

A world map is centered in the background, rendered in a dark blue color. Overlaid on the map is a network of glowing blue lines and nodes, representing global connectivity or data flow. The nodes are bright blue circles of varying sizes, and the lines are thin, curved paths connecting them across the globe. The overall aesthetic is futuristic and technological.

Role of Blockchain in Precision Medicine: Challenges, Opportunities, and Solutions

Focus Points–Agenda



Global Healthcare Crisis



Precision Medicine–Inherent Challenges



Role of Blockchain



Conclusion–Q&A

Global Healthcare Crisis

Chronic Diseases

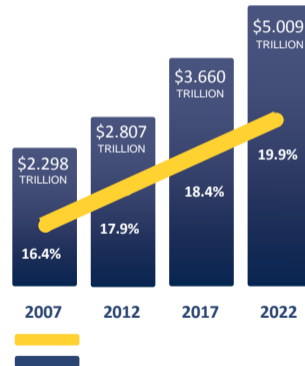


Aging Population



- **40 of the 56 million annual deaths** globally occur from preventable chronic conditions such as cardiovascular disease, cancer, and chronic respiratory conditions
- 80% of all **heart disease, diabetes, and stroke** and 40% of **cancers** can be prevented by optimizing risk factors including **obesity, hypertension, sedentary activities, poor nutrition, tobacco, and alcohol use**
- Global **aging** and an **expanding middle class** are a major contributor to the chronic disease epidemic
- **10,000** Americans turning **65 everyday**
- **80%** of Medicare costs are accounted for **20% of the patients**, who are **elderly**, with **multiple comorbidities** such as diabetes, COPD, or congestive heart failure

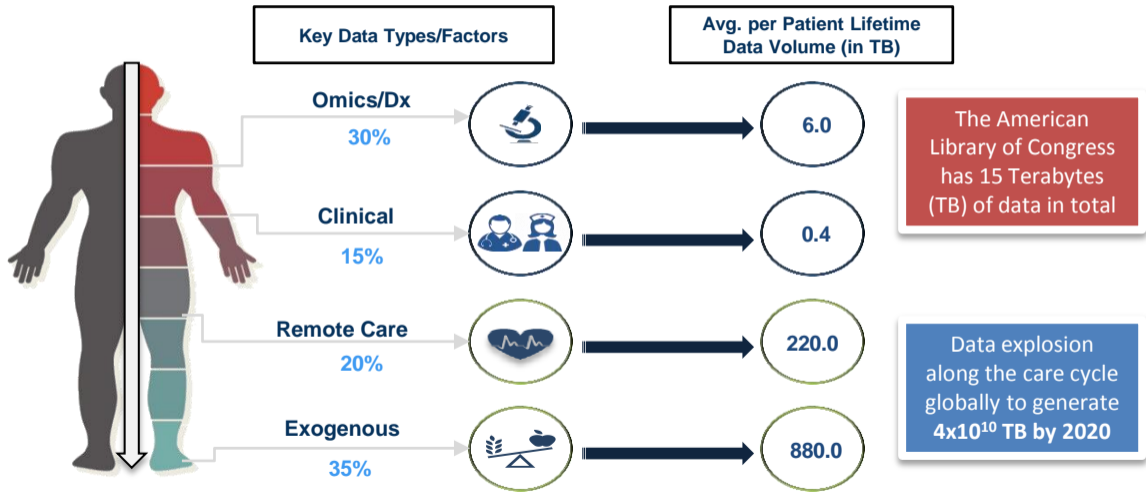
US Healthcare Costs*



*CMS--National Health Expenditure Projections 2012-2022 / Lancet Global Burden of Disease 2015 / World Health Organization / CDC

Precision Medicine—A Major Big Data Challenge

Precision Health will see a \$140+ billion market opportunity by 2025



Source: IBM Watson Health; Frost & Sullivan Analysis

Precision Medicine—Inherent Challenges

- Healthcare data is worth **10x the price** of credit card data in the black market
- US Hospital Cybersecurity market alone is expected to cross the **\$5 billion** mark by **2021**

- About **53%** of **patients** in the US believe that they own their healthcare data; **20%** simply do not know
- The global Healthcare Big Data and Analytics market will amount to **\$7.50 billion** by **2020**



- Cost **150,000** lives and **\$18.6 billion** per year
- **About 46%** of US clinicians do not have a complete view of their patients' health history/records

- **About 90%** top-selling blockbuster medicines only work for **30–50%** of the patients
- **5–10%** of **healthcare costs** are fraudulent (e.g. excessive billing and/or billing for non-performed services)

- **About 70%** of consumers in the US track their health symptoms. **74%** appreciate receiving customized alerts/news feeds post care
- **41% of patient** will change their physicians if they are not allowed to access their health records



Role of Blockchain in Precision Medicine Practice

What is Blockchain?

There are many definitions, with the evolving application potential of blockchain technologies



Despite all the hype, for many people (across different industries), the blockchain concept still seems difficult to grasp, which makes it one of the most misunderstood technologies of 2017.

