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