

A Proposed Quality Preserving Framework for Ensuring the Property of Medical Patient Information

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Abstract

The problem lies in the existence of important medical information (patients' records). That, information grew, originated from medical treatment foundation. Practically, a careful and accurate keeping of patients' information has a high degree of ensuring patient privacy and confidentiality. Moreover, the medical information of patient can be used by various insurance companies, medical research institutions for specific purposes. In this regard, the protection of medical information records is a very complex issue. More often, researchers develop new techniques to protect patients' data and resulting information but without introducing advanced solutions of data quality problems. In this paper, a proposed framework is presented to highlight "how to keep and maintain the patient medical information quality in order to ensure its intellectual property ". After applying the proposed framework on different patients' records, an effective and satisfactory result will be gained to serve and solve the two contradictory issues.

Keyword: Medical Information, Privacy, Confidentiality, Intellectual Property, Data Quality Problem.

1. Introduction

The medical records are important documents of a patient's/individual's rights that store the facts and his/her medical status in details. It is used to describe the most important data of health treatment of the patient. Patient's records are created by the provider of health treatment such as medical institutions, hospitals, medical polyclinic and private clinics. Today, medical records are much broader concept than in the past [1]. The beginnings of health record history due to date 3000 BC when the Egyptian started keeping the oldest form of health records.

There is a need to protect the intellectual property of that electronic medical patient information inside the surrounding electronic era. Furthermore, there are different techniques that encode the data/ information in a general such as data hiding techniques (steganography and cryptography). Their works depend on coding and decoding the information so as to keep it secure, done by using a key as well as hiding the secret message in original media such as (image, text, video and audio) so that it will get visible to anyone. H. Thakur [2] supposes a recent study to compare between these techniques. He reached to, it is found that a combination of cryptography and steganography gives better security to the digital data, but the problem related to these techniques is the requirement of more space to hide the data. Hence, there is another interesting and contradictory issue, data quality problem as a trade-off issue with ensuring medical information property.

Data quality means the quality of the data values without errors. The problems of data quality are missing attribute values, incorrect attribute values, or different representations of the same data and etc. [3-4]. Regrettably, many organizations learn about the importance of preserving the data quality late only after causing technical problems such as plagiarism, theft of confidential information and information penetration problems. Therefore, a proposed quality preserving framework is presented to handle these issues.

This paper's content is organized as follow; Section 2, investigates the related work. The medical information value is presented in section 3. Section 4, discusses the medical intellectual property and its legal accountability. At section 5, shows the data quality importance and its problems. A proposed framework and its workflow are presented in section 6. Finally, a discussion of the advantages of the proposed framework is found in section 7. The conclusion is presented in section 8.

2. Related work

In the past few years, more than studies were introduced to handle the related issue. One of them, [5] talked about the privacy of medical information by presenting a framework for de-identifying health information. De-identification refers to a set of methods that can be applied to data in order to ensure the probability of assigning a correct identity to a record of the patient data. She focused on the control of data sharing and management in order to preserve patient information. Her main objectives were removing the sensitive data by using k-anonymization and generalization methods in privacy and

misuse protection [5]. Moreover, [6] proposed a pseudonymization approach that is suitable for preserving medical records. They were developed a PIPE approach in order to ensure the secured and privacy of sensitive patient information. The PIPE approach's ideas focused on separation the medical content from patient identify information such as (name, address). The both patient's record are assigned randomly-selected pseudonyms/ a (1:1) relation. The both pseudonyms are protected by encryption with a secret key, authentication, and cryptographic standards. Furthermore, a high sensitive patient data fragments can be encrypted and still preserve query functionality, while depersonalized and large medical data can be left unencrypted, but still protected by pseudonymization.

