ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 5, August 2015

PROTECTION OF PATIENT CONFIDENTIAL DATA USING ECG STEGANOGRAPHY

Nidhi
M. Tech Scholar, BCET,
Gurdaspur
nidhi_axe@yahoo.com

Dr. Arpinder Singh
Associate Prof., ECE Department, BCET,
Gurdaspur
singharpinder@gmail.com

Abstract

In recent years, people are more and more concerned about the privacy of their information and other important data. Personal Health Record is an emerging application of health information exchange that allows people to access and co-ordinate their lifelong health information. The patient's privacy and security is important in the protection of healthcare privacy and at the same time the patient has control over access to their own PHR. This paper provides survey to makes use of electrocardiography (ECG) data in order to protect individual information. An ECG image can not only be used to analyse disease, but also to provide crucial biometric information for identification and authentication.

Keywords— PHRs, ECG, Watermarking, DWT.

Introduction

Steganography is a method/ technique used to hide data or identifying information within digital multimedia. Steganography is becoming popular, especially for adding undetectable identifying marks, such as author or copyright information. The steganography process embeds a signal into the media without significantly degrading its visual quality. It embeds some information called stegogramme into different kinds of media called cover work. It is used to hide the information inside a signal, which cannot be easily extracted by the third party. It's widely used application is copyright protection of digital information. It is different from the encryption in the sense that it allows the user to access, view and interpret the signal but protect the ownership of the content.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 5, August 2015

Therefore Steganography involves embedding a structure in a host signal to "mark" its ownership. Steganography are inside the information so that ownership of the information cannot be claimed by third party.

Personal Health Record (PHR) is the internet based or computer based methods that records patient personal confidential data in electronic version. The availability of medical information on the internet/online has made patients much more aware of symptoms, diagnostic tests, diseases, and treatment options. Many people now a day's keeps their health information records for themselves and their families [1, 2]. The patients personal confidential data sent through the public network should be protected and secure. Patient can control who will use his/her confidential health data. The personal confidential data may include name, address, telephone number and Medicare number and who can access data.

Monitoring patients at their place can reduce the rush/ traffic at hospitals and medical centres. The primary goal is to provide confidentiality, integrity, and availability [3]. Growth in PHR use parallels the adoption of electronic medical record systems by primary care physicians. Primary care physicians play a predominant role in advising and supporting patients in education and health self management [4]. PHR systems have the potential to change and possibly to improve patient provider relationships, enhance patient physician shared decision making, and enable the healthcare system to evolve toward a more personalized medical model [5].

The main goal of watermarking is to hide patient's confidential data and other physiological information in ECG images. ECG images is used because the size of ECG is large compared to other medical images. Patients ECG images and other physiological readings such as temperature, blood pressure, glucose reading, position, etc., are collected at homes by using Body Sensor Networks (BSNs) will be transmitted and diagnosed by remote patient monitoring systems. At the same cost that the patient confidentiality is protected against intruders while data traverse in open network and stored in hospital servers. The aim is to show that both the Host ECG and watermarked ECG signals can be used for diagnoses and the difference would be undetectable.

Key Parameters of PHRs

System parameters relate to the characteristics of PHR systems

A. *Content*

The confidential data included in PHR system and who can access that data is great concern. Confidential data from practitioner sources should use easy to understand language. Data entered by patients may not be as complete, accurate and organized as data exchanged between health-care providers [6, 7]. Content must be important, understandable, and credible to patients and their caregivers. Physician experience has shown that patient problem lists, clinical notes, medication and allergy data, and laboratory and diagnostic test results can be shared with patients [8, 9]. An attempt should be made to adjust office workflows so physicians can discuss results with patients before they appear in online records.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 5, August 2015

B. Architecture

Confidential data that patients may keep for their personal use may also be valued by health-care providers. A personally controlled PHR, integrated with a primary care, can manage communications for prescriptions and appointments at reasonable cost. System interoperability is critical to giving consumers access to health records in hospital, physician, and laboratory systems [10, 11, 12].

