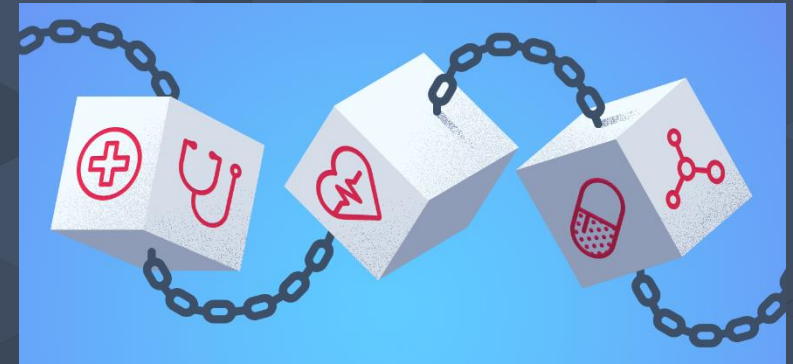


# BLOCKCHAIN

A GAME CHANGER

FOR HEALTHCARE



Worldwide healthcare systems produce terabytes of data each day for every patient at the cost of millions of \$\$\$\$\$\$\$\$\$\$ each year.

## Healthcare Industry is dealing with data overload

### Exogenous data

(Behavior, Socio-economic, Environmental, ...)

**60%** of determinants of health  
*Volume, Variety, Velocity, Veracity*

**1100 Terabytes**  
Generated per lifetime

### Genomics data

**30%** of determinants of health  
*Volume*

**6 TB**  
Per lifetime

### Clinical data

**10%** of determinants of health  
*Variety*

**0.4 TB**  
Per lifetime

Source: "The Relative Contribution of Multiple Determinants to Health Outcomes", Lauren McGover et al., Health Affairs, 33, no.2 (2014)

Credit card data theft, on the other hand, can be quickly reported to banks, which can act immediately.

# 10x

On the black market, stolen medical data is

**10x more valuable than that of a credit card number.**

[returnpath.com](http://returnpath.com)

