The Future of Blockchain in Quality Measurement

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September 7, 2017

Topics for Today

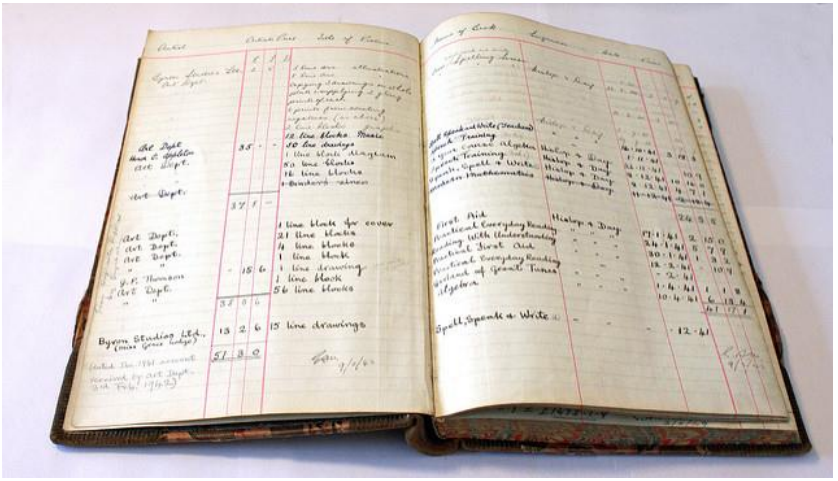
- What is Blockchain, exactly?
- How Did This Become Important in Health IT?
- The Intersection of Blockchain and Quality
- Blockchain's Future

What is Blockchain?

- To understand blockchain, you must understand the concept of a ***distributed ledger***
  - Type of database that is shared, replicated, and synchronized among the members of a network.
  - It records the transactions, such as the exchange of assets or data, among the participants in the network.
  - Participants in the network govern and agree by consensus on the updates to the records in the ledger
  - Every record in the distributed ledger has a timestamp and unique cryptographic signature, thus leaving an auditable history

Blockchain Is a Digital, Distributed Ledger

- A tamper-evident, shared digital ledger
- Records transactions in a public or private peer-to-peer network
- The ledger permanently records, in a sequential chain of cryptographic hash-linked blocks the history of asset exchange between peers in the network
- All the confirmed and validated transaction blocks are linked and chained from the beginning of the chain to the most current block, hence the name ***Blockchain***



HOW BLOCKCHAIN WORKS

"A Blockchain is a cloud based database shared by every participant in a given system, in the case of this exemplar, its a currency trade. The Blockchain contains the complete transaction of the cryptocurrency or other record keeping in other applications. Think of it as a cloud based peer to peer ledger."

1. **Alice** wants to **send** money to **Ben**
2. The first **Block** is created online and represents **the transaction**
3. This Block is **broadcast** to every party in the network
4. Those in the network approve the **transaction** and validate it
5. The Block is then added to the Chain which provides a permanent, nonrepudiable and **transparent record of the transaction**
6. **Ben receives** the money from **Alice**

Notes: Transactions are not valid until added to the Chain. Tampering is immediately evident.

The Blockchain is regarded as safe as everyone in the network has a copy. The Source of any discrepancies are usually evident immediately.

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How Did This Become Important in Health IT?

Evolution of Information Transfer

Where would you go to learn about cardiovascular disease?

1994

Encyclopedia

You would look for an Encyclopedia, either at home if you are lucky to have one, or take a trip to the library and search for the page that would enlighten you.

This would have cost you some considerable amount of time, transportation money, fee to access the library or money you pay for the Book.

2004

The Internet, Wikipedia

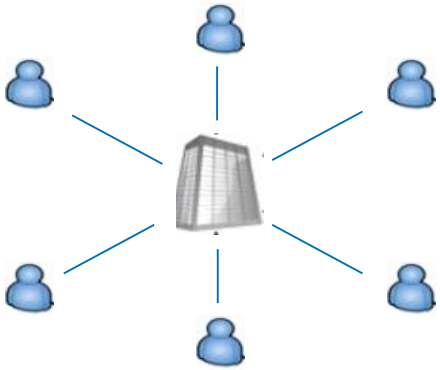
He would pull out his phone or any other web-enabled device and search for this piece of information. One of the easiest places he would find his answer is on a website called Wikipedia.