C. Privacy and Security

Consumers are very much concerned about the privacy and security of their health information, Current security protection mechanisms need to be enhanced for record protection, but to maintain privacy, and security levels must not become so tight that health records are unusable. However wireless transmission of patient medical data, including the privacy, integrity, and confidentiality of the data, and the authentication and authorization of users are great concern [13, 14].

D. Functionality

PHR functionalities can be classified as: (1) information collection, (2) information sharing and exchange, and (3) information self-management. Functionalities include sending and receiving electronic messages to and from doctors' offices; completing prescription renewal forms, appointments, and referral authorizations; viewing lists of current medications and allergies; and accessing health and practice information. Decision support can also assist patients in managing chronic illnesses, based on monitoring data. The nature of the patient's illness affects preference for functionalities.

Related Work

There are many methods to secure patient confidential information however we concentrate on the approaches proposed to secure data is based on using steganography techniques to hide secret data inside medical images. The main challenging factors of these methods are how much information can be stored and security of the proposed method. Lastly, what will be the quality of the resultant stego image i,e image having data stored in it.

Zheng and Qian, present a new reversible data hiding algorithm based on wavelet transform. The technique is based on applying B-spline wavelet transform on the original ECG signal to detect QRS complex. This method has low capacity since it is shifting 1 bit. Furthermore, the security in this algorithm relies on the algorithm itself; it does not use a user-defined key.

Golpira and Danyali, present a reversible blind watermarking for medical images based on wavelet histogram shifting. Medical images such as MRI are used as host signal. A 2-D wavelet transform is applied to the image. This method performs well for MRI images but not for ECG host signals. The capacity of this technique is low and no encryption key is involved in its watermarking process. Kaur et al. proposed a new digital watermarking of ECG data for secure wireless communication. Each ECG sample is quantized using 10 bits and is divided into segments. The segment size is equal to the chirp signal that they use. Patient ID is used in the modulation process of the chirp signal. The modulated chirp signal is multiplied by a window dependent factor and then added to the ECG signal.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 5, August 2015

PHRs Purpose

The purposes of PHR are outlines as

A. Easy Communication to patient

The benefits and satisfaction with PHRs have included easy access to test results and better communication with healthcare practitioners. Physicians generally prefer telephone or face-to-face communication. One EMR web portal designed to assist the self-management of ambulatory patients with diabetes included secure e-communication with the physician's office, preventive healthcare reminders, and disease-specific tools and information [15, 16].

B. Education and lifestyle change

In addition to personal data and data from the provider EMR and monitoring devices (eg, weight, blood glucose), a PHR could store other data on, for instance, social status, family history, or living and work environment. It could also include information on healthy lifestyles (diet, exercise, smoking, weight loss, and working habits). In one study patients could access education and automated advice programs and add their own information to hospital systems. In this case, patients primarily reviewed laboratory results; patients and physicians reported enhanced communications and patient understanding.

C. Health self-management

Patient health self-management can be supported by PHRs that allow patients to record, edit, and retrieve their healthcare data, including blood glucose and blood pressure measurements, weight and activity logs, and stress scales. Frequent monitoring can lead to early detection of critical situations and timely intervention. Self-care monitoring tools are becoming more mobile and reliable, particularly in 'smart home' applications.

D. Adoption, acceptance, and usability

There are several inter-related measures of success, including system quality, use, user satisfaction, individual impacts, and organizational impacts. In this section we review findings on related PHR characteristics, such as adoption, use, acceptance, satisfaction, and usability. A sustainable PHR implementation depends on positive results from all these characteristics as well as favourable individual and organizational impacts.