3. Medical Information are Valuable

Nowadays, medical information of any patient is kept from birth to death. All the times, medical information of patients is very sensitive. It does not describe the patient's status only but contains the confidential information about his/her life details. The history of disease also contains information of other family members. As well as medical information has an important impact with its positive and negative. Medical information is the important assets of doctors' decision making. The issue of this concern is special only for the patient with a partnership of his medical treatment providers. They are the all medical staff of proper monitoring of his /her health with a specific plan of treatment. This medical information serves as the basis for the realizing of individual rights, both in the civil and legal transaction, as well as the exercise of rights relating to privacy determining health status [1-4]. Medical information includes different patient healthy records. It provides with specific drugs and the medication dose. Therefore, the medical information contains accurate information, so it is hard and complex to change these data. Fig. 1 shows an example of medical information/ personal patient records [1, 6].

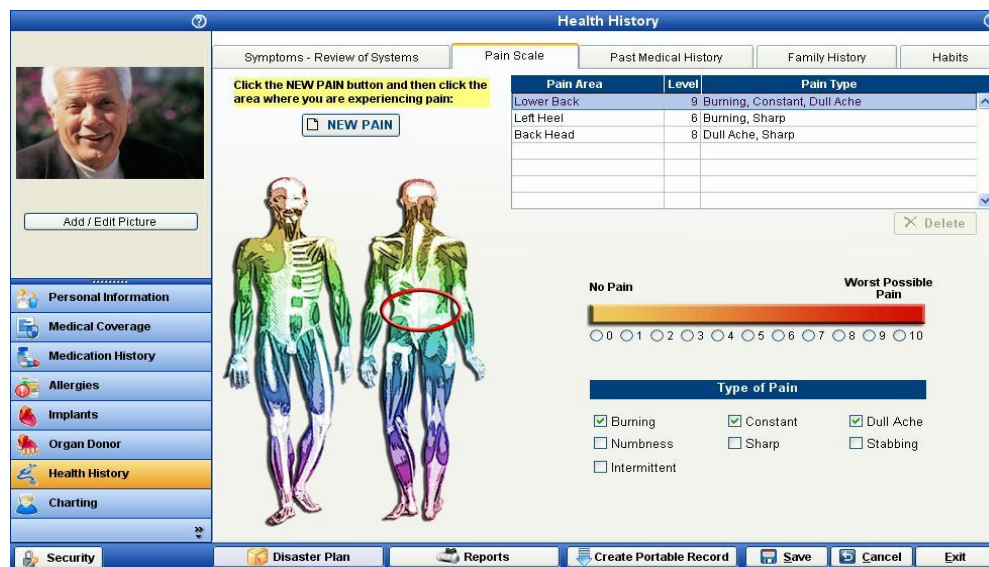


Fig.1 An example of Medical Information/ Patient Record

4. Medical Intellectual Property and Its Legal Accountability

The medical information contains patients' symptoms, diagnoses, and treatments. We are now in an open e-world. As we know that, a medical intellectual property is defined as a medical work that represents in a tangible form (text, image, report, x-rayed) that can be legally protected [7]. Under the applicable domestic law, the doctor is the responsible for the medical patient information. Although, on the ground, health records are handled and accessed by treatment foundation's administrators and nurses. In practice, however, medical information is created by various experts. The methods, storing, accessing are not legally defined, therefore allowing excessive availability, non-transparent treatment, and property problem either disposal of patient's records or reuse capabilities and unauthorized publishing/distribution. On the other hand, medical

information of patient either online available or documented are the only evidence that health treatment was inadequate or error diagnosed. It can be used to prove the patient's rights [1, 7].

Therefore, the legal accountability of this issue is a shared responsibility between the patients as a medical service recipient and the treatment institution as a service provider. They worked together in the possession of medical information property. Hence, reusing of patient's information is prohibited without their consent / written approval. Whether in prior agreement or according to published policies/internal laws are declared and adopted by the treatment institution provider. The medical patient information originality returns to the two owners of this information, these are (patient and treatment institution). In general, the law allows any mean/method to ensure the property of medical data according to the data hiding technique as we mentioned it above. The goals of intellectual property for the medical information of patient are summarized in fig.2.

