The Use of Blockchain to Improve Quality Outcomes

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Conflict of Interest

Jason C. Goldwater, MA, MPA

Has no real or apparent conflicts of interest to report.
Agenda

• An Overview of Blockchain
• The Evolving Field of Quality Measurement
• The Potential Intersection Between Blockchain and Measurement
• What the Future Holds
Learning Objectives

• Describe the use and functionality of blockchain in quality reporting
• Apply the blockchain ledger to collect digital health assets for quality outcome reporting
• Formulate dynamic quality measures using blockchain and digital health assets
• Integrate blockchain into the quality measurement enterprise for dynamic reporting
• Explain how to use the information available on the blockchain as a basis for quality reporting
An Overview of Blockchain

A Not-So-New Way of Capturing, Structuring and Exchanging Data
The Basics of Blockchain

**Block Definition**
Sequence of blocks which hold a complete list of transaction records like a conventional public ledger

**Immutable**
Data transactions cannot be tampered with once they are placed on the blockchain

**Decentralized**
In contrast to centralized data validation, no third party is needed in blockchain, as consensus algorithms are used to maintain data consistency

**Digital Signature**
Each blockchain user owns a pair of private and public keys to sign and verify transactions
# Different Types of Blockchains

<table>
<thead>
<tr>
<th>Property</th>
<th>Public</th>
<th>Consensus</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consensus Determination</td>
<td>All</td>
<td>Selected Set</td>
<td>One Organization</td>
</tr>
<tr>
<td>Read Permission</td>
<td>Public</td>
<td>Public or Restricted</td>
<td>Public or Restricted</td>
</tr>
<tr>
<td>Immutability</td>
<td>Nearly Impossible to Tamper</td>
<td>Could be tampered</td>
<td>Could be tampered</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Centralized</td>
<td>No</td>
<td>Partial</td>
<td>Yes</td>
</tr>
<tr>
<td>Consensus Process</td>
<td>Permissionless</td>
<td>Permissioned</td>
<td>Permissioned</td>
</tr>
</tbody>
</table>
Public Blockchain

Consensus
Each node can take part in the consensus process

Read Permission
Transactions in the public blockchain are visible to the public

Immutability
Record are stored on a large number of participants, making it nearly impossible to tamper transactions

Efficiency
Time-intensive to propagate transaction and blocks because of the large amount of nodes.

Decentralized
Public blockchain is completely decentralized

Consensus Process
Everyone can join the consensus process
Scalability
Is blockchain scalable to capture, store and exchange health data?

Data Latency
Large number of transactions may lead to slower processing time.

Privacy
No guarantee of transactional privacy.

Hacking
Ways of revealing identity.
The Evolving Field of Quality Measurement

Quality Medicine in a Value-Based World
Transition to Value-Based Care

<table>
<thead>
<tr>
<th>Market Pressure</th>
<th>Market Innovating</th>
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</thead>
<tbody>
<tr>
<td>Dominant Provider</td>
<td>Market-balking</td>
</tr>
<tr>
<td>06</td>
<td>02</td>
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<tr>
<td>03</td>
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<tr>
<td>04</td>
<td>05</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

- **Global ACO (1)**: Highest amount of care coordination and physician alignment.
- **P4P (2)**: Method to optimize outcome and value.
- **Focused ACO (3)**: Alignment for conditions or populations.
- **P4Q (4)**: Method to optimize rate and volume.
- **FFS (5)**: Lowest amount of care coordination and physician alignment.
- **GAIN SHARING (6)**: Focus is on improving efficiency of services.
- **MEDICAL HOME (7)**: Innovating ways to coordinate care.
Needed Characteristics of Value-Based Care

Integration
- Integrated practice units provide a full team of clinicians and staff

Outcomes
- Measure outcomes and costs for every patient

Technology
- A robust infrastructure that supports interoperability

Geography
- Expanding the reach beyond typical boundaries
Quality Measurement
Drives the Process for Value Based Care

Alignment
Aligns priorities across both public and private sectors.

Regulations
Also aligns priorities across the federal government through MACRA initiatives.

Consensus
Provides an impetus for consensus building among states.

Foundation
Identification of core measure sets.
Why Clinical Outcomes are Important

- Patient Experience
- Population Health
- Reduce Cost
- Identify Variation
- Interventions
- Effectiveness
Process improvement, when linked to processes proven by randomized clinical trials to improve outcomes, is an important part of quality improvement. Implementation of quality programs based on process improvement can reduce variation and enhance patient care.
The Potential Intersection Between Blockchain and Measurement

Where Blockchain Can Be Unleashed for Quality
Grounded in Evidence

Measures are based on best-available evidence.

Diversity of Measurement

Structural, Process or Outcome

Action

Measurement recorded during the encounter

Not All Electronic

Electronic measures are still evolving

Snapshot

Take a measure from a point in time

Limited Patient-Focus

Although is evolving and taking on importance
Patient-Reported Outcome Measures (PROMs)

**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
The Challenges in Effectively Developing and Using PROMs

Criteria for Success
- Depends on a psychometrically tested and validated tool

Grounded in Evidence
- Tool must show that it can reliably measures its intended target

Measure Objective
- PROM must always measure its intended objective

Cost and Time
- Testing of a PROM before use can be time-consuming, and costly
Expansion of Data Streams

**Personal History**
Mobile apps collect a wide array of data

**Family History**
Apps such as My Medical History

**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**
iTriage, GoodRx
The Development of Personal Data Streams

- **Endpoints**
  
  Establish baseline and variability endpoints

- **Normalization**
  
  Proactively target longevity, enhancement and health.

- **Ecosystem**
  
  Intermingling of data streams with crowdsourced studies.

- **Larger Data Set**
  
  Integrated data streams from these tightly coupled solutions provide a larger array for PROMs.
What the Future Holds

How Blockchain Can Change Quality
Transactions
Facility could receive numerous transactions per minute

Signature
Each receives a digital signature

Provenance
Signatures are combined

Streams
Data collected and submitted from multiple sources

Clinical Areas
Expanding with data and digital devices

Area
Data moves up the chain to the provider

Updates
Data integrity is continuously maintained
Blockchain decentralizes data

Patient uses their own digital signatures

Patient has complete control

Can integrate data through RESTful APIs

Increases patient participation

Technologies from the IoT are "always-on"
Questions

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Please remember to fill out your evaluations!