Frost & Sullivan's Definition:

A blockchain is a new data structure that creates trusted, **distributed digital ledgers** for assets and other data. It is an **immutable** and **time stamped** record of digital events shared **peer to peer** between different parties. It can only be updated by **consensus of a majority** of the participants in the system and, once entered, information is very **hard to erase**.



BLOCKCHAIN



bitcoin

Blockchain—Foundational Properties and Differential Value Propositions

Blockchain is a type of distributed/decentralized ledger/database used to record digital transactions.

Cryptographically Secured

Transactions added to the blockchain are irrevocable or immutable

Decentralized

Network of replicated databases, synchronized through the Internet and visible to users/miners within the network

Trusted

Network requires consensus, which allows for transactions to occur between unknown parties

Peer-to-Peer Network

Transactions that satisfy certain conditions are recorded, eliminating a central administrator or third-party intermediaries

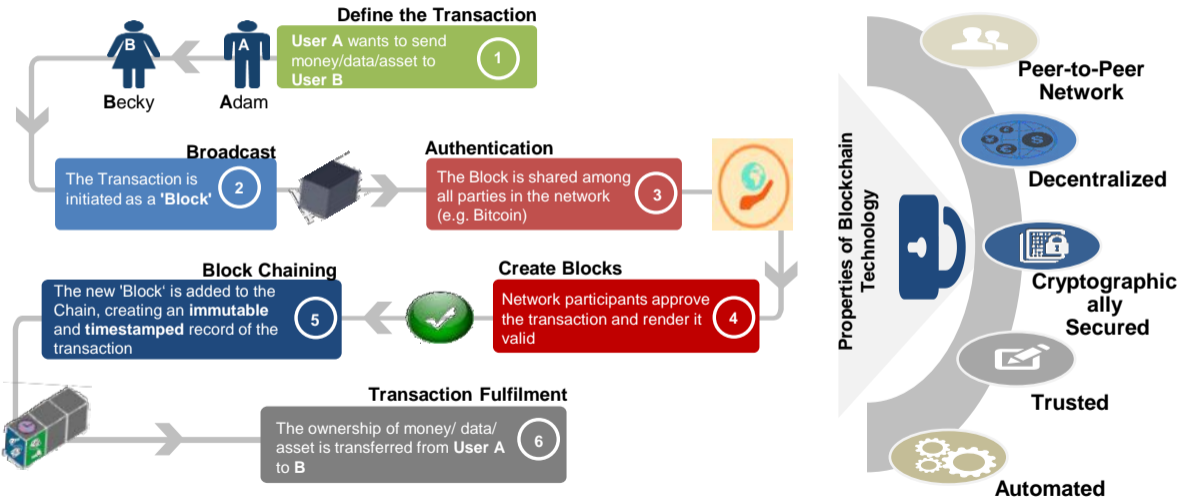
Automated

Avoids double counting and allows transactions to occur automatically

Properties of Blockchain Technology

How Blockchain Works

Understanding its core properties and differential value propositions



6 Big Themes in Healthcare Industry and Role of Blockchain Technology

Is Blockchain the Missing Puzzle in the Healthcare Industry's Digital Transformation Journey?

