Preface

Medical practitioners are continuing to advance their knowledge of the latest technologies in order to keep up with the opportunities for faster and more reliable treatments for patients.

*Advancing Medical Practice through Technology: Applications for Healthcare Delivery, Management, and Quality* focuses on the latest medical practices through the utilization of technologies and innovative concepts. This book is an essential reference source for researchers, academics, and industry professionals interested in the latest advancements in the healthcare, biomedicine, and medical communications fields. After reading it, you will understand what these applications are and appreciate their strengths and applicability.

The book is aimed at the reader who is interested in the practice and techniques of applications for healthcare, delivery, management, and quality and related research questions. It will also be of interest to information professions who need to become acquainted with these technologies.

The book is organized in layers that make the ideas accessible to reader who are interested in grasping the basics, as well as accessible to those who would like more depth of treatment, along with full details on the applications covered. It is composed by 12 chapters. Chapter 1 addresses Medical Information Retrieval Strategies for Non-Medical Professionals. They may find performing a medical type search difficult due to limited knowledge and expertise. Thus, medical information retrieval strategies are key in assisting non-medical professionals experience a productive search session. This chapter reviews the available information retrieval strategies and introduce new generation information retrieval approaches. The authors analyze search behavior of non-medical professionals when searching across varying levels of task difficulty. This is followed by an evaluation on how new generation medical information retrieval strategies support a non-medical professionals medical search session when searching across varying levels of task difficulty. Results of this research study provide a better understanding of the search behavior of non-medical professionals when searching across varying levels of task difficulty. The results also provide suggestions on how information retrieval strategies can better assist non-medical professionals when searching across varying levels of task difficulty.

Chapter 2 focuses on indicating fields of inequalities regarding the access to health benefits. The fundamental disease of the system is the disproportion between the amount of the funds and the contents of the package. It causes the same "symptoms" and leads to the same pathological phenomena everywhere: queues and other forms of rationing ("guaranteed") health benefits, corruption, and making use of privileges. The foundation uses the potential of the information society and available infrastructure (Web portal, www.watchealthcare.eu), and all activities are presented on the Website with the aim of influencing the health care system. On the basis of reports of limited access to health services, a registry
of patient problems was created in the WHC Web portal, which aims to show what the biggest gaps in access to health services are – this is a way of showing the patient and health care system the needs and also one possible approach to continuous education of the health care service consumers targeted at health care system improvement.

An important topic related to the role of IT solutions to influence consumer perception at a health care payer in order to perform a health care reform is available in chapter 3. Recent health care reform is one of the biggest changes that the health care industry has ever faced. This reform represents paradigm changing opportunities and challenges for the company providing health insurance in a managed care environment. The CIO of a premier managed care health insurance provider (ABC Company) wants to take advantage of the new environment using Information Technology. He and his management teams have determined, using primary research, that the customer perception of the health care company’s cost and accessibility to quality health care are the most important factors to their customers in the new market. They are aware that even though they have been able to use information technology to predict customer reaction to changes in cost and perception of quality, it will be very difficult to deliver new systems and processes that support ABC Company’s exposure to the new realities it faces in the market.

Chapter 4 addresses an interesting issue concerning the measurement and evaluation of healthcare services’ quality. The author fixed key questions to start his study: Is the right service rendered for the specific disease? Or do our measures quantify the efficiency of producing these services without first assessing if they were needed? Eventually, it is a question of accountability about the processes and outcomes of the care which are expected to both demonstrate the social responsibilities of health care professionals and gauge the expectations of patients, families, and communities. The purpose of this chapter is to explore the determinants of what and why patients expect from healthcare and caring. Within the concept of accountability, the role of physicians as educators rather than exclusively healers of disease is explored.

Chapter 5 introduces a machine learning system for cluster analysis to take on the problem of syndrome discovery in the clinical domain. A syndrome is a set of typical clinical features (a prototype) that appear together often enough to suggest they may represent a single, as yet unknown, disease. The discovery of syndromes and relative taxonomy formation is therefore the critical early phase of the process of scientific discovery in the medical domain. The proposed system discovers syndromes following Eleanor Rosch’s prototype theory on how the human mind categorizes and forms taxonomies, and thereby to understand how humans perform these activities and to automate or assist the process of scientific discovery. The author created a realistic test-bed for syndrome discovery and used a data visualization technique based on the heat maps to represent the disease-syndrome relationship. Experimental results on a case-study in erythemato-squamous diseases show that cluster analysis of clinical observations, based on prototype theory, is well-placed for syndrome discovery. Furthermore, the system is able to achieve syndromic categorization at different levels of abstraction (superordinate, basic, and subordinate levels) according to the results of cognitive psychology, and it provides an explanation of pregnancy of the basic level.