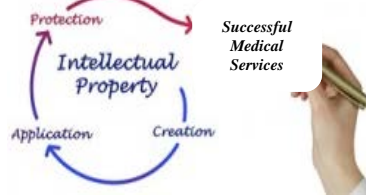


Fig. 2 Goals of Medical Intellectual Property

5. Data Quality Problems

Data is an important cooperate asset. Data quality defined as the condition of a set of values of qualitative or quantitative variables. The high quality of data is considered if it's fit for its intended uses in operations, decision making, and planning. Data accuracy refers to whether the data values stored in an object are the correct values. To be correct, a data values must be the right value and must be represented in a consistent and unambiguous form. Data accuracy is one of the components of data quality. The viability of medical decisions is contingent on good data. Good data is contingent on an effective approach to data quality. Various data quality problems are originated from different automating solutions. There is a partnership between data quality problems and Information Technology (IT) that poses errors and some data challenges. A successful data quality program has a reactive component that consists of dealing with problems that are inherited in the existing data. According to the Data Warehouse Institution, the U.S Government estimates that 600 billions of dollars are lost annually due to data quality problems [3]. Therefore, it is a big number we should to stop and rearrange our vision for data quality concept. Additional estimates have shown that 20% of the data in a typical organization is erroneous or otherwise unusable. Hence, the importance of data quality issue should be clear and take into the medical treatment provider's consideration. Two contradictory issues are depicted in fig. 3 that shows a trade-off between (Data /medical information quality requirements and Ensuring Intellectual property/data hiding techniques). A quality preserving framework is proposed to make a balance between the two issues in order to specify the tolerance level. Then it is appropriate to accept the error.

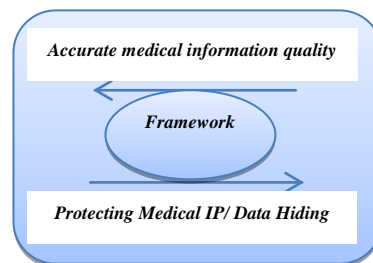


Fig.3 a Trade-off between two contradictory Issues

6. A Proposed Quality Preserving Framework

In general, the definition of framework means that is the structure of components and its relationship. Therefore, we suppose this framework as it depicted on fig.4 in order to achieve two goals. As it shown the framework components are (patient level, Medical treatment level, Intellectual property level and data quality level for specifying the tolerance level of acceptable errors/ data quality constraints).The first embeds a data hiding technique to protect the intellectual property of medical patient's information. The second is avoiding the data quality problems by specifying the tolerance level of acceptable errors (data quality level). The relationship between this framework's components is based on the patient's participation as a permanent partnership. Furthermore, it also depends on the medical treatment institution as a medical service provider. The advantages of this framework are depending on applying two objectives (intellectual property level and data quality level). A workflow of the proposed framework is presented in figure (5). It shows the processes in details of the proposed framework.

