and finance. Demographic challenges are reflected by longer life expectancy and an aging population; technology challenges include incorporating advances that keep people younger and healthier; and finance challenges are exacerbated by the escalating costs of treating everyone with the latest technologies. Health care organizations can respond to these challenges by focusing on three key solution strategies; namely (1) access—caring for anyone, anytime, anywhere; (2) quality—offering world class care and establishing integrated information repositories; and (3) value—providing effective and efficient health care delivery. These three components are interconnected such that they continually impact on the other and all are necessary to meet the key challenges facing health care organizations today. Moreover, it is at the confluence of these key solution strategies that the role of ICTs in health care becomes of particular significance.

Access to health care for anyone, anywhere, and at any time is a goal that is very far from being achieved. ICT has a crucial role to play in improving access to health care. Although ICT cannot by itself perform such actions as diagnosing a medical condition, it can provide low-cost communication between physician and patient that makes a diagnosis possible and innovations could dramatically improve the effectiveness of such remote access as well as address minimal invasive surgery. Other aspects of access are less obvious, but are critical to controlling quality and costs of health care. These include timely access to medical records and universal accessibility to data among disparate information systems and medical devices (AHRQ, 2003; PITAC, 2001). In each case, improvements in ICT design and standards can dramatically increase access.

Quality in health care has six key goals (Wickramasinghe, Schaffer, & Geisler, in press):

1. **Safety:** Avoiding injuries to patients from the care that is intended to help them
2. **Effectiveness:** Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those who will not benefit (i.e., avoiding under-use and overuse)

3. **Patient-centered:** Providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions
4. **Timeliness:** Reducing waiting and sometimes harmful delays for both those who receive care and those who give care
5. **Efficiency:** Avoiding waste
6. **Equitability:** Providing care that does not vary in quality based on personal characteristics.

These quality aims will be negatively impacted by poor information quality, flow, and integrity. Conversely, higher quality, flow, and integrity of information can help to reduce the large number of medical errors that currently permeate the health care system (Geisler, Lewis, Nayar, & Prabhaker, 2003; Moore & Wesson, 2002).

Value of health care incorporates the overarching goal of increased productivity, but this goal has distinct aspects depending upon one's perspective, and only some of these aspects are primarily monetary. To patients, the value proposition may be enhanced by reducing time spent in obtaining health care, lowering stress and worry, and increasing satisfaction with the experience. To physicians and clinical support personnel, value may be enhanced by the ability to remotely access medical records and monitor prescribed regimens and patient symptoms. To managers and investors, value may be enhanced by lowering costs of delivering health care in ways that do not compromise access or quality.

Because of the rapidly-decreasing cost structure of hardware, IT is now able to provide many functions that were not previously available, such as connectivity through mobile devices. Thus, IT innovations hold great potential for enhancing the value of health care to patients and stakeholders. Yet, it is not simply the introduction of IT per se that provides a good solution, but often it is necessary to combine IT with new management techniques such as total quality, knowledge management, and business process redesign to achieve success (Sharma, Wickramasinghe, & Gupta, 2004). When we look at health care, we can see that in order to enhance value, we must not simply focus on clinical care but also be cognizant of education, research, and administrative needs of this industry.

This encyclopedia provides an extensive and rich compilation of various ICT initiatives and the role that ICT plays and will play in the future of health care delivery be it in terms of enhancing clinical delivery or enabling administrative activities. International experts address one or more of the areas of access quality and value and thereby represent ways in which health care delivery can be made superior and the health care industry can begin to address its the major challenges it faces in the 21st Century so that ultimately the most important person in the web of health care players, the patient, can be confident of receiving high quality cost effective health care anytime anywhere.

Presently, to the best of our knowledge, no such comprehensive encyclopedia exists that focuses on ICTs in health care. Hence, this encyclopedia is truly unique and serves to fill an important void in the existing literature. Moreover, given the sentiments of both EU and U.S. leadership regarding investing in ICTs to support superior health care delivery, the timing of this encyclopedia is most opportune.

The purpose of our encyclopedia is to bring together articles by international experts pertaining to critical concepts about the use, adoption, design, and diffusion of ICTs in health care. Ultimately the role of ICTs in health care must address the challenges faced by today's health care environment. We have identified that any truly beneficial solution must focus on access, quality, and value, and thus the management of medical technologies must relate to addressing and facilitating one or more of these solution strategies. We believe that in order to do this in a meaningful and systematic fashion it is essential to focus on five important themes, namely:

- a. Generation, adoption, and utilization of medical technologies. This thrust includes research on the organization, financial and managerial aspects of the process of need identification for medical technologies by health care organizations, and the acquisition, diffusion, utilization, updating, replacement, and resources allocation for such technologies.
- b. The nature of medical technologies and innovation and the role it plays in health care delivery. This thrust focuses on studies of the generation of medical technologies in industry, universities and the government sectors, and the processes by which such technologies are marketed to the health care delivery sector and their consequent impact on resolving the challenges faced by health care globally.
- c. Evaluation of medical technologies. Included in this thrust are evaluation, assessment, monitoring, and auditing of costs and benefits from medical technologies, in health care delivery organizations, and in the supporting industries, such as insurance, regulatory agencies, manufacturing of medical technology, and pharmaceuticals.
- d. Ethics, social implications, and patient value. This thrust focuses on ethical considerations and the role of patients in the health delivery sector. The center conducts research on accessibility, availability, and value derived from health care delivery, and the role that medical technologies play in this regard for patients in general, the underserved and uninsured, and the emerging empowerment of patients.

- e. Management of medical information and emerging technologies. This thrust focuses on studies of emerging technologies such as telemedicine, telehealth, computerized medical records, e-health, knowledge and knowledge management, knowledge in health care, and the future of medical informatics. Topics include diffusion, evaluation, economics, and applications of these technologies to the health care sector.

These themes also form the thrust for our own on going research endeavours at IIT's Centre for the Management of Medical Technology (CMMT; <http://www.stuart.iit.edu/cmmt/>). Contributing authors have focused their article(s) on one or more of the above five general themes or thrusts which taken together are naturally not exhaustive but do serve to underscore the key areas within health care delivery.

The significance of ICTs in health care cannot be understated. A recent survey by the Cleveland Clinic noted that health care is the number one or two key issue for U.S. citizens, ahead of employment, war, and the economy. Health care is also the number two topic searched by users of the Internet worldwide and there are over 100,000 commercial Web sites dedicated solely to health care. In both the U.S. and globally, health care cannot survive without the application and adoption of a whole spectrum of technologies and since health care impacts all of us, it becomes a priority to all readers, both health care professionals and general citizens, to develop an understanding and appreciation of the various possibilities for ICT use within the health care domain. We are confident that this encyclopedia will be used by all leading health care organizations throughout the U.S. and globally as well as be a vital part of any universities reference collection in the area of ICT use in health care. We encourage all individuals wanting to understand the role of technology in health care delivery and more especially the nuances pertaining to the management of medical technology to also use this as a useful reference. We trust that all readers will enjoy this compilation and become more enlightened on the subject.

The Editors

Nilmini Wickramasinghe and Elie Geisler, 2007

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