

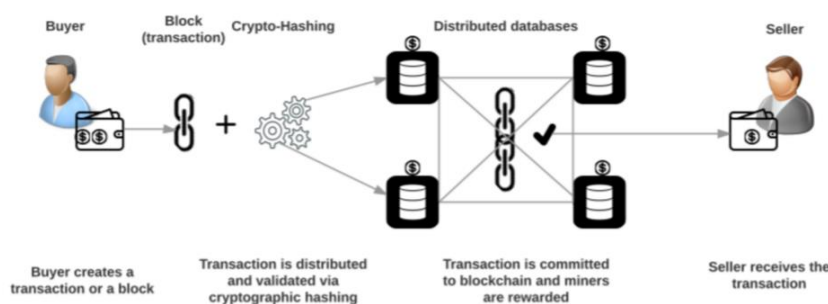
# BLOCKCHAIN & HEALTH SCIENCE PRIMER



## WHAT IS A BLOCKCHAIN?

1. A blockchain or blockchain technology is a distributed ledger of data transactions, exchanges, or events.
2. Blockchain/distributed ledger technology (DLT) allows a distributed network to automatically maintain a single, virtually immutable record based on an agreed upon governance protocol for consensus.
3. Blockchain/DLT can be public, permissioned, or private. Incentives and consensus proofs will vary. There are different types of distributed ledgers; blockchain is most common and gets used as a general term
4. Benefits: secure, encrypted, inexpensive, interoperable with legacy systems, redundant/resilient  
Challenges: novel, requires standardized data, complex with complex data, scalability/resources
5. Blockchain is not Bitcoin. Bitcoin is the most popular cryptocurrency, which is one type of application.

## Blockchain - Process



**Example of a financial application of blockchain** (By B140970324 - Wikimedia Commons)

## WHEN IS A BLOCKCHAIN USEFUL?

1. Blockchain is useful when there is a need for trust between distributed parties without an intermediary.
2. Finance – Payments, digital identity, clearing and settlement, smart assets
3. Supply Chain – Tracking, quality, life-cycle, provenance, authenticity

4. *Healthcare – Provider identity, payments, supply chain (i.e. pharma, devices) clinical trials, EHR*
5. *Science – Data access and audit, supply chain (i.e. reagents), publishing, regulatory audit, proposal review*

## **WHO IS USING BLOCKCHAIN?**

1. *Technology Companies – IBM, Oracle, AWS, Facebook, Google and more. Tons of startups.*
2. *Financial Companies – BNY Mellon, Deutsche Bank, Barclay's, Credit Suisse and more. Lots of startups.*
3. *Retail and Manufacturing Companies – Alibaba, Walmart, Amazon, Boeing and more. Many startups.*
4. *Healthcare Companies – Change Healthcare, Optum, UnitedHealthcare, Humana and more. Some startups.*
5. *Science Companies – Springer Nature, Digital Science, Frontiers and a few more. A handful of startups.*

## **HOW CAN BLOCKCHAIN BE USED IN HEALTH SCIENCE RESEARCH?**

1. *Better Science - Improved reproducibility through transparency and immutable audit trail for research data*
2. *Better Science – Improved material quality and provenance via supply chain tracking*
3. *Cheaper Research - Increased return on investment for research dollars spent; reduced data management costs through blockchain/smart contracts, amplified with machine learning/AI*
4. *Faster Miracles - Moving more quickly from bench to bedside and improved outcomes with accelerated research and higher quality data; improved tracking of individual contribution; increased meta-analysis*
5. *Faster Miracles - Assisting with administrative applications for blockchain (e.g. IRB process, proposal review)*

## **WHERE CAN I LEARN MORE ABOUT BLOCKCHAIN?**

1. **Health & Human Services Office of the National Coordinator - 2016 White Paper Contest**

<http://www.cccinnovationcenter.com/challenges/block-chain-challenge/view-winners/>

2. **Hyperledger Project – Linux Foundation's open-source blockchain effort**

<https://www.hyperledger.org/>

3. **Hashed Health – Leader in blockchain in healthcare; outstanding resource section**

<https://hashedhealth.com/>

4. **Blockchain in Healthcare Today – First peer-reviewed journal on blockchain in healthcare**

<https://blockchainhealthcaredtoday.com/index.php/journal>

5. **HIMSS Blockchain Task Force – Industry-wide health informatics application**

<https://www.himss.org/library/blockchain-healthcare-toolkit>

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