This probably took him 5 minutes and didn't cost much money if any.

What has changed in relation to information flow over these 10 years?

Trend behind Transformational Improvements in Transfer

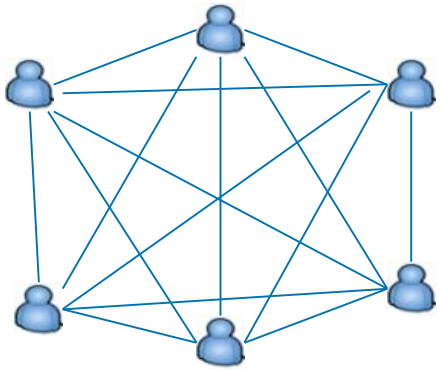
Encyclopedia



Centralized Content

- Thousands of exclusive content generators who were expensive to pay
- Books either available for purchase, or in Libraries
- Access limited to a handful of people

Wikipedia



Decentralized Content

- Millions of content generators
- **Much lower Cost** of generating content
- Internet available to a hundred times **more people** than the Books
- **Much faster** generation of content

Move towards Decentralized Information Creation & Distribution

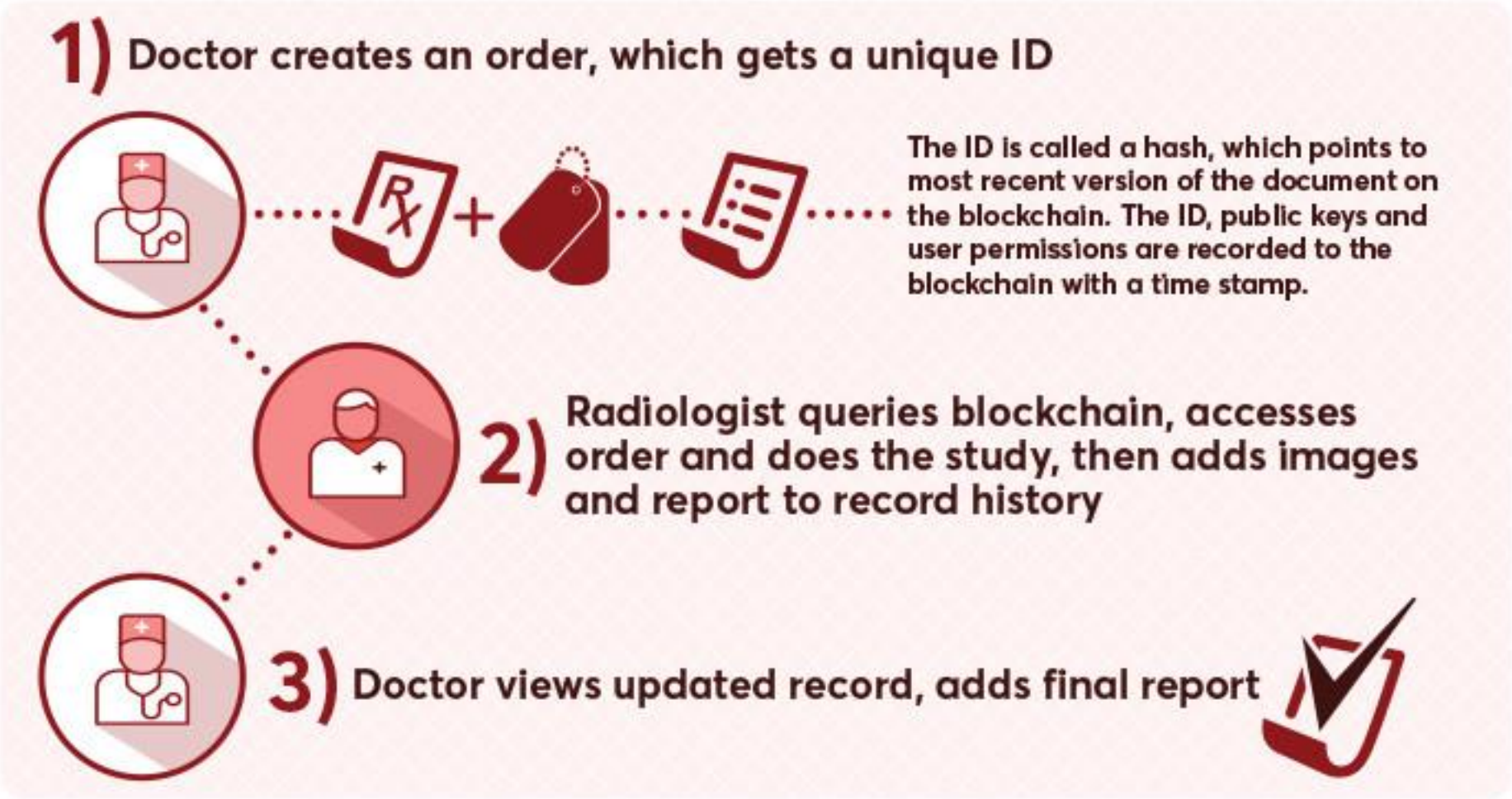
Why Blockchain: 7 Driving Key Principles