Human factors and social media implications on e-collaboration in biomedical research is addressed in chapter 6. This chapter reviews current research and current technologies for e-collaboration in biomedical research. There are compelling arguments for using emerging Web technologies to facilitate research in the biomedical sciences. This chapter presents four case studies examining the use of Web-based tools to support the teamwork of geographically distributed biomedical researchers. It then
reviews case study findings in light of the Web 2.0 e-collaboration enablers that are available. It concludes with surprising and concerning reflections about current practices in biomedical research collaboration as well as some promising future directions through the use of biomedical informatics to advance these practices by addressing human factors.

Chapter 7 studies the implications for policy development of effective user driven health care on migrant women. Migration within countries is also on the rise, as people move seeking resources, services, education, and employment opportunities. In addition, they may want to escape from violence or natural disasters. This movement of people from rural to urban areas has resulted in an explosive growth of cities around the globe. Women migrate to enhance their life experiences and that of their children and kinsfolk. This chapter draws on a research case study undertaken with the Kewapi language group in Port Moresby and the Batri Villages of the Southern Highlands in Papua New Guinea. It highlights the perspectives of women migrating from their home communities in order to seek education and health care. It explores the implications for developing user-focused health care systems designed to meet the needs of mobile and vulnerable women. The study suggests that if women and their families from remote rural communities participate in health promoting initiatives, they can dramatically improve their life and health experiences and that of their community.

The use of diffusion of innovations as a foundational theory for research in the medical informatics discipline is discussed in Chapter 8. A meta-analysis to examine the enduring efficacy of the tenets of diffusion of innovations is performed. The authors implemented a content analysis to examine over 2,000 journal articles from the fields of medical informatics, medicine, and information systems. They found that tenets of diffusion of innovations theory were prevalent in much of the literature and that the relationships proposed by diffusion of innovations theory have remained significant in the empirical literature. Although several theories are useful in explaining phenomenon in the domain of medical informatics, diffusion of innovation is one such theory that can be applicable to a vast amount of medical informatics research focused on new technologies or work processes. The authors suggest that scholars use and/or synthesize it with additional theory to provide a foundation for future research in this topic.

Chapter 9 focuses on the promotion of online research communities and their importance for knowledge integration and knowledge generation in an innovation-driven biotechnology environment. This chapter presents a qualitative case study including an analysis of open forums in an “Open Source Drug Discovery” network portrays how knowledge integration mechanisms and hence innovation are put into practice in virtual space. In this newly created environment a number of geographical patterns are inverted: the strong role of physical co-location is partly substituted by enabled online proximity and new opportunities of virtual “prototype-sharing”; the former global pipelines are transformed to local and virtual cross-community pipelines. Yet, mechanisms of creating social coherence and stability illustrate noteworthy similarities with “localized capabilities” of regional agglomerations. Eventually, knowledge integration capabilities ensure that the network can operate as a successful knowledge provider.

Modeling the diffusion of psychological stress is the main topic of chapter 10. Stress reduces quality of life and causes many diseases. Nevertheless, it is not completely clear whether stress transmission may involve acquaintances and other people in addition to lovers, friends, and relatives. More generally, it is not clear how stress spreads among the population and how its diffusion in a society can be estimated. This chapter presents a set of mathematical and computational models that can be used to approach the modeling of psychological stress diffusion.
Chapter 11 describes service portability for a private cloud deployment, including a detailed case study about Cloud Bioinformatics services developed as part of the Cloud Computing Adoption Framework (CCAF). The Cloud Bioinformatics design and deployment is based on Storage Area Network (SAN) technologies, details of which include functionalities, technical implementation, architecture, and user support. Bioinformatics applications are written on the SAN-based private cloud, which can simulate complex biological sciences and present them in a way that anyone without prior knowledge can understand. Several bioinformatics results are discussed, particularly brain segmentation, which demonstrates different parts of the brain simulated by the private cloud. In addition, benefits of CCAF are illustrated using several bioinformatics examples such as tumour modelling, brain imaging, insulin molecules, and simulations for medical training. The Cloud Bioinformatics solution offers cost reduction, time-saving, and user friendliness.

The application of the cloud computing for the effective implementation of the medical information system is the main topic of Chapter 12. The field of healthcare informatics is rapidly evolving. The new models and protocols of Medical Information System (MIS) are developed. Despite obvious advantages and benefits, practical application of MIS in everyday practice is slow. Cloud computing have emerged as an important new field, distinguished from conventional distributed computing by its focus on large-scale sharing, innovative applications, and, in some cases, high-performance orientation. “Cloud computing” is defined as flexible, secure, coordinated resource sharing among dynamic collections of individuals, institutions, and resources. Cloud computing is a new way of delivering computing resources and services. It is plausible that this technology has more potential and can improve health care services, benefit health care research, and change the face of health information technology. This can be a solution for widespread and effective implementation of the medical information system. The present chapter discusses the application of cloud computing for the medical information system practical usage. The ideal of healthcare in the information age must be to create knowledge from medical information and less time managing medical information and data. The application of easily available and adaptable technology and improvement of the infrastructure conditions is the basis for medical informatics applications. The usage of MIS holds the potential to improve, develop, and realize medical service in the effective and comprehensive mode.

Joel Rodrigues
Instituto de Telecomunicações, University of Beira Interior, Portugal