

# Preface

The importance of Health Information Technology (HIT) studies continues to grow as health care organizations make significant investments in health information technology such as Electronic Health Records (EHR), Health Information Exchanges (HIE), Computerized Provider Order Entry (CPOE), ePrescribing, and Clinical Decision Support Systems (CDSS), among others. The need for HIT studies and growing need for HIT workforce has led to the development of health information technology programs at several universities. As health care organizations continue to make large investments in health information technology, it is important to understand the potential challenges and lessons learned from past implementations.

The overall objective of this book is to provide a comprehensive set of cases that describe the challenges faced in various stages of health information technology implementation in different types of health care organizations. It is written for professionals who want to improve their understanding of the process, challenges faced, and lessons learned in the implementation, application, and adoption of Health Information Technologies. The cases span a wide variety of health care organizations from large health care systems to small independent rural health care centers, and describe a wide range of health information technologies. The cases also cover a range of Health IT issues such as security, privacy, adoption, change management, and return on investment.

We believe the cases in this book will be useful for practitioners, researchers, and students working in the field of health care information management and technology. The cases provide insight and support practitioners by providing an understanding of potential challenges to HIT implementation in a variety of health care organizations. For students and educators, it provides a rich set of cases describing HIT implementations that complement the theoretical knowledge gained in HIT course work. This case collection will also serve as a valuable data set for building theory as well as validating IT implementation and adoption theories in the health care context.

The book begins with an overview of the case method for teaching health informatics. In Chapter 1, the authors discuss the case method of teaching and provide examples of successful application of health informatics teaching cases. The chapter includes extensive guidance on various styles of case teaching and a detailed process for using case studies for health informatics education and training. The process presented in the chapter is based on published literature on case-based teaching methods as well as the authors' collective experience in using the case method for teaching.

In recent years, electronic health records have been the major focus of information technology investments in the healthcare industry. While many organizations in the United States have implemented or plan to implement electronic health records, their adoption by clinicians remains a major issue. This issue is the focus of Chapter 2, which describes the implementation of electronic health records at a large medical center in the Mid-Western United States. The case provides an in-depth description, along with survey data, of the individual, organizational, and technological barriers faced by the organization in its electronic health record implementation process. The case includes a discussion of the findings in the context of adoption theories and other research studies on the adoption of information technology in healthcare.

Large electronic health record implementations, such as those in multi-hospital, multi-clinic organizations, spread across multiple states involve additional complexities and challenges when compared to single entity organizations. Such a complex implementation and its associated challenges and solutions are discussed in Chapter 3. The chapter details the implementation of Electronic Health Records at Regional Health, a health organization that includes multiple hospitals, clinics, and specialized healthcare centers such as rehabilitation, cancer care, and behavioral health. As organizations implement electronic health records, integrating current patient data held in paper records into the electronic records is among the most challenging aspects of the implementation. This case particularly focuses on scanning and archiving paper records as a first step towards building an electronic health records infrastructure.

Improving quality of care and reducing healthcare costs are among the key objectives in implementing electronic health records, and Chapter 4 describes a case where they were the driving criteria for the adoption of an EHR. The case describes the cost and quality challenges at a rural safety net hospital and the EHR-based strategy adopted by the organization to overcome those challenges. The case includes a description of the EHR implementation process from a financial, business process, and strategic perspectives, and is set at the Broadlawns Medical Center, which was recognized as the "Most Wired Hospital" in the Small and Rural Hospital category by the Hospital and Health Networks Magazine. A unique aspect of the case is the

emphasis on the strategic use of EHR for monitoring real time performance data and improving financial, clinical outcome, and patient satisfaction measures.

One of the main challenges in electronic health record implementations is identifying stakeholders, understanding their needs, and ensuring stakeholder involvement in the implementation process. This is especially critical for physician acceptance of the electronic health record systems. Chapter 5 describes the case of an EHR implementation with specific focus on stakeholder identification and change management. The case is set at a medical center in MidWest US and describes the adoption issues encountered at the organization due to the failure to adopt effective change management practices and stakeholder involvement in the implementation process. A unique aspect of the case is the focus on the effects and changes in the underlying organizational cultural climate due to the EHR implementation. The case includes survey data that helps pinpoint specific problems related to technology, implementation process, and project management that lead to the adoption problems.

Understanding the impact of electronic health records on quality requires an understanding of the clinical process and the use of information systems for achieving the process objectives. Chapter 6 focuses on providing such an understanding. It includes a case scenario that describes the clinical utility of integrated and readily available information that can be provided by different health information technologies including computerized provider order entry and clinical decision support systems. The case details through the use of examples the clinical decision problems that can be supported using various health information technologies. The case also describes the shortcomings of information technology and potential for their improvement by analyzing different health information technologies within the context of a clinician's workflow. It describes how design limitations can hinder the flow of critical clinical information, but when technology is designed with attention to clinical workflow, it can significantly enhance care processes by enabling better information flow.

Clear and effective communication is essential for the successful implementation of information technology projects, and especially critical for large multi-stakeholder projects, such as the implementation of electronic health records. In Chapter 7, the authors describe the implementation complexities and communication issues that can arise during electronic medical record implementation at academic medical centers due to the structural and organizational complexities of such organizations. Academic medical centers have differences in structure and organization as they often include hospitals that operate independent of medical schools, and this issue requires special attention and consideration in health information technology implementation projects. The case includes a description of the communication issues leading to problems with the infrastructure design, and consequent impact on user experience and system maintenance.