Health Data
Interoperability



Incentivizing/Monetizing
Digital Health
Business Models

Cybersecurity



Value-based
Care/Reimbursement

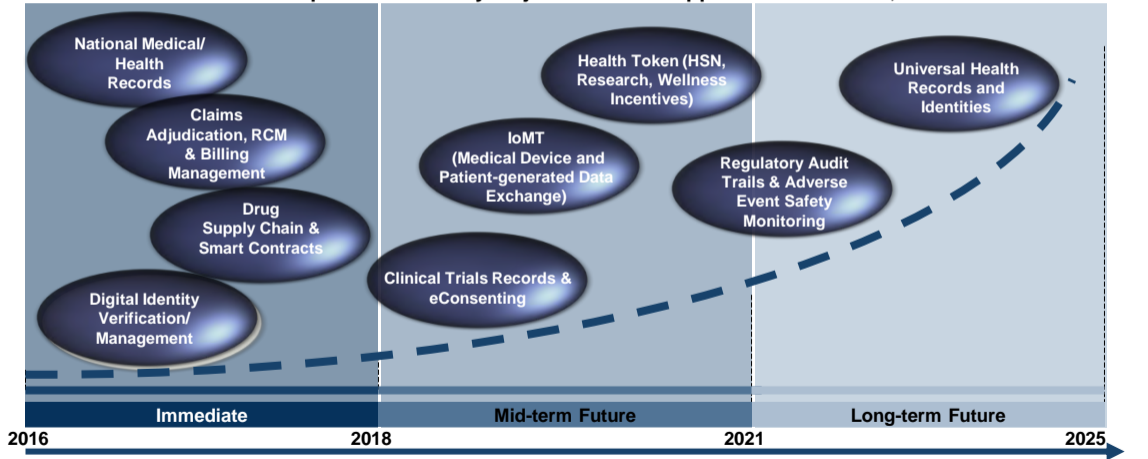
Healthcare Consumerism



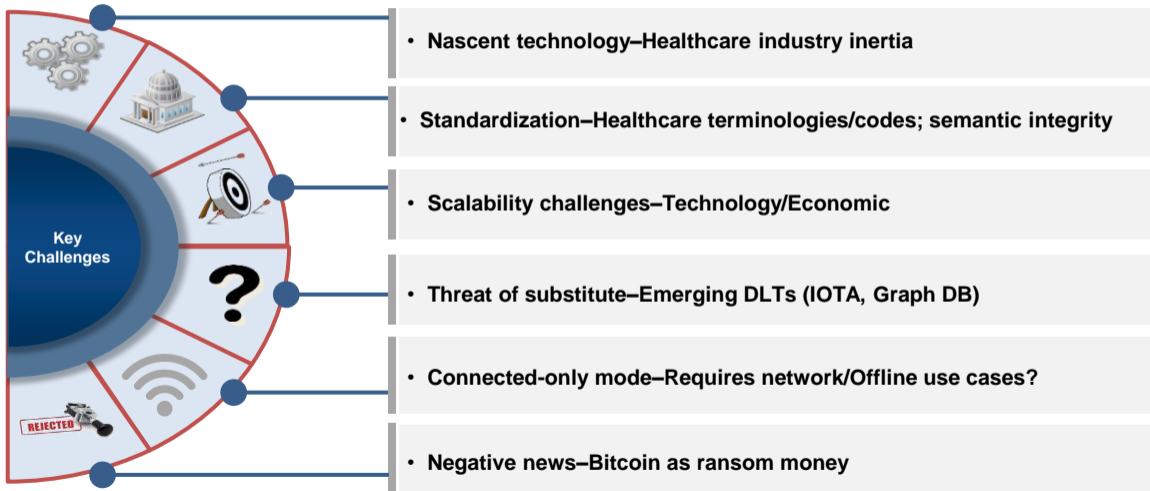
Personalized Health
and
Precision Medicine Practice

Blockchain Timeline for Healthcare Use Cases— Differentiating Hype from Reality

Blockchain Adoption Timeline by Major Healthcare Application/Use Case, Global



Blockchain Implementation Challenges in Healthcare

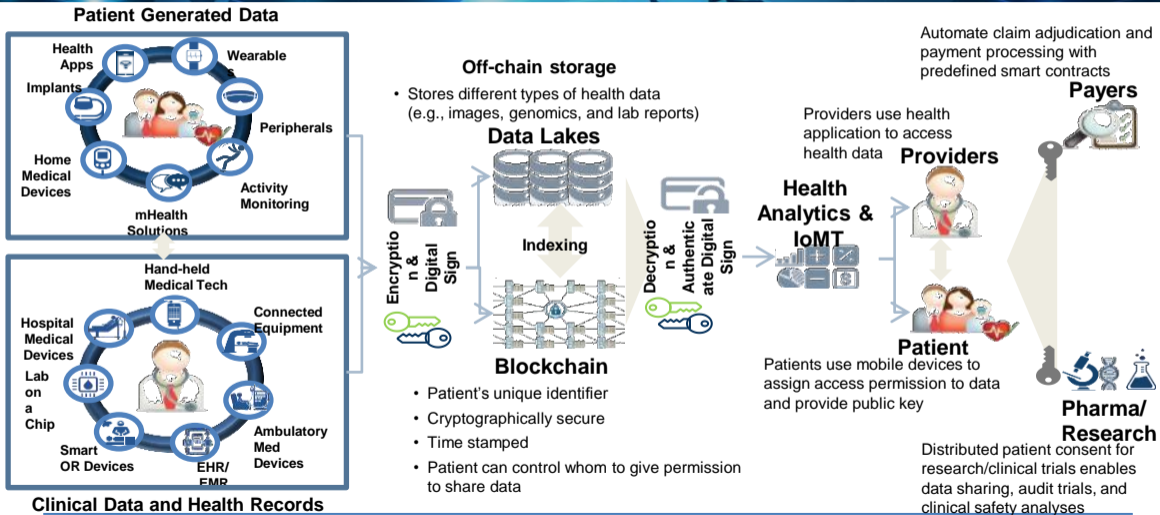


Blockchain-based Solutions for Major Precision Medicine Stakeholders


Who are the users?	What use cases they can leverage now vs. next 5 yrs?	What are the key deployment/ implementation challenges to consider?	What they would gain post implementation (ROI)?
Healthcare Systems			
Payers/Insurance			
Pharma & Academic Research			
MedTech			
HIT/Vendor Partner			

Note: The above framework is a strategic model developed by Frost & Sullivan to help healthcare industry stakeholders identify the most relevant blockchain use cases and the strategic imperatives for successful implementation.


Future Prospective—Role of Blockchain in a Connected Health Ecosystem



Interested in Actionable Insight? Connect With Us

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