- **Transparency & Visibility** - No one should be able to cover their tracks.
- **Accountability** - Every action should be attributable to it's owner.
- **Privacy** - Security should be afforded without giving up confidential information.
- **Scalability** - Must be able to scale to trillions of digital assets.
- **Portability** - Security must move with the data, wherever the data goes.
- **Permanence** - Security must not be ephemeral – it must exist as long as the data exists, and ideally longer.
- **Open** - It must not rely on traditional closed trust anchors.

Status of Blockchain in Healthcare

- **There is a growing trend towards personalized medicine**, with people tracking and gaining more information about their health than ever before. Federal legislation (*Medicare Access and CHIP Reauthorization Act*) has also dramatically sped up digitization of medical records. However issues arise when all this data need to be stored securely and transferred across healthcare practitioners to foster collaboration.
- **Blockchain in healthcare is still very early stage requiring education around use-cases that can benefit from it**, unlike in finance where it is a worldwide phenomenon. However it has moved past the theoretical stages and has spurred activity from major companies and venture capitalists.
- An initial adoption barrier was that Healthcare providers – historically locked in competition and often resistant to sharing health data within their systems – would need to agree to use Blockchain. With recent developments in the United States, **Federal Legislation is incentivizing data sharing with new pay-for-value payment models**.

