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The Future of Computer Applications in Health Care

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After reading this chapter, you should know the answers to these questions:

• What are possible future directions for medical informatics?
• What are the forces that are driving these changes?

In this book, we have summarized the current state of medical informatics in a variety of application areas and have reflected on the development of the field during the past 40 years. To provide a background for our discussions, we opened the book with a glimpse into the future—a vision of medical practice when individual physicians routinely and conveniently use network-based computers to help with information management, communication, and clinical decision-making. In this chapter, we again look forward, this time concentrating on likely trends in medical applications of computers, on current avenues of research, and on the issues that will determine along which paths medical informatics will develop.

20.1 Progress in Health Care Computing

We begin by looking back at the changes in medical computing since the first edition of this book was published in 1990. Then we look ahead to the not-too-distant future—presenting a few scenarios that we can extrapolate from the current trends in medical computing. These scenarios provide perspective on the ways that computers may pervade medical practice. A key aspect of the scenarios is the extent to which, unlike most specialized medical paraphernalia of today, medical-computing applications are integrated into routine medical practice rather than used on an occasional basis. The realization of a highly integrated environment depends on the solution of technological challenges, such as integrating information from multiple data sources and making the integrated information accessible to health professionals when, where, and in the form that it is needed. Integration of medical information also encompasses social issues, such as defining the appropriate role of computers in the workplace, resolving questions of legal liability and ethics related to medical computing, and assessing the effects of computer-based tech-
nology on healthcare costs. The chance that our hypothetical scenarios will become reality thus depends on the resolution of a number of technological and social issues that will be debated during the coming years.

20.1.1 Looking Back to 1990

In the first edition of our book, the closing chapter included two future scenarios of medical care and discussed emerging topics such as the Unified Medical Language System (UMLS), integrated academic information management systems (IAIMS), and the medical information bus (MIB). Today the UMLS is employed in information-retrieval systems as a tool for converting textual medical information into standardized terms taken from coding schemes and vocabularies such as MeSH and ICD and to help translate from one vocabulary to another (McCray & Miller, 1998). IAIMS sites are now scattered around the country with many different models being implemented. The MIB has been approved as the IEEE 1073 family of standards for medical device interconnection (Stead, 1997b) and has been incorporated into multiple instruments at the bedside (see Chapter 13).

The scenarios we discussed in the first edition included computer-based support during both cardiac-bypass surgery and long-term care of a patient with a chronic disease. Although the information-support capabilities have changed considerably in the decade since the first version of this chapter was written, it is possible that the practice of medicine has changed just as much. For example, less invasive alternatives to open-chest bypass surgery have become more common. Stricter criteria for admission to the hospital and shorter lengths of stay once hospitalized mean that sicker patients are routinely cared for in outpatient settings. In such situations, the need for computer-based tracking of a patient’s medical status is increased. This need has led to experiments such as the use of wireless pen-based computers by home healthcare nurses for logging patient conditions and Internet-based disease management interactions between clinicians and patients in their homes.

Significant advances have been made in raw computing power (e.g., hardware and software for the manipulation of three-dimensional images); interconnectivity (e.g., high-speed network backbones and wireless connections to palm-sized hand-held computing devices); the ability to store very large amounts of data (e.g., the terabyte data storage device shown in Fig. 20.1); and the development of infrastructure—particularly in the area of communication standards (e.g., HL7 and object broker architectures). On the other hand, the anticipated level of seamless integration between applications, highly interconnected medical databases with embedded decision-support tools, and ubiquitous computing support have not come to pass.

20.1.2 Looking to the Future

During testimony before the U.S. House of Representatives Committee on Science in 1997 concerning the future role of the Internet, we laid out a set of long-