One of the leading uses of technology in healthcare has been to provision healthcare services to remote and underserved areas through the use of telehealth. Chapters 8 and 9 describe challenges and issues in implementation of telehealth programs. Telehealth is especially useful in making specialist healthcare services available in remote and underserved areas. The case in Chapter 8 describes the implementation of a telehealth program to provide underserved rural areas with access to infectious disease specialists. In this case, the authors provide an overview of benefits of the program not only to the core mission of providing quality care, but also from a business and clinical practice perspective. The case provides a detailed discussion of the impact of expanding services on clinical resource and operation management as well as the regulatory issues related to telehealth implementations.

The case study in Chapter 9 describes an eConsult program, also known as telemedicine, at a regional clinic that is a part of a large integrated healthcare system. The case includes a detailed description of the equipment required for the program, the implementation process, and the benefits of the program for patient care. The case describes the benefits of establishing standard procedures for implementation process as organizations gain experience in technology implementations. The main differentiating aspect of telemedicine is that the patient encounter with the physician is through a technology medium as opposed to a face-to-face encounter. Therefore, significant attention needs to be given to ensuring a robust technology infrastructure. In this case, the authors present details that bring out the challenges in implementing telemedicine by focusing on the differences between electronic consults and face-to-face consulting in terms of the patient consultation process and medical technology used for patient consultations. This is an area that needs special attention as primary care clinics in underserved areas implement telemedicine for expanding access to specialist services.

As an increasing number of healthcare organizations implement electronic health records, the logical next step is to develop infrastructure to allow for the electronic exchange of records to enable faster and more comprehensive information sharing between patient care providers for providing a better quality of care. The development of a health information exchange is the focus of the case in Chapter 10, which describes the evolution of the Florida Health Information Exchange and the challenges in implementing the exchange that arises from the opposing mandates of sharing of information versus protecting the information. The case demonstrates the importance of legal policy and trust agreements for the successful implementation of inter-organizational health information technologies.

Shared health information technology infrastructures can help organizations reduce costs associated with their implementation and use. This is especially a major consideration for Community Health Centers, which serve as safety net health care providers for vulnerable patient populations and rely predominantly on grant

funding for their operations. Community Health Centers can potentially achieve economies of scale by forming a Health-Center-Controlled Network, a collaborative venture that provides health information technology services to member community health centers. Chapter 11 describes the formation of a Health-Center-Controlled Network, the Community Partners HealthNet, formed through the collaboration of six individual Community Health Centers. The case includes a detailed description of the environment and background leading to the formation of the Community Partners HealthNet, and also describes challenges in planning for sustainability and ongoing operations, which is a critical issue due to the financially challenging environment in which community health centers operate.

The majority of the information technology investments have focused on information technology for supporting core clinical processes of a healthcare organization, such as electronic health records. However, there is significant potential for the use of various information technologies for supporting specialized healthcare processes. In Chapter 12, the design and operation of a disease registry for rare disease is described. The case describes the technology, implementation, and challenges involved in creating a disease registry that can not only be used for patient care but also for clinical research. The case also illustrates how information technology can be used to solve difficult healthcare problems such as helping patients suffering from rare diseases.

The increasing adoption of electronic health records leads to the generation of large amounts of data that can then be analyzed and leveraged for further improving the quality of care. The case study in Chapter 13 describes the implementation of a decision support system that leverages data from multiple systems to support clinical decision processes. The chapter specifically focuses on interoperability challenges that arise when integrating and aggregating data from multiple systems. The case describes several challenges that are unique to the healthcare industry and arise due to the dynamic nature of the healthcare operating environment.

A key requirement arising out of the dynamic operating environments in healthcare is the need to access and update patient data in real-time. Chapter 14 describes an innovative solution using radio frequency identification for the real-time acquisition and updates to patient data. The chapter includes descriptions of cases where the technology can be applied to acquire patient data, locate the nearest available physician, and enable the physician to access the patient data using a computing device. Given the ubiquitous nature of wireless and RFID networks, the chapter also includes a specific focus on security- and privacy-related aspects of the technology.

While many information technology applications in healthcare have focuses on applications that can be used by clinicians to provide care for patients, information technology can also be leveraged for enabling self-care by patients. Chapter 15 focuses on the application of new advances in handheld and mobile phone technolo-

gies to diabetes self-care. The chapter summarizes the evolution of the handheld and mobile technology for diabetes management by reviewing several studies that describe the implementation, use, and outcomes of using mobile technology for diabetes self-management. The chapter includes a discussion on the challenges faced due to technological limitations of the devices as well as operational challenges when a healthcare organization adopts large-scale uses of mobile devices for patient care management.

Given the massive growth and large-scale adoption of mobile devices such as smartphones by the general population, there is potential to use mobile technology in many healthcare applications. Chapter 16 describes the potential uses of mobile devices in six different scenarios that involve various clinical workflows. The chapter includes a detailed analysis of each workflow, mobile technology uses for individual tasks within the workflow, and an implementation process for automating specific tasks within the workflow with mobile technologies. In addition, the chapter includes a detailed list of advantages of mobile technology in healthcare and potential challenges that can arise during implementation.

In order for information technology to help in the improvement of health outcomes, it needs to be designed and implemented based on an in-depth understanding of clinical and care provisioning process. The final chapter in this book begins with an in-depth description of the clinical processes for diabetes care and presents an overview of how clinical decision support systems can be used to support all aspects of diabetes care including screening, prevention, and treatment. The chapter includes a mapping between various types of clinical decision support systems and the different clinical decision processes they can support.