Managing a medical record on the BLOCKCHAIN



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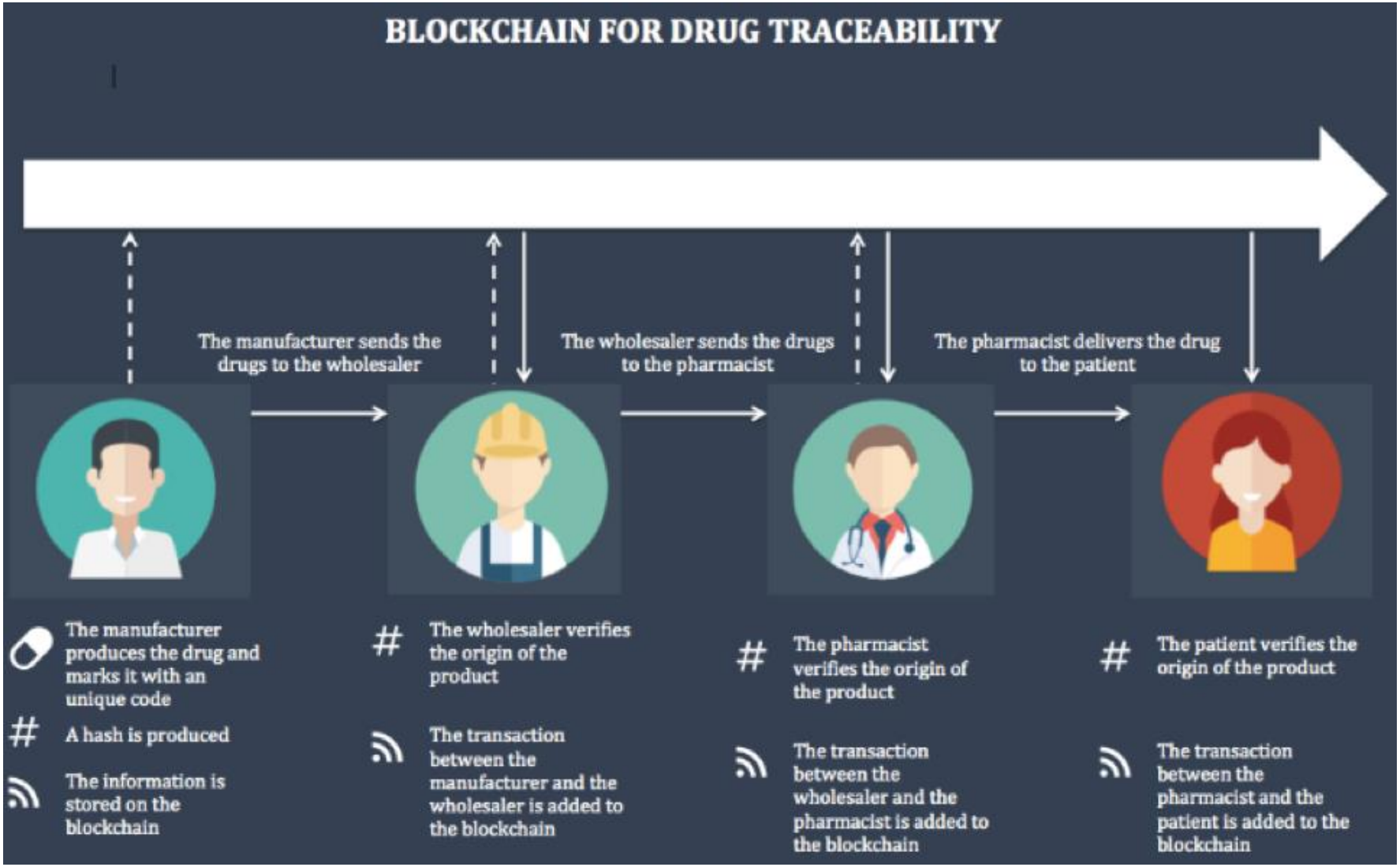

BLOCKCHAIN FOR DRUG TRACEABILITY
The manufacturer sends the drugs to the wholesaler
The wholesaler sends the drugs to the pharmacist
The pharmacist delivers the drug to the patient
The manufacturer produces the drug and marks it with an unique code
A hash is produced
The information is stored on the blockchain
The wholesaler verifies the origin of the product
The transaction between the manufacturer and the wholesaler is added to the blockchain
The pharmacist verifies the origin of the product
The transaction between the wholesaler and the pharmacist is added to the blockchain
The patient verifies the origin of the product
The transaction between the pharmacist and the patient is added to the blockchain

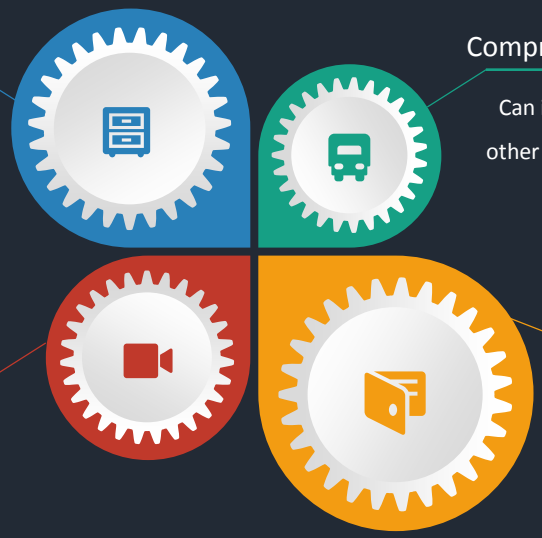
Blockchain Value Propositions for Healthcare