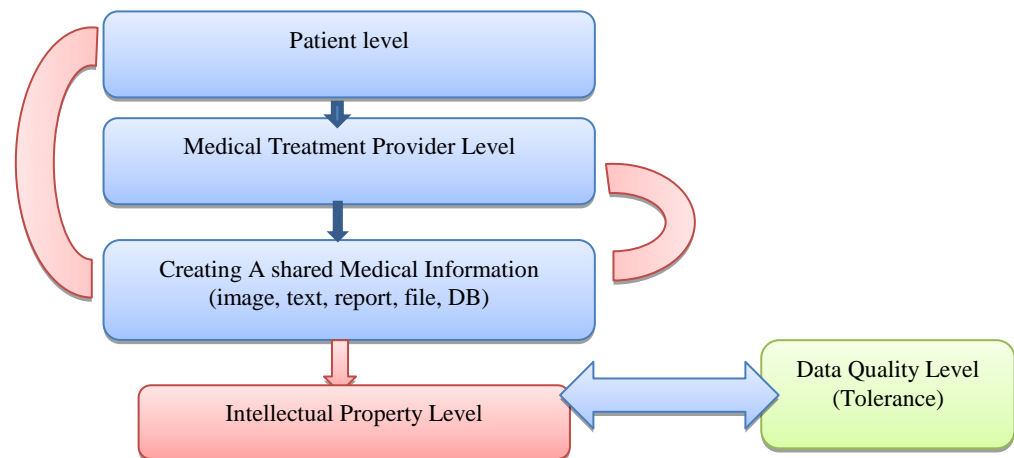


Fig. 4 A proposed framework

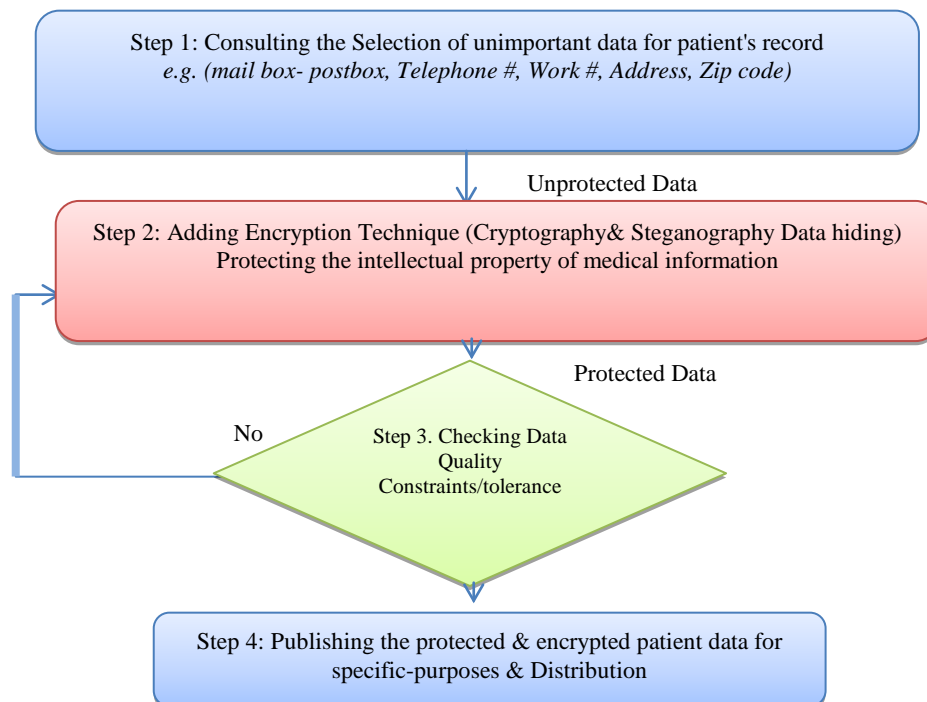


Fig.5 A work flow of the proposed framework

7. Discussion and Advantages of the Proposed Framework

The proposed framework has many advantages such as avoiding the data quality problems and ensuring the medical intellectual property. Furthermore, it allows patient participation and also for the medical treatment institutions. Table (1) shows a comparison between the exiting framework and our proposed framework.

Table 1 A comparison between the existing model and the proposed framework

Items	<i>Exiting Framework</i>	<i>Proposed Framework</i>
Intellectual Property	Semi-available	Fully Available
Preserving Data quality problem	N/A	Fully Avoided
Data Hiding Techniques	Limited/Separated	Fully Applicable/ Integrated
Privacy	Fully Available	Applicable
Partnership Participation	Limited	Fully Applicable

8. Conclusion

The medical records of patients are very important assets. It must be handled carefully, because it contains accurate and confidential information. Many medical treatment intuitions ignored two issues (intellectual property of the patient records and the problems of data quality). A proposed framework is presented to handle the two issues. We activate and encourage the roles of patients and medical treatment institution's participation. Many advantages gained from applying the proposed framework such as not only preserving the data quality problem but also ensuring the medical intellectual property of patient's records. The piece of advice now for all huge treatment institutions is to apply the proposed framework in order to ensure the medical intellectual property of patients' records/medical information and avoiding the cost of data quality problem to treat with a secure and safety surrounding environment.

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