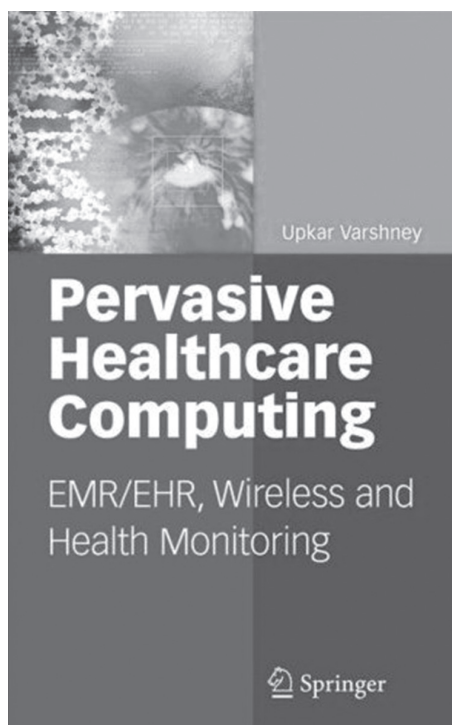**HIR**

Healthcare Informatics Research

Pervasive Healthcare Computing: EMR/EHR, Wireless and Health Monitoring

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The application of pervasive computing and smart technology to our social life is changing it in both great depth and scope, and it will improve the healthcare system as well. Black et al. [1] envisioned that as pervasive computing develops, there will be an evolution from isolated "smart spaces" to more integrated enterprise environments where the dream of unconstrained, ubiquitous, pervasive computing will face the realities of enterprise requirements, market forces, standardization, government regulation, security, and privacy. These tensions are particularly strong in the case of healthcare, given the promise of smart spaces to improve care and lower costs, the many parties with legitimate interests, and the medical and legal risks.

The author defined pervasive healthcare, based on pervasive computing, as the conceptual system of providing healthcare to anyone, at anytime, and anywhere by removing the restraints of time and location while increasing both the coverage and the quality of healthcare. Pervasive healthcare computing -- or u-Healthcare -- is at the forefront of delivering healthcare services to patients at other sites, and presents the ways in which mobile and wireless technologies can be used to implement the vision of pervasive healthcare. Large general and special hospitals are soon to be among the first to adopt smart and pervasive computing in service and management.

The book introduces healthcare IT challenges and requirements (patient-oriented, system-oriented, and healthcare professionals-oriented), presents a state-of-the-art overview of all available and emerging wireless and mobile technologies, and covers emerging challenges of IT in healthcare such as context-awareness, reliability, adaptiveness, scalability of wireless health monitoring systems, suitability, and personalization.

This vision includes prevention, health maintenance, and checkups; short-term monitoring (home healthcare moni-

toring), long-term monitoring (nursing home), and personalized healthcare monitoring; and incidence detection and management, emergency intervention, and transportation and treatment. The pervasive healthcare applications include pervasive health monitoring, intelligent emergency management system, pervasive healthcare data access, and ubiquitous mobile telemedicine.

Pervasive Healthcare Computing fills the need for a research-oriented book on the wide array of emerging healthcare applications and services, including the treatment of several new wireless technologies and the ways in which they will implement the vision of pervasive healthcare. This book was written primarily for university faculty and graduate students in the field of healthcare technologies, and industry professionals involved in healthcare IT research, design, and development.

This book consists of 12 chapters. The first chapter, *Challenges and Solutions of US Healthcare Systems,* describes the costs and complexity of payments, limited number of healthcare professionals, technological and other inefficiencies in healthcare, patient-related challenges, and other problems in healthcare systems.

Chapter 2, *E-Health and IT in Healthcare,* shows how IT can be utilized in specific areas of healthcare, such as in E-health, EMR and EHR, and telemedicine.

Chapter 3, *Pervasive Computing and Healthcare,* discusses current and emerging trends in pervasive computing, and then presents how pervasive computing can lead to pervasive healthcare. Also, this chapter identifies various requirements of pervasive healthcare and presents open issues and challenges to spur more research in this area.

Chapter 4, *Wireless and Mobile Technologies,* presents wireless technologies and networks. These include cellular/3G networks, wireless LANs, satellites, sensors, Radio Frequency Identification (RFID), Bluetooth, ZigBee, and fixed wireless networks.

Chapter 5, *Wireless Health Monitoring: Requirements and Examples,* introduces wireless health monitoring systems that can be used to monitor patient health anywhere and anytime without affecting their daily lives and to more effectively use the limited healthcare resources. Major contents are discussed, such as monitoring environments, general monitoring requirements, vital signs and medical parameters, and specific vital signs. It also discusses how vital signs can be obtained and what specific vital signs can be used in detecting certain health conditions, and also introduces several examples, including sleep apnea, cardiac arrhythmia, stress, and behavioral problems with dementia.

Chapter 6, *Wireless Health Monitoring: State of the Art and Implementations,* presents and classifies works related to wireless health monitoring. This includes scenarios and visions, monitoring of vital signs, prototypes for specific conditions, monitoring for preventive care, monitoring for the elderly, network infrastructure, and the evolution of health monitoring.

Chapter 7, *Medical Decision Making,* discusses the medical decision making process by focusing on healthcare professionals, requirements and functions of healthcare professionals, managing the wrong context, and managing the cognitive load. It also presents a monitoring system with various components to monitor the generation, transmission, processing, and impacts of various alerts.

Chapter 8, *Health Monitoring using Infrastructure-oriented Wireless Networks,* discusses how infrastructure-oriented wireless networks, including commercial cellular/3G and versions of IEEE 802.11 wireless LANs, can be used to support health monitoring in diverse environments.

Chapter 9, *Ad Hoc Networks for Health Monitoring,* focuses on ad hoc networks in wireless health monitoring. It also introduces several challenges of using ad hoc networks, including reliability, power management, and routing.

Chapter 10, *Using Incentives in Wireless Health Monitoring,* discusses how reliable wireless health monitoring can be achieved using ad hoc networks, ways to obtain the cooperation of routing devices, and an incentive-based mechanism to improve wireless health monitoring.

Chapter 11, *Context-awareness in Healthcare,* presents why context-awareness is desirable for healthcare and how it can be extended to support the monitoring of multiple chronic diseases.

Chapter 12, *Monitoring of Mental Health, Medication and Disability,* introduces wireless monitoring for people with mental illnesses. It also introduces the notion that this monitoring can extend to the comprehensive monitoring of patients for symptoms, behavior, and medication compliance.

The book introduces several research issues and examples of pervasive healthcare in each chapter. Although pervasive healthcare is promising with regard to lowering costs, making expert care more accessible, making healthcare more personalized, and prompting individuals to take more responsibility for maintaining their health, we have to improve the many technologies that constitute pervasive computing: from how we collect data to sensing devices to how we present information [2]. Thus, this book will be invaluable to researchers and practitioners who are to improve the technologies and realize qualified pervasive healthcare in the near future.

References

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