	Health Information Exchange (HIE) Pain Points	Blockchain Opportunities
	Establishing a Trust Network depends on the HIE as an intermediary to establish point-to-point sharing and "book-keeping" of what data was exchanged.	**Disintermediation of Trust** likely would not require an HIE operator because all participants would have access to the distributed ledger to maintain a secure exchange without complex brokered trust.
	Cost Per Transaction, given low transaction volumes, reduces the business case for central systems or new edge networks for participating groups.	**Reduced Transaction Costs** due to disintermediation, as well as near-real time processing, would make the system more efficient.
	Master Patient Index (MPI) challenges arise from the need to synchronize multiple patient identifiers between systems while securing patient privacy.	**Distributed framework for patient digital identities,** which uses private and public identifiers secured through cryptography, creates a singular, more secure method of protecting patient identity.
	Varying Data Standards reduce interoperability because records are not compatible between systems.	**Shared data** enables near real-time updates across the network to all parties.
	Limited Access to Population Health Data, as HIE is one of the few sources of integrated records.	**Distributed, secure access** to patient longitudinal health data across the distributed ledger.
	Inconsistent Rules and Permissions inhibit the right health organization from accessing the right patient data at the right time.	**Smart Contracts** create a consistent, rule-based method for accessing patient data that can be permissioned to selected health organizations.

The Intersection of Blockchain and Quality

Patient-Reported Outcome Measures (PROMs)

Their Importance and Significance



Significance

Increased focus on the patient experience of care

Comprehensive

Can include symptoms and other aspects of health such as social function or treatment adherence

Assessment

Includes patient perspective on the burden and impact of disease

Communication

Fosters better patient-provider communications by delivering detailed and complete evaluations of treatments for specific conditions

Development and Implementation

The Challenges in Effectively Developing and Using PROMs

Criteria for Success

Depends on a psychometrically tested and validate tool to capture the patients' experience.

Grounded in Evidence

Tool must show that that it can reliably measures its intended target.

Measure Objective

PROM must always measure its intended objective and not demonstrate significant variation

Cost and Time

Testing of a PROM before use can be time-consuming, burdensome and costly

Availability of Data

Expansion of Data Streams

Personal History
Mobile apps , such as MyMedical App collect a wide array of data

Family History
Apps such as My Medical History, or those designed by Mayo or AMA

Self-Expression
Social media platforms such as Tumblr, Twitter, Yelp, etc.

Baseline and Variability
Sensor and wearable technology

Improvement
Applications such as MyFitnessPal, CodeBlue, Talk2Relax

Prevention
Applications such a s iTriage, GoodRx, Wellframe and interactive components of web portals

Where Does the Data Go?

Data storage spans multiple servers and is accessible through a web-based API**, a cloud storage gateway or content management systems**.

In 2013, the Office of Civil Rights redefined a “Business Associate” and increased protections for the privacy and security of personal health information under its “Omnibus Rules”

Cloud storage providers are included as covered entities as they act on behalf of a Business Associate

How Does it Work?

Transactions

A community health center may receive up to 10 transactions per second from its network of known patients

Signature

Each of these transactions receive a digital “signature” that is associated with a specific patient

Provenance

Signatures are combined together an given a “fingerprint” to uniquely identify them with the patient.


Access
Data moves up the chain to the provider, who is the only one who has access
Updates
Fingerprints are continuously updated and verified to maintain access and integrity

Future of Blockchain in Healthcare IT

- Support interoperability and patient data management
- Can be used for a number of transactions across the healthcare enterprise
- Can leverage data streams from internet-based devices for quality reporting
- Cannot be used for high-volume processing
- Implementation and sustainability of blockchain is resource- and cost-intensive
- Unlimited potential, but will be done incrementally to determine its utility and success.

Thank you!

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