September 2, 2015

## Healthcare Data Breaches Among U.S. Consumers



### FROM THESE LOCATIONS:



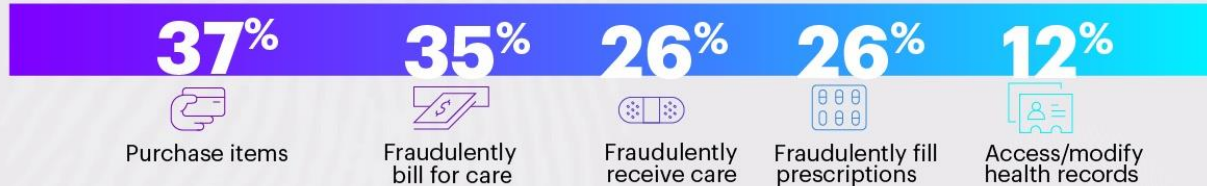
Highest percentage of breaches occurred

### OUTCOME FOR VICTIMS:



in average out-of-pocket costs per incident

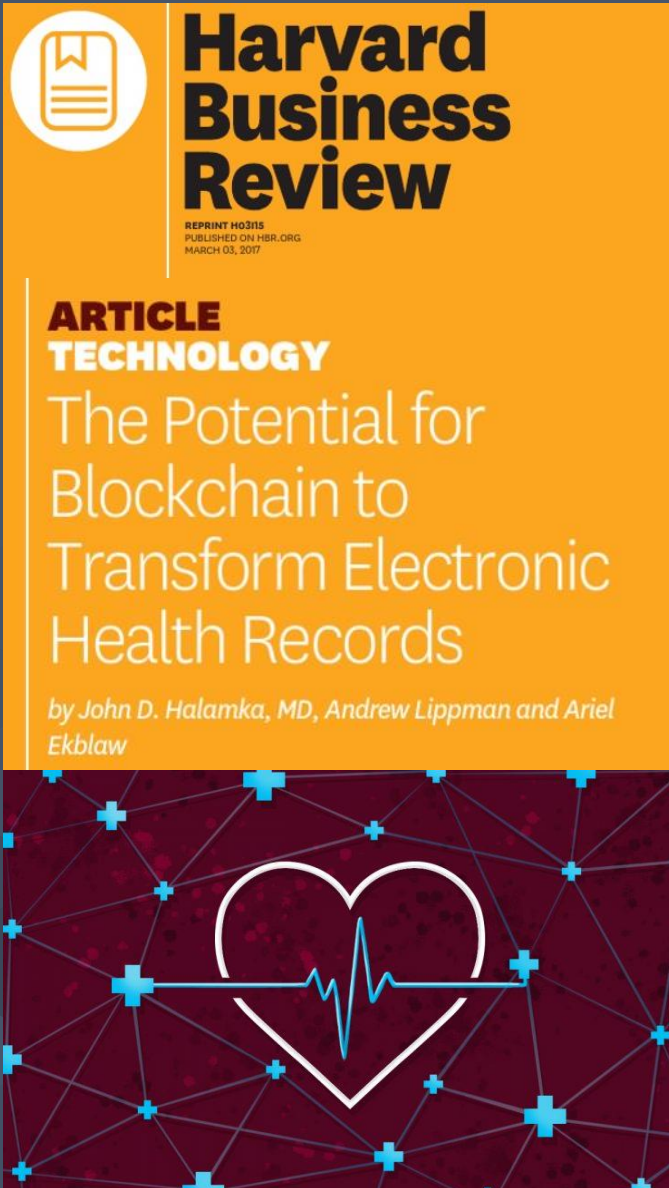
### STOLEN DATA USED TO:



Prices for Fraudulent Documents in the Underground	
DOCUMENTS	PRICE (US\$)
Profile with Social Security Number (SSN) or Medicare insurance ID	0.50
US person profile (including medical and health insurance data)	0.99
Fraudulent tax returns (based on data from stolen medical records)	13.50
Fake birth certificate (based on data from stolen medical records)	500.00
Medical insurance ID with valid prescriptions	0.50
Medical insurance cards	1.00
Complete EHR database	500,000.00

**REUTERS**







Your medical record is worth more to hackers than your credit card

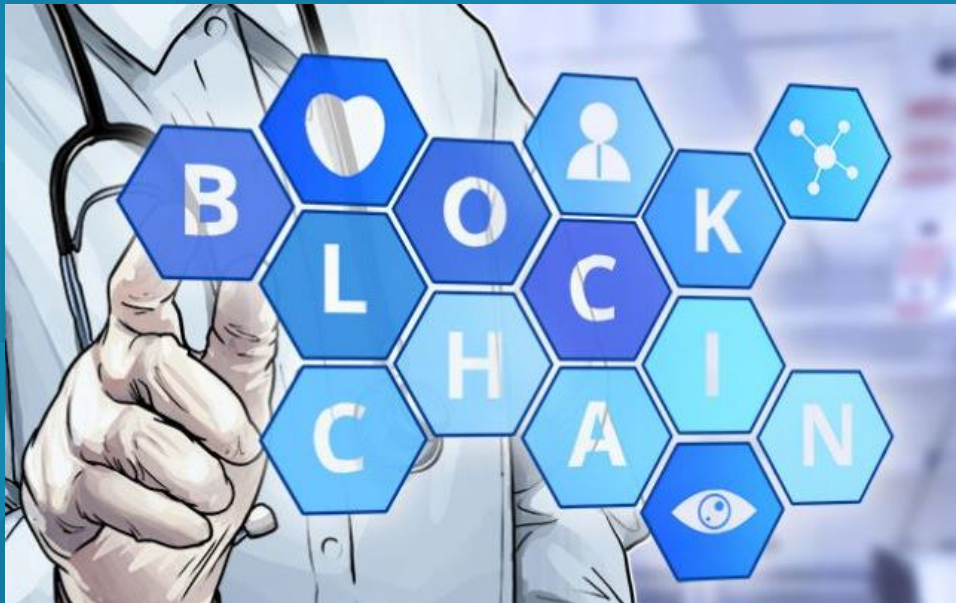


“Traditionally, the interoperability of medical data among institutions has followed three models: push, pull, and view, each of which has its strengths and weaknesses.

