

# Chapter XXXII

## Trends and Prospects of Telemedicine

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### ABSTRACT

*Recent development in telecommunication and information technologies came up with several technology options for telemedicine applications in hospitals and for medics for quality healthcare to patients. The research trends therefore need to be addressed for the proper deployment of technologies in a clinical setting or in a telemedicine environment with the adaptive compromise of technology and suitability. In this chapter, along with a description of the research trends and system design issues concerned with telemedicine, a mobile telemedicine system architecture and design have been proposed. Other current telemedicine technology options and prospects and challenges of future research in this emerging area are also described to indicate the possible future research challenges. Research in telemedicine is a future to provide improved and quality access to the healthcare professionals and patients. Therefore, developing telemedicine systems with state-of-the-art technologies is of paramount importance and hence, this chapter would link up an important step in system analysis and design perspective to this evolving research arena.*

### INTRODUCTION

Telemedicine has been defined as the use of telecommunication to provide diagnostic and therapeutic medical information and to provide healthcare services between patient and doctor without either of

them having to travel across geographic, time, social, and cultural barriers. In other words, telemedicine is the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis,

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treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities. The ongoing advancement of the sensors, low-power integrated circuits, and wired or wireless high data-rate broadband communication services under the umbrella of the telecommunication technology recently flickered renewed research trends and prospects for the efficient and cost-effective deployment of state-of-the-art technologies in telemedicine. It is therefore worthwhile to evaluate the technologies involved in telemedicine applications and establish a relationship between telemedicine system analysis and design to efficiently deliver services in a wider geographic area depending on the bandwidth and user requirements. This chapter therefore describes the trends and prospects of research in telemedicine in this emerging world of broadband convergence with a view to review and establish system design issues in this area. First we will review the definitions of telemedicine with some background information on the development of telemedicine. Subsequent sections of this chapter explore the different applications and design issues of telemedicine in different settings of technologies. As a part of telemedicine system development using current wireless technologies, the system architecture of a mobile telemedicine application is detailed thereafter. Later on, we narrate the other research issues in telemedicine and finally summarize the possibilities and future directions in a technical perspective.

### **BACKGROUND**

The term “telemedicine” derives from the Greek “tele” meaning “at a distance” and the present word “medicine,” which itself derives from the Latin “mederi” meaning “healing” (Feliciani, 2003, p. 114). A 1999 definition adopted for a Congressional briefing on telemedicine in the USA produces a statement as follows:

*Telemedicine utilizes information and telecommunication technology to transfer medical information for diagnosis, therapy and education.*

The World Health Organization (WHO) describes the definition of telemedicine as follows:

*The practice of medical care using interactive audiovisual and data communications including medical care delivery, diagnosis, consultation and treatment, as well as education and the transfer of medical data.*

In addition to patient records, medical professionals can obtain vital signs and other reference data through telemedicine applications. Depending on the need and availability of communications infrastructure, telemedicine uses a variety of transmission modes including integrated services digital network (ISDN), local area network (LAN), asynchronous transfer mode (ATM), digital subscriber line, satellite, microwave, digital wireless, and the Internet. With all these ranges of technology deployment, telemedicine works have paved the right impetus for a cost-effective telemedicine network.

Telemedicine can be divided into two modes of operations: real-time mode (synchronous), in which patient data are available at the remote terminal immediately after acquisition, and store-and-forward mode (asynchronous), which involves accessing the data at a later time (Craig, 1999, p. 5).

In the store-and-forward mode, a digital image is taken, stored, and then forwarded to another location to a medical specialist for consultation and avoids the simultaneous communication between both parties in real time. Teleradiology, where radiographic images are needed to be transferred or in dermatology, where visually skin lesions are examined, are very good examples of this kind of mode. Store-and-forward also includes the asynchronous transmission of clinical data, such as blood glucose levels and electrocardiogram (ECG) measurements, from one site (e.g., patient’s home) to another site (e.g., home, health agency, hospital, or clinic).

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