Health Data & Blockchain: The New Sharing Frontier

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Overview

• Who?
  • Background
• Why?
  • Enterprise & Consumer Benefit
• What? (Blockchain of course)
  • Value Prop
  • Lingo
  • Pros & Cons
• FAQs
Who?

Tech entrepreneur, health data exchange pioneer, globalist

✓ Sensors
✓ Engagement
✓ Analysis
Why?

User Generated Health Data: 300% Growth

80 billion connected devices by 2020...zero universal sharing mechanism!

Providers can do better care delivery with more data to target prevention.

An independent data marketplace helps payer have access to important care delivery and efficacy data.

Providers can do better care delivery with more data to target prevention.

Numerous care continuum partners can do better population management with good data.

Customization: better care at lower cost can be achieved only with individual at the center of information flow.

Payers

Providers

Pharma

Drug companies need access to patient data to improve business at each point of value chain.

Aggregators
Blockchain’s Value Prop: *Moving from Stores to Access*

The blockchain is a **distributed system** where every node has a ledger of everything that happens. A new level of transparency/privacy where organizations can verify what happened at every level.
Blockchain Replaces the “3rd Party"

• Block chain technology was designed to replace the trusted third party with a protocol.
• This “trust-less” protocol runs on a peer-to-peer network which allows rapid, low-cost local clearing of global transactions.
• A mechanism to tie data and code to transactions, aka “smart contracts”.
Blockchain Lingo

- Chains
- Signatures
- Ledgers
- Hashing
- Proof of Work
- Wallets
- Nodes
- Smart Contracts
Roadmap to Blockchain: *Institution* to *Individual*

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Past</th>
<th>Present</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution-centric</td>
<td>Institutional-centric</td>
<td>Cloud</td>
<td>Individual-centric data layer</td>
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<table>
<thead>
<tr>
<th>Identity</th>
<th>Identity and Data Combined</th>
<th>Deidentified</th>
<th>Data and identity separate</th>
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<thead>
<tr>
<th>Access</th>
<th>All or none access</th>
<th>Role-based</th>
<th>Granular access and control, provenance</th>
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Open source platforms that provide a thin data layer able to work with applications and data stores with or without blockchain

Platforms
Open source platforms that provide a thin data layer able to work with applications and data stores with or without blockchain

User Wallet
Owned by consumer with consistent blockchain addressing

Health Applications
Accesses YouBase on behalf of user for data

Data Stores (EMR, et al)
SmartKey Enabled Data Store

BlockChain
Permanent transaction record without size limit on data

Blockchain platforms & apps will use DLT technologies for an immutable data transaction record not for data storage.
Blockchain + Healthcare: Well Suited

In healthcare, something like the blockchain could be used in setting up vaccine registries or transactional histories for patients. During clinical trials, the blockchain could be used to share blood test information; for, say, five different trials, only one blood test would then be needed.

The blockchain could also be paired with a patient’s current electronic medical record to provide a new level of data integrity and interoperability, meaning patient data could be shared across organizations and people without compromising the security of the information that’s stored.
Pros & Cons

• **Audit.** Digital signatures and “Proof of Work” enable a universal, unalterable record.

• **Integrity.** Cryptographic hashing functions provide security.

• **Patient ID.** Inherent separation of PHI and PII from ID.

• **Messaging.** Smart contracts provide a mechanism for incentivizing patients.

• **Scalability.** Large data sets are expensive to transact on the blockchain.

• **Enterprise asset protection.**

• **Interoperability.**
Scaling: large-scale implementation, large data sets

• Content-addressable data store de-duplicates data for efficiency.
• Federated data store designed to run across many inexpensive nodes (RAID for cloud).
• P2P technology scales system resources automatically as result of new entrants.
• Bulk of processing client-side.
Custodian Benefits

• Runs on existing infrastructure
• Custodian has population data
• Individuals have their own data
• Global IDs, so data can live and move across multiple silos.
## Private vs Public Chains

<table>
<thead>
<tr>
<th>On chain data</th>
<th>Off chain data</th>
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</thead>
<tbody>
<tr>
<td><strong>Data types</strong></td>
<td><strong>On chain data</strong></td>
</tr>
<tr>
<td>- Standardized data fields containing summary information in text form (e.g., age, gender)</td>
<td>- Expansive medical details (e.g., notes) and abstract data types (e.g., MRI images, human genome)</td>
</tr>
<tr>
<td><strong>Pros</strong></td>
<td><strong>Pros</strong></td>
</tr>
<tr>
<td>- Data is immediately visible and ingestible to all connected organizations, making blockchain the single source of truth</td>
<td>- Storage of any format and size of data</td>
</tr>
<tr>
<td><strong>Cons</strong></td>
<td><strong>Cons</strong></td>
</tr>
<tr>
<td>- Constrained in the type and size of data that can be stored</td>
<td>- Data is not immediately visible or ingestible, requiring access to each health care organization's source system for each record</td>
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<td>- Requires Off-Chain micro-services and additional integration layers</td>
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<td>- Potential for information decay on the blockchain</td>
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Healthcare Enterprise Blockchain Value

Risk and Cost Control

Data Management
Eliminate health data silo proliferation and ensure data privacy

Identity Matching
Solve identity matching

Data Analysis
Obtain data insights without compliance nightmare

Cross-Org Workflow
Enable cross organisation workflow

Messaging
Enable secure anonymized messaging
Blockchain Benefits for Health Data Sharing

• Combine general population data with the individual’s data.
• Validated data, yet private: a private patient ID.
• Any kind of data profile for an individual, IoT, etc.
• Individuals choose desired level of privacy to a public (or other) store for research.
• See how one’s DNA profile is related to personal information.
• Potential for complete, longitudinal data of individual and population, with trust.
• Sharing can be compensated.
• Distributed data model improves security, lowers costs.
Blockchain FAQs

• What is the risk of patient privacy breaches if blockchain nodes are hacked?
• Though we understand blockchain apps will primarily contain pointers to patient data, will these firms also be storing patient data for smaller customers?
• Are there HIPAA compliance issues limiting implementation?
• Where will users/patients store private keys? What if they are lost?
• How is a single user’s data residing across multiple databases being linked initially? (assuming data was not associated with a user’s public token)
• Ideas on getting other nodes to contribute data?
• Will patients see all data that’s added to their wallet? Will they verify the data’s accuracy or be able to change it?