Blockchain offers a fourth model, which has the potential to enable secure lifetime medical record sharing across providers.”

# Blockchain Value Propositions for Healthcare

	Health Info Exchange Pain Points	Blockchain Opportunities
	<b>Establishing a Trust Network</b>	<b>Disintermediation of Trust</b>
	<b>Cost Per Transaction</b>	<b>Reduced Transaction Costs</b>
	<b>Master Patient Index (MPI)</b>	<b>Distributed framework for patient digital identities</b>
	<b>Varying Data Standards</b>	<b>Shared data real-time updates across the network. Audit Trails</b>
	<b>Limited Access to Population Health Data</b>	<b>Distributed, secure access, Aids eGovernance decisions</b>
	<b>Inconsistent Rules and Permissions</b>	<b>Smart Contracts create a consistent, rule-based method</b>



## Philips Healthcare Launches Blockchain Lab in R&D Push

Pete Rizzo (@pete\_rizzo\_) | Published on March 3, 2016 at 17:12 GMT

NEWS



Healthcare giant Philips has officially launched the Philips Blockchain Lab, a research and development center located in Amsterdam and focused on the emerging technology.

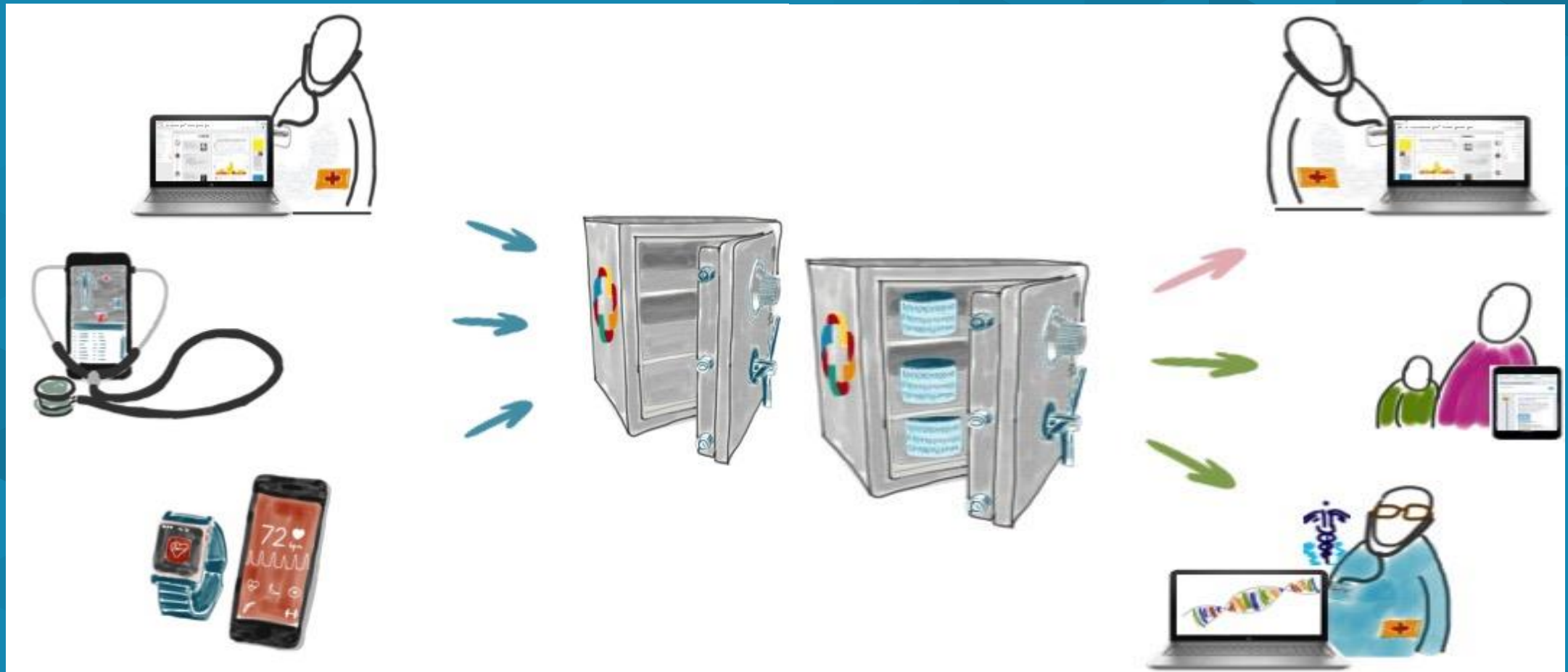


In a post on its website, Philips said that the lab follows six months of exploratory research, and that the goal of the effort is to unite the company's IT experts, healthcare professionals and blockchain

