Wireless Body Area Network: From Electronic Health Security Perspective

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ABSTRACT

The Wireless Body Area Network (WBAN) promises a great revolution in the field of electronic health technology in the future. These types of networks are, in fact, collections of low-priced small sensors with low voltage and computational power as well as insufficient energy capacitors which are located on the human body. As the wireless body area network should send the critical information gathered from the patient’s body to the physician, the hospital, or the emergency for a supervision in real time, it needs strong mechanisms to protect the security and personal limits of the patient in order to avoid damaging invasions to the system and minimize the system vulnerability. Evaluation of previous works in WBAN security show different levels of threats and security solutions must be considered in accordance with each level. This paper aims at studying current methods of the wireless body area network and considering the levels, evaluation of the security requirements and existing threats. Furthermore, the paper is an attempt to present security solutions to improve the current status of the wireless body area network.

Keywords: E-Health, Electronic Health Security, Security Solutions, Wireless Body Area Network (WBAN), Wireless Body Area Network (WBAN) Security

INTRODUCTION

Thirty percent of the mortality around the globe results from cardiovascular diseases (CVD) according to statistical reports of the World Health Organization. About 17.50 million people in the world die from the heart and cerebral strokes. Also, it is predicted that about 20 million persons will die from heart diseases in 2015. More than 246 million persons throughout the world suffer from diabetes, and the figure is expected to reach 380 million people in 2025 by the population growth (Eberle, 2011). According to the statistical reports of the USA, it is expected that the population of senior citizens older than 65 years will double by 2020, and it will triple by 2050 (Chen et al., 2011). As a result, an increase in the age of the populations in developed countries and an increase in health care costs has urged introducing a technologi-
cal progress in the current methods of health care. Regardless the above mentioned, we have found out that in the current years inevitability of the electronic health for the remote health control through wireless networks and small low-power electronic systems has led to a significant development of the wireless body area networks (WBAN).

Primary applied programs of the wireless body area network initially emerged in the health and treatment area. In a way, there is a need for continuous and long term supervision on several diseases like high blood pressure, diabetes, and so on. In fact, a WBAN allows continuous supervision on physiological parameters of the patients’ and lets the patient perform his/her daily activities freely and without being hospitalized for a long term. Therefore, the physician may have better control on the patient’s information in such a long run. The patient’s data should be sent in real time in order to help the physician to precisely diagnose the patient’s problems. Furthermore, it helps the elderly to manage their daily life and medical conditions more appropriately (Wolf, 2007). As well, combination of agent features presented in Chen et al. (2011) and sensor networks in WBAN can be helpful in decision making for physicians.

The Wireless body area network entails some cheap, small, and noninvasive sensors with low voltage and computational power, and limited energy capacitors which allow a continuous supervision of the human body functions and its environment (Vallejos de Schatz et al., 2012).

Although the WBAN is typically applied in medicine, it has nonmedical applications, as well. Different applications of WBAN can be enlisted as follows:

- Supervising the health and physical fitness remotely;
- Military & Sport Trainings;
- Interactive games and entertainments;
- **Secure Identification:** This applied program includes the restoration of behavioral and mental biometric plans like the face status, finger printing, and iris diagnosis;
- Transferrable audiovisual systems like microphones and MP3 players;
- Monitoring and automatic control of the physical and chemical parameters are necessary to optimize a bioprocess.

The emergence of the wireless body area network has a great potentiality in causing revolution in the future remote health technologies. Although this technology has useful effects on human quality of life, we are still encountering numerous challenges in this regard. A significant decline in power consumption is considered as one of such challenges. Indeed there has been an endeavor to minimize the battery energy in order to avoid additional costs resultant from the recharge replacement.

Saving the energy via body movement or temperature difference is one of the solutions to resolve the aforementioned issue. Besides, an increase in the sensors’ dimensions rates and weight is another challenge faced in this technology. In the wireless body area network, security and efficiency of the system are very important and necessary so that designing a secure WBAN system is considered as an essential challenge for the designers (Sana Ullah, 2010). The information of a wireless body area network includes a collection of critical data gathered from different parts of the human body. In this way, the data should be transferred securely to avoid its susceptibility caused by malicious invasions to the system as such a network is being used in health and treatment areas and has a personal nature.

In a number of medical application cases, security threats might put the patient’s status at risk or even cause the patient’s death. Consequently, a WBAN requires strong security and scalable mechanisms to evade hostile invasions and transfer the read information reliably and precisely. As a result, the security and protection of private limits is one of the challengeable problems in WBANs.
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