Chapter 57
Preserving Data Privacy in Electronic Health Records Using Blockchain Technology

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ABSTRACT

Technology is a boon to mankind in this fast-growing era. The advancement in technology is the predominant factor for the sophisticated way of living of the people. In spite of technology, revolution happens across the world, and mankind still suffers due to various health issues. Healthcare industries take immense measures to improve the quality of life. An enormous volume of digital data is being handled every day in the healthcare industry. There arises a need for the intervention of technology in the healthcare industry to be taken to a greater extent. The prime duty of any healthcare industry is to store and maintain those data in the form of electronic health records (EHR) in a secured manner.

INTRODUCTION

Health care industry is one of the important industries that greatly influence the economy of a country. The present era is likely to be dominated by technology in order to fulfill the demands that arise majorly for the patient under continuous health monitoring.The healthcare industry acts as a bridge between the beneficiaries such as medical practitioners, patients, hospitals, public and private health sectors. The major issue to be addressed in this scenario is the possibility of achieving interoperability. Since the patient data is being shared between various stakeholders the data security and privacy issues are also of high concern. The affluence of block chain technology circumvents the problems related to security and privacy issues and resolves the challenges in implementing interoperability facility (Mukkamala,

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Vatrapu, Ray, Sengupta, & Halder, 2018). In Gordon & Catalini (2018), the block chain databases are specially designed databases created only once and never edited or deleted. Data is stored in block chain as a decentralized ledger (computer file asset) and accessibility to it is not provided as the owner holds the private keys. Additionally, the owner can hold the control to provide to access the data and transfer it from one computer to another much faster and secure manner.

Block chain technology facilitates 'smart contracts', through which patients are allowed to be compensated with tokens for their sharing of health data with providers and their research partners (Hölbl, Kompara, Kamišalić, & Zlatolas, 2018). The significance of this approach is to enable individuals to possess complete control on their own health data in order to respect and preserve the privacy of the data. Data is secured by encrypting the medical data using attribute-based encryption (ABE) and identity-based encryption (IBE) in order to implement digital signatures (Tamazirt, Alilat, & Agoulmine, 2018). This implementation ensures that EHR can be maintained with high level of security (Zhang, Schmidt, White, & Lenz, 2018). This approach also eradicates the need to use any other complex cryptographic systems. In da Conceição, Silva, Rocha, Locoro, & Barguil (2018), Data privacy and data accessibility are conflict with each other as data privacy ensures the overall control provided to access the data where as the accessibility means unconstrained information access. According to Science House (n.d.), Block chain technology possesses key properties, such as immutability, decentralization, and transparency and it also allow software apps and technology platforms to communicate securely and seamlessly in order to exchange data. Blockchain offers the opportunity to enable access to longitudinal, complete, medical records that are stored in fragmented systems in a secure and pseudo anonymous fashion (Dagher, Mohler, Milojkovic, & Marella, 2018).

NEED FOR BLOCK CHAIN TECHNOLOGY IN HEALTHCARE INDUSTRIES

Recently, Block chain technologies set it trails in the healthcare domain too. A blockchain is well-known distributed structurewhichstores healthcare transaction records securely. It is capable of sharingthese immutable recordsof peer-to-peer transactions. Blockchain is built from linked transaction blocks and stored in a digital ledger (Burniske, Vaughn, Shelton, & Cahana, 2016). Blockchain is also apublic catalog of health records that references databases, fitness and medical devices, mobile phones, and laptops. It could be used to connect every patient, healthcare provider, and payer to a secure, yet public network.

Blockchain technology has proven its worth in adecentralized digital cash system such as bit coin which was introduced as a peer-to-peer crypto currency a decade before (Calzadilla & Villa, 2017). Disruptive and innovative nature of blockchain technology, strong underpinning theoretical cryptography foundations, distributed consensus algorithms, and decentralized databases make it suitable for healthcare applications.Blockchain resembles a database which not only stores information but the data is located in a network of personal computers called nodes without any central entity to control the data. Data is shared publicly although the contents of each data are only accessible to the authenticated users. Block chain can augment intelligent miner which provides the solution to effective data management and secured access. It offers interoperable mechanism with highly immutable property and connects seamlessly all the required information on disparate networks to a common infrastructure.

Block chain is a distributed digital ledger, capable of executing smart contracts (Wang & Song, 2018). This component is responsible to record references to health transactions, such as healthappointments, clinical tests and their results, prescribed medication and treatment for cure. In a privacy layer for EHRs,