Healthcare Rallies for Blockchain, a study from IBM, found that 16% of surveyed healthcare executives had solid plans to implement a commercial blockchain solution in 2017, while 56% expected to by 2020.

# Promises of Blockchain Technology in Healthcare

## ✓ Medical Records



# Birth and Death Certifications



The Open Standard For Blockchain Credentials



Recipient	Issue Date
Dimi Arhontidis	February 15, 2018
Issuer	Transaction ID
Learning Machine	<a href="#">f0861067ee5a535eab...</a>



## Illinois Blockchain Initiative

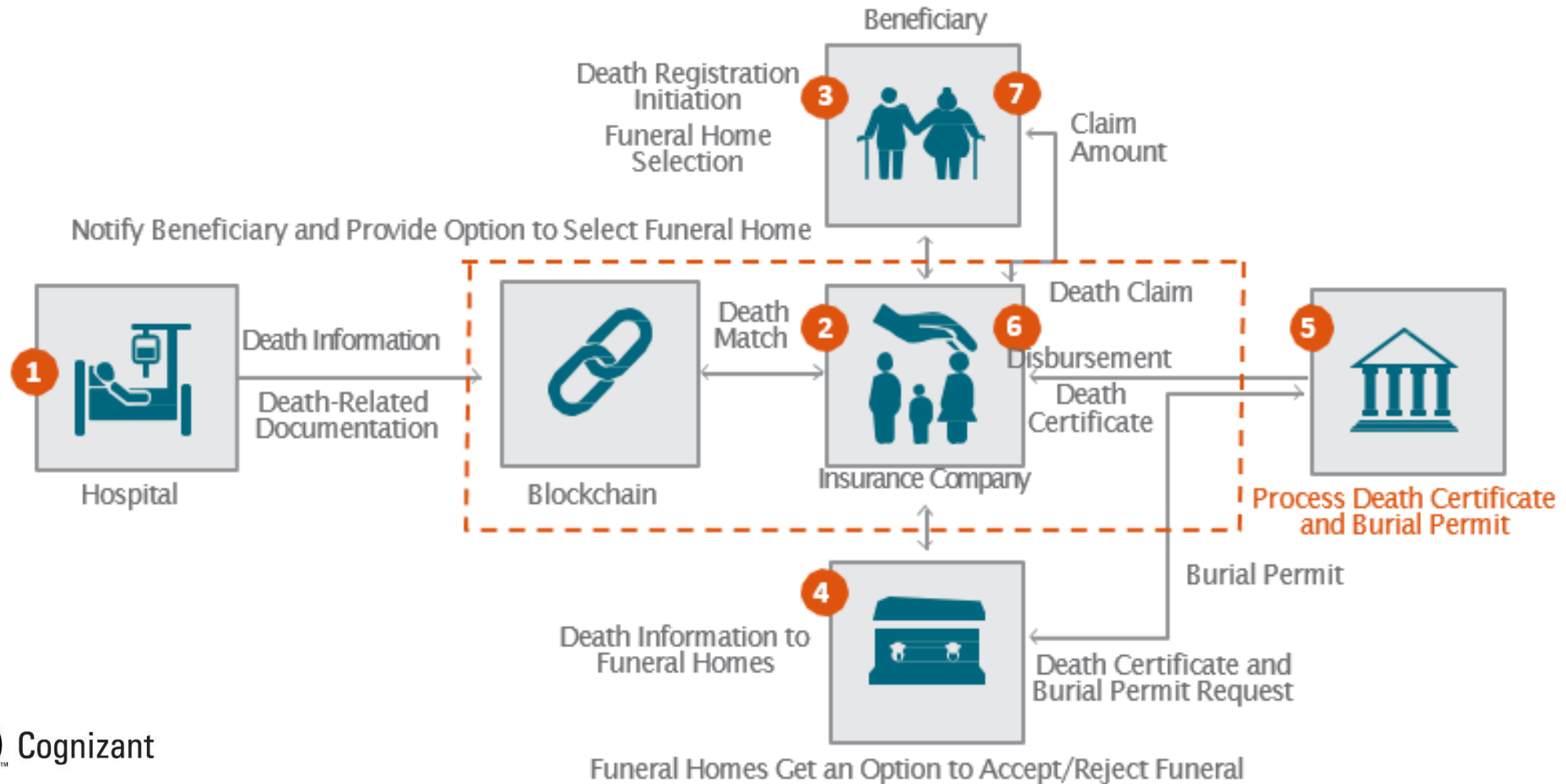
Evernym is partnering with IBI to develop and deploy a secure, distributed ledger-based, self-sovereign identity for Illinois citizens during the birth registration process.

