Chapter 22
Medical Informatics:
Preventive Medicine Applications via Telemedicine

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ABSTRACT

Information services, medical decision support systems and telemedicine are becoming important tools for medical professionals and also people who are interested in health related information. Medical decision support aims at providing healthcare professionals with therapy guidelines directly at the point of care. Telemedicine is the use of modern information and communication technologies (ICT) for the provision of clinical care to individuals at a distance and transmission of information to provide that care. The chapter intends to an integrated view of the medical informatics and preventive medicine applications via telemedicine. The chapter includes technological perspectives in e-health and telemedicine. The author suggests that the content of the chapter will assist to the people in gaining a better understanding of the technological perspectives in e-health and telemedicine and preventive medicine applications.

INTRODUCTION

In the last decade, information and communication technologies (ICT) have seen enormous growth and have been introduced by various degrees into the medical environment. The extra processing power and facilities open up the scope for much more powerful processing and networking of medical applications. Communication networks are becoming increasingly large in size and heterogeneous in nature. Recent advantages in communication technologies have contributed to an explosion of new services directed at the medical environment. The general goal of using communication technologies in medical environments is to improve the overall quality of healthcare at an affordable cost. This requires close interaction between healthcare practitioners and information technologists to ensure that the proposed technologies satisfy current user's needs and anticipate future ones. Appropriate application of ICT in primary healthcare will extend traditional diagnosis and patient management

beyond the physician's clinic into the everyday living environment (Pombortsis; 1998; Ruggiero et al., 1999; Lovell & Celler, 1999; Anantharaman & Han, 2001; Bliven et al., 2001; Güler & Übeyli, 2002; Übeyli, 2009).

Medical informatics is the development and assessment of methods and systems for the acquisition, processing and interpretation of patient data with the help of knowledge from scientific research. The focus are the patient and the process of care. The foundation for any medical decision support is the medical knowledge base which contains the necessary rules and facts. This knowledge needs to be acquired from information and data in the fields of interest, such as medicine. Three general methodologies to acquire this knowledge can be distinguished: traditional expert systems, evidence-based methods, statistical and artificial intelligence methods. The medical decision support system consists of differential diagnosis, computer-assisted instruction, consultation components and their subsystems. The differential diagnosis component contains three subsystems: artificial neural network (ANN) model, time series analysis and medical image analysis. ANNs are computational modeling tools that have recently emerged and found extensive acceptance in many disciplines for modeling complex real-world problems. ANNs produce complicated nonlinear models relating the inputs (the independent variables of a system) to the outputs (the dependent predictive variables). ANNs have been widely used for various tasks, such as pattern classification, time series prediction, nonlinear control, function approximation, telecommunications and biomedical (Haykin, 1994; Basheer and Hajmeer, 2000; Chaudhuri & Bhattacharya, 2000). Time series analysis is based on the extraction of information from medical signal data. Medical image analysis can be used for medical decision making. Important tools in modern decision-making, in any field, include those that allow the decision-maker to assign an object to an appropriate group, or classification (Anderson et al., 1997; Bellazzi et al., 2001; Bel-

lazzi, 2003; Thornett, 2001; Imhoff, et al., 2001; Brown, 1998; Conner et al., 2000).

Telemedicine represents a combination of expertise and technology that delivers medical services and information over distance. Telecommunications technology delivers this information in the form of voice, data or video imagery. The most part of existing literature on telemedicine has taken as its primary focus the utility and efficacy of the technology itself, as it is applied to particular clinical problems and settings. This is primarily a clinical literature that is about establishing the safe practice of medicine using a diverse set of communications technologies. Since the rapid growth in telecommunications and computer technology over the last decade, telemedicine has become an important part of medical development with the potential to greatly improve quality of future healthcare. Preventive medicine is the part of medicine engaged with preventing disease rather than curing it. It can be contrasted not only with curative medicine, but also with public health methods (which work at the level of population health rather than individual health) (Morabia & Costanza, 2008). Interactive health communication using Internet technologies is expanding the range and flexibility of intervention and teaching options available in preventive medicine and the health science (Güler & Übeyli, 2002; Benger, 2000; Binks & Benger, 2007; Broens et al., 2007; Callas et al., 2000; Chae et al., 2001; Chen et al., 1999; Sood et al., 2007).

Fast developments in ICT have made it possible to develop new services for people. One of the most interesting areas is the healthcare (Forsström and Rigby, 1999; Bellazzi et al., 2001; Bliven et al., 2001; Bellazzi, 2003; Thornett, 2001; Imhoff, et al., 2001; Brown, 1998; Conner et al., 2000). In this chapter, the importance of medical informatics and telemedicine in preventive medicine are emphasized. Medical informatics, medical decision support systems, preventive medicine applications, telemedical services, quality and reliability of healthcare services are presented.

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