

# Chapter 10

## Communication Issues in Pervasive Healthcare Systems and Applications

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### ABSTRACT

*This book chapter provides a systematic analysis of the communication technologies used in healthcare and homecare, their applications and the utilization of the mobile technologies in the healthcare sector by using in addition case studies to highlight the successes and concerns of homecare projects. There are several software applications, appliances, and communication technologies emerging in the homecare arena, which can be combined in order to create a pervasive mobile health system. This study highlights the key areas of concern and describes various types of applications in terms of communications' performance. A comprehensive overview of some of these homecare, healthcare applications and research are presented. The technologies regarding the provision of these systems are described and categorised in two main groups: synchronous and asynchronous communications' systems and technologies. The recent advances in homecare using wireless body sensors and on/off-body networks technologies are discussed along with the provision of future trends for pervasive healthcare delivery. Finally, this book chapter ends with a brief discussion and concluding remarks in succession to the future trends.*

### INTRODUCTION

The shifting of telemedicine from desktop platforms to wireless and mobile configurations has a significant impact on future healthcare. Obstacles for healthcare services are time and space between the providers and the patients. Wireless technol-

ogy came to encompass the e-health monitoring everywhere from any given location. The benefits of wireless technology have been illustrated in a number of different examples and applications. Today, patients at rural areas, at accident scenes or even at home are often physically remote to suitable healthcare providers.

Research and development advances in the e-health community include data gathering and

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transfer of vital information, integration of human machine interface technology into handheld devices, data interoperability and integration with hospital legacy systems and electronic patient records. However, several major challenges still need to be clarified so as to expand the implementation and use of mobile health devices and services and reinforce the market development.

In recent years, there has been increased research on commercial mobile health systems based on WLAN (Wireless Local Area Networks), GPRS (General Packet Radio Service) and 3G UMTS (3<sup>rd</sup> Generation Universal Mobile Telecommunications System) networking technologies. These technologies have been utilized in the deployment of emerging healthcare and homecare systems. The introduction of high speed data rate, wide bandwidth, digital and encrypted communication technology, makes possible the delivery of audio, video and waveform data to wherever and whenever needed. It is hoped that the current deployment of 3G based systems with global operational morphologies will improve some of the limitations of the existing wireless technologies and will provide a well-organized platform for homecare services.

Mobile and wireless concepts in healthcare are typically related to bio-monitoring and home monitoring. Bio-monitoring using mobile networks includes physiological monitoring of parameters such as heart rate, electrocardiogram (ECG), electroencephalogram, (EEG) monitoring, blood pressure, blood oximetry, and other physiological signals. Alternative uses include physical activity monitoring of parameters such as movement, gastrointestinal telemetry fall detection, and location tracking. Using mobile technology, patient records can be accessed by healthcare professionals from any given location by connection to the institution's internal network. Physicians now have ubiquitous access to patient history, laboratory results, pharmaceutical data, insurance information, and medical resources. Handheld devices can also be used in home

healthcare, for example, to fight diabetes through effective monitoring.

The mission of this book chapter is to provide a detailed analysis of the pervasive healthcare technology, applications and uses of mobile technologies in the health sector by using in addition case studies to highlight the successes and concerns of relevant projects. There are a variety of applications, devices, and communication technologies emerging in the electronic healthcare arena, which can be combined to create a pervasive mobile health system. This book chapter will highlight the key areas of concern and describe the various types of applications. A comprehensive overview of some of these electronic health applications and research will be presented. Meanwhile, the technologies regarding the provision of the pervasive health systems will be described and categorised in two main groups: synchronous and asynchronous communications' systems and technologies. Correspondingly, the classification of the wireless technologies will also be categorized according to their total throughput into small and high data rates within the relevant applications following the end-users view. The recent advances in mobile health (m-health) systems using wireless body sensors and on/off-body networks technologies will be discussed along with the provision of future trends for pervasive healthcare delivery.

In addition, the pervasive healthcare systems operating in patient's homes define the field of the so called homecare systems. These systems will be presented in a different section of this chapter issue, since the delimitations of the home environment dictates special technical objectives and introduces important problems and obstacles. However, the use of this wireless sensor technology in medical practice not only allows a supreme level of complexity in patient monitoring with regards to existing parameters (such as vital signs), but also offers the prospect of identifying new ways of diagnosing and preventing disease. The book chapter will end with a description of various applied pervasive health platforms along with their

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