## Healthcare Initiative

Evernym is partnering on a nationwide initiative to provide all UK doctors with a digital passport and reputation system.



# Blockchain in Insurance and claims



# Promises of Blockchain Technology in Healthcare

## CLINICAL TRIALS

- When we do clinical trials we find molecules. Sometimes we find molecules outside the area we are looking as well. Scientists that one hires also belong to a specified area meaning a lot of molecules found during the process just sit on the shelf. These molecules if shared with other companies, scientists and agencies like WHO can solve world's biggest problems.



Imagine a blockchain for molecules that can be shared with scientists based on their capability and expertise and then creating an economic model to discover and patent these molecules to manufacture life saving drugs.

# Promises of Blockchain Technology in Healthcare



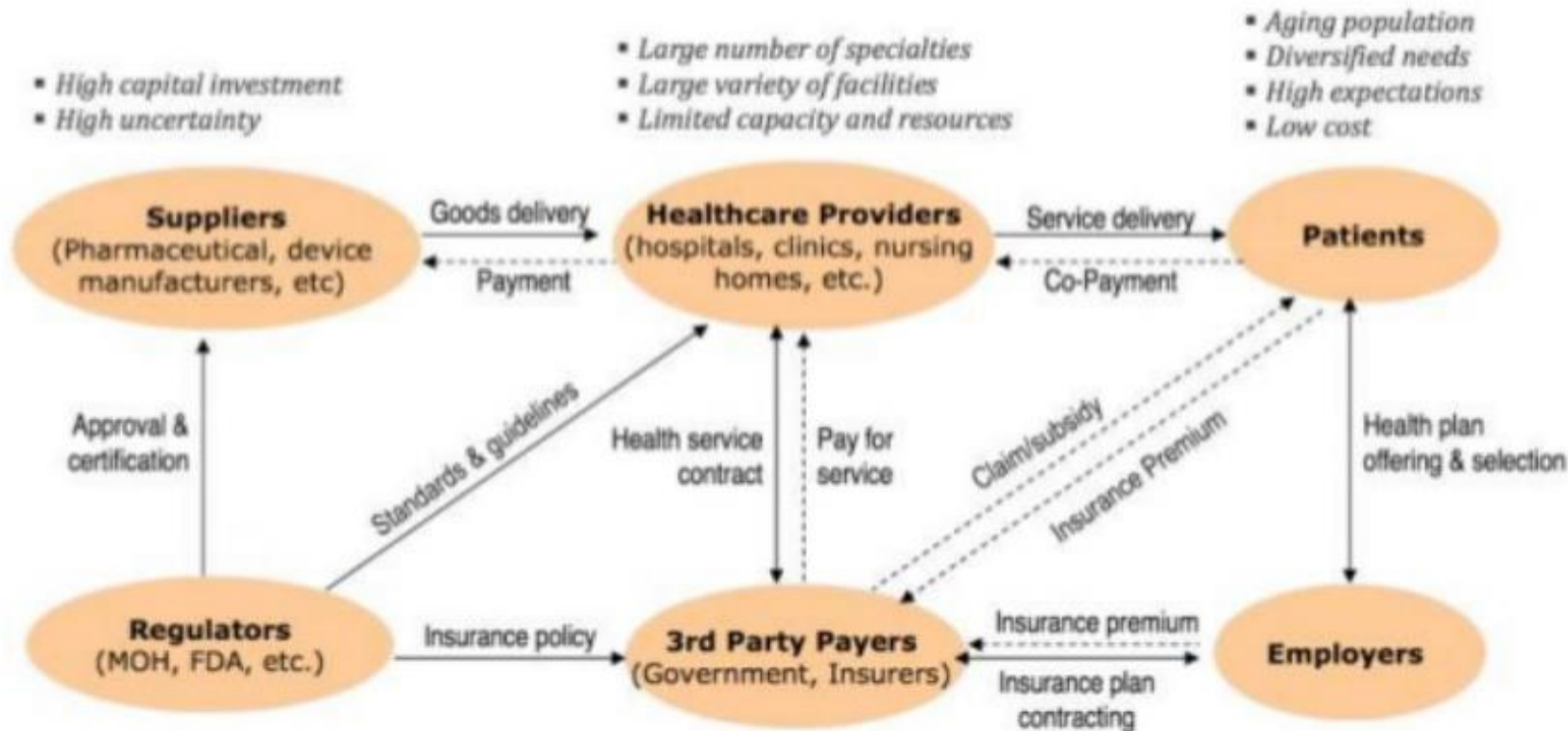
- **Proprietary** genomic datasets and cloud-based tools
  - 3,751 whole human genomes of 7 Billion
  - Genomic Data Commons (open only to US scientists)
- **Decentralized projects:** big data access + query tools for scalability, privacy.
- Genetic records anonymously is a game changer
- **DNA.bits** blockchain-based ✓
- Large genetic dataset access with correlated clinical records crowdsourced disease diagnosis