E. Acceptance and satisfaction

Three compelling reasons motivating patients to maintain PHRs: serious chronic illnesses, unexpected health events, and the availability of inexpensive and secure computers. In a study of healthy, chronically ill, mentally ill, and pregnant patients, it is found that patient access to online medical records fitted three classifications: participation in care, quality of care, and self-care strategies. Patients felt that access helped reinforce trust and confidence in doctors and made them feel more like partners in healthcare. A measure of adoption success is sustainability—'the degree to which an innovation continues to be used after initial efforts to secure adoption are completed. Sustainability was rarely if ever mentioned in any of the papers reviewed, although satisfaction, a related term, was often reported.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 5, August 2015

Limitation

One of the limitations to this study is that new papers are being published quite regularly on PHRs, and some may have been missed in this study. Second, although we have tried to discuss some of the most important findings in the literature, it is impossible in a limited space to detail all the aspects we found that affect PHR attributes, purposes, benefits, usage, user satisfaction, and barriers to adoption and use.

Conclusion

The main aim/goal of this paper was to describe existing electronic PHR research and to determine whether PHRs can provide benefits to consumers/patients. We found a growing interest in PHR use. The current lack of understanding of optimal functionality and usability of PHRs systems need more research. However PHPs play a beneficial role in supporting self-managed healthcare.

References

[1] Bliemel M, Hassanein K. Consumer satisfaction with online health information retrieval: a model and empirical study. e-Service J 2007;5:53–83.
[2] Rideout V, Neuman T, Kitchman M, et al. e-Health and the Elderly: How Seniors Use the Internet for Health Information. Menlo Park, CA: Kaiser Family Foundation, 2005.
[3] Taylor H. Two in five adults keep personal or family health records and almost everybody thinks this is a good idea. Health Care News 2004.
[4] Demiris G, Afrin LB, Speedie S, et al. Patient-centered applications: use of information technology to promote disease management and wellness. J Am Med Inform Assoc 2008;15:8–13.
[5] Kaelber DC, Jha AK, Johnston D, et al. A research agenda for personal health records (PHRs). J Am Med Inform Assoc 2008;15:729–36 .
[6] Earnest MA, Ross SE, Wittevrongel L, et al. Use of a patient-accessible electronic medical record in a practice for congestive heart failure: patient and physician experiences. J Am Med Inform Assoc 2004;11:410–17.
[7] Wuerdeman L, Volk L, Pizziferri L, et al. How accurate is information that patients contribute to their electronic health record? AMIA 2005 Symposium Proceedings. 2005:834–8.
[8] DeLenardo C. Web-based tools steer patient-focused care. Nurs Manage 2004;35:60–4 .
[9] Halamka JD, Mandl KD, Tang PC. Early experiences with personal health records. J Am Med Inform Assoc2008;15:1–7.
[10] Tang PC, Ash JS, Bates DW, et al. Personal health records: definitions, benefits, and strategies for overcoming barriers to adoption. J Am Med Inform Assoc 2006;13:121–5.
[11] Stolyar A, Lober WB, Drozd DR, et al. Feasibility of data exchange with a patient-centered health record.AMIA 2005 Conference Proceedings; 2005. 2005:1123.
[12] Tang PC, Lee TH. Your doctor's office or the Internet? Two paths to personal health records. N Engl J Med2009;360:1276–8.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 5, August 2015

[13] Win KT, Susilo W, Mu Y. Personal health record systems and their security protection. J Med Syst2006;30:309–15.
[14] Masys D, Baker D, Butros A, et al. Giving patients access to their medical records via the Internet: the PCASSO experience. J Am Med Inform Assoc 2002;9:181–91.
[15] Hess R, Bryce CL, Paone S, et al. Exploring challenges and potentials of personal health records in diabetes self-management: implementation and initial assessment. Telemed J E Health 2007;13:509e18.
[16] Tang PC, Ash JS, Bates DW, et al. Personal health records: definitions, benefits, and strategies for overcoming barriers to adoption. J Am Med Inform Assoc 2006;13:121e5.