Blockchain Technology

We heard a lot on blockchain recent years, usually in the context of cryptocurrencies such as Bitcoin. But this technology has applications outside cryptocurrencies.

Blockchain is a way of storing and sharing data in a way that can be distributed, transparent, and temper resistant.

Blockchain is a chain of blocks that has a start and free end to which new data is added. This gives blockchain a direction. Each block consists of data and easy to manage size that links together by crypto-graphical pointer. This pointer ensures the integrity and tamper resistance of blockchain. So if you modify one of the blocks in your chain, this will break the cryptographic links disrupting your blockchain. You can copy the blockchain to multiple other locations. This could be within the same facility or healthcare delivery network or could be part of national or international data sharing program, to make your healthcare data available to researchers, rather facilities, and service providers in multiple locations. These blockchains are linked with a network which shares data and ensures that the data within the network is accurate, reliable, and consistent. So when you add data to the blockchain at one location, it is then distributed to one or more locations within the network. Those new locations also share the data with other locations in the network, eventually distributing the new data to the entire network. This gives every location access to that data and provides redundancy to the new data.

# How can this technology be used for healthcare?

Healthcare generates enormous amount of data: laboratory tests, images studies (X-rays for example), other measurements that as virus signs, reports, financial documents, and the list seems to be endless. The volume of data being generated in healthcare is expanding in very rapid rate. However, healthcare data suffers from challenges of access to that data, how can that data be accessed outside the healthcare delivery facility in which its stored. Blockchain has the potential to improve that. How can you verify the integrity of this data? Has been altered or tampered with, has been damaged due to database error. Blockchain has the potential to ensure the integrity and redundancy of this data. And the blockchain helps the distribution of this data within a network of facilities that use the data. These features have the potential to impact the cost, quality, and value of healthcare delivered within a system using blockchain.

# Blockchain Components

* Cryptographic hash function: data can be any size, text, image and file, most common hash function secure hash algorithm (SHA256), the output of SHA256 is 32 bytes (256bits).
* Transactions: it represents interaction between parties that is transfer of assets between two users. Each block in blockchain can contain zero or more transactions; it consists of inputs and outputs, the inputs – assets that are to be transferred, and outputs – where the assets go.
* Asymmetric-key cryptography: asymmetric key consists of public key and private key of two pairs of key systems. The encryption key is public and decryption key is private key (anyone can encrypt the data, but decryption only done for intended receiver).
* Addresses: In blockchain network, the addresses are used only once, using cryptographic hash function.
* Ledgers: it’s a collection of transactions; every user maintains their own copy of the ledger.
* Blocks: A block contains block header (metadata) and block data (list of validated and authentic transactions)
* Consensus models: Determining the next block in the systems, verify and construct a valid block and add to chain, by computing a cryptographic block hash then generating new asset.
* Forks: software changes periodically.
* Smart contracts: code and data deployed in the blockchain network.