Blockchain  
Big Health Data

Saving Lives

# Promises of Blockchain Technology in Healthcare

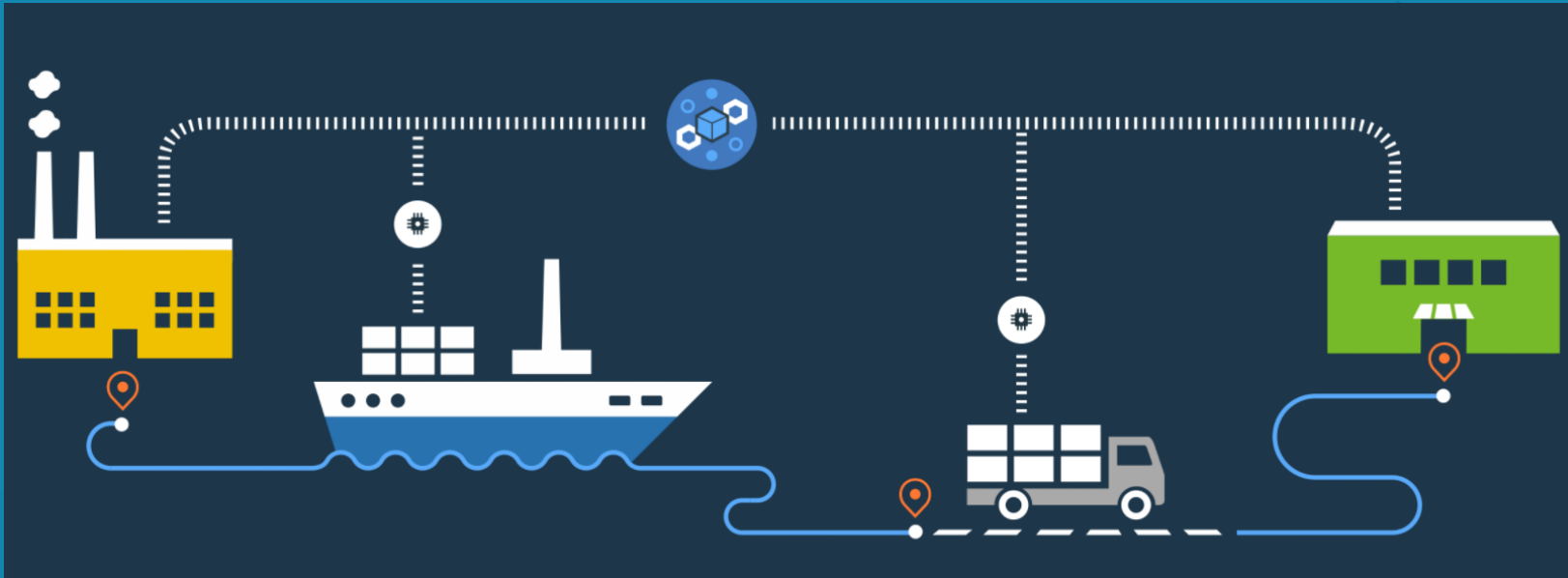
## SUPPLY CHAIN IN HEALTHCARE





- Supply chain costs ranks second only to reimbursement problems as the issue top of mind for hospital executives today.
- The supply chain is the second largest expense for healthcare providers, according to Cardinal Health, which also estimates \$5 billion of annual waste in high-value medical devices alone.





# BLOCKCHAIN FOR DRUG TRACEABILITY





trusted by 



- 2017-05-20 9:30 p.m. ● issued by  Big Pharma
- 2017-05-20 9:36 p.m. ● signed by  Shady Reseller Inc
- 2017-05-21 9:49 a.m. ● signed by  Next door pharmacy
- 2017-05-21 just now ● verified by  Patient

Contract unique ID  
0xe41042A87817777cA01E1F8f02f0F8F580be82Ef

# IOT AND MEDICAL DEVICES MANAGEMENT WITH BLOCKCHAIN

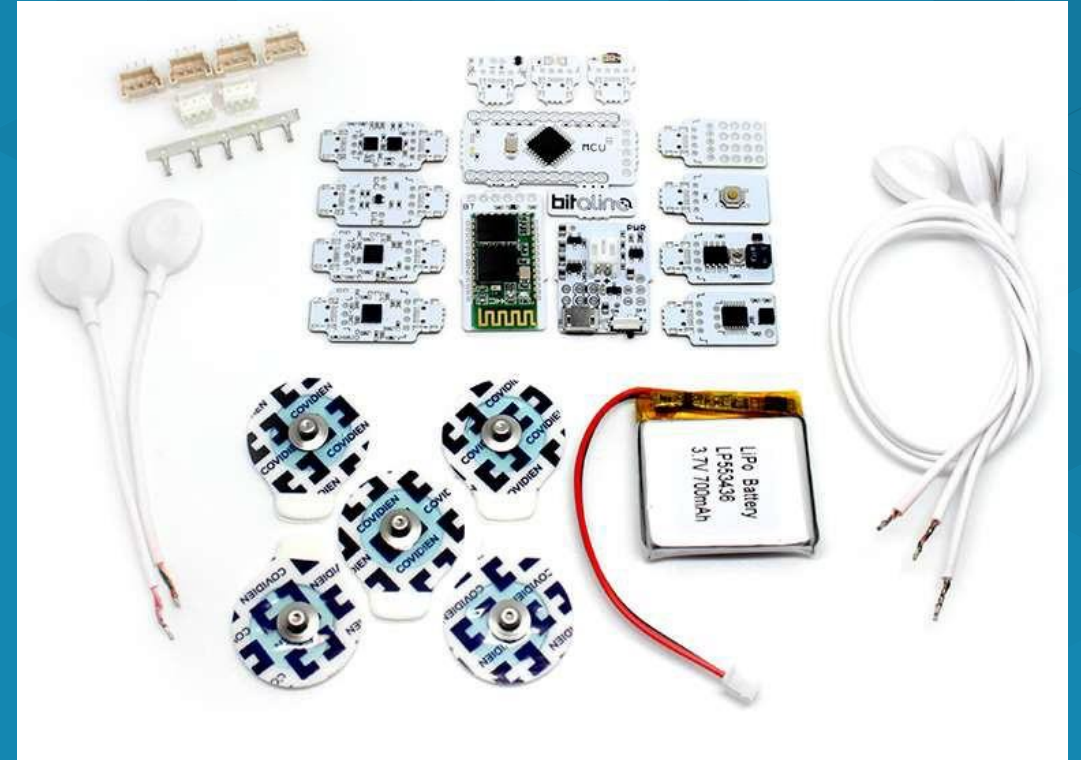
## CONTROLLING THE CHAOS

*Medical Device Market to reach  
\$640 Billion By 2020*

Providing Trust in a trustless  
ecosystem

Compliance

Interoperability



THE PROBLEM IS IN THE STANDARDS.

*“Shared infrastructure (blockchain) allows us to create global data standards without compromising privacy and security” Gem Health*

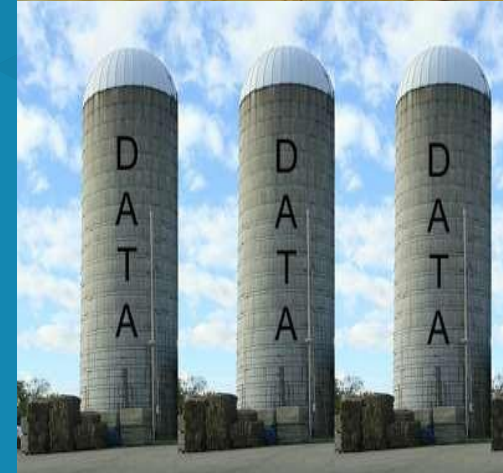




# Devices are facing the same barriers to Interoperability.

Blockchain allows arbitrary system to communicate within a non-trusted environment while retaining privacy leading to cost reduction, through shared data

CHAIN OF CUSTODY			
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
Received From:	_____	Received By:	_____
Date:	_____	Time:	_____ am/pm
CAT NO. C002100			



## Your Wearables/Apps



## Your IoT Devices



## Your Care Providers



## Your Prescriptions



Data Collection

Rewards

Profile Settings

Data Visualization



# 10 Notable Healthcare Companies Built on Blockchain

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**Gem**

Its first partner is **Philips Blockchain Lab** is exploring the uses of Blockchain technology in **clinical trials**.

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**Guardtime**

Partnered with the Estonian e-Health Foundation to securely store over 1 million medical records.

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**Brontech**

Australian Blockchain company to improve accuracy of the diagnosis and reduce common clinical errors.

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**MedRec**

Created by MIT. Gives patients one-stop-shop access to their **medical history** across multiple providers.

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**Blockchain Health Co.**

Revolutionize the relationship between **medical researchers and users**, so users can share their medical data while maintaining control.

# 10 Notable Healthcare Companies Built on Blockchain

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**Pokitdok**

Platform company offering 5 types of solutions reduce the inefficiency of the healthcare system.

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**Factom**

Help insurance companies use the Blockchain, signed a deal with US health data provider to guarantee authenticity of sequence of events.

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**Stratumn**

French startup to improve major issue of lack of transparency and trust panning from data falsification in pharmaceutical clinical trials

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**Tierion**

Partnered with Philips Healthcare to work on the possible applications of Blockchain technology to improve the healthcare industry.




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**Blockpharma**

French startup using blockchain-based technologies to fight drug counterfeiting.

# Classifying Companies

Companies	Description	Supporting Trends	
	Patient Data Management	The typical primary care physician has to coordinate care with <b>229 other physicians</b> working in 117 practices	Lack of interoperability costs <b>150,000 lives and \$18.6 billion</b> per year
	Research and Clinical Trials	In 2015, publisher Springer had to <b>retract 64 articles</b> from its journals for fraudulent findings	
	Drug Provenance	<b>800,000 deaths</b> due to consumption of falsified medicines in the world every year	<b>\$100s of billions</b> are spent tackling counterfeit drugs in developing nations annually
	Payments, Claims & Other Services	Highmark for example, the biggest health insurer in Pennsylvania <b>lost \$222 Million</b> selling coverage under the Affordable care Act in 2015	

# Promises of Blockchain Technology in Healthcare



Clinical data



Claims processing



Pharmaceutical supply chains



Internet of Health



Universal health identities



Genomic data management

Wellness Apps

Electronic Medical Records

Global Patient ID Software

Medical Inventory Management

Rehabilitation Incentive Programs

Apps

Users

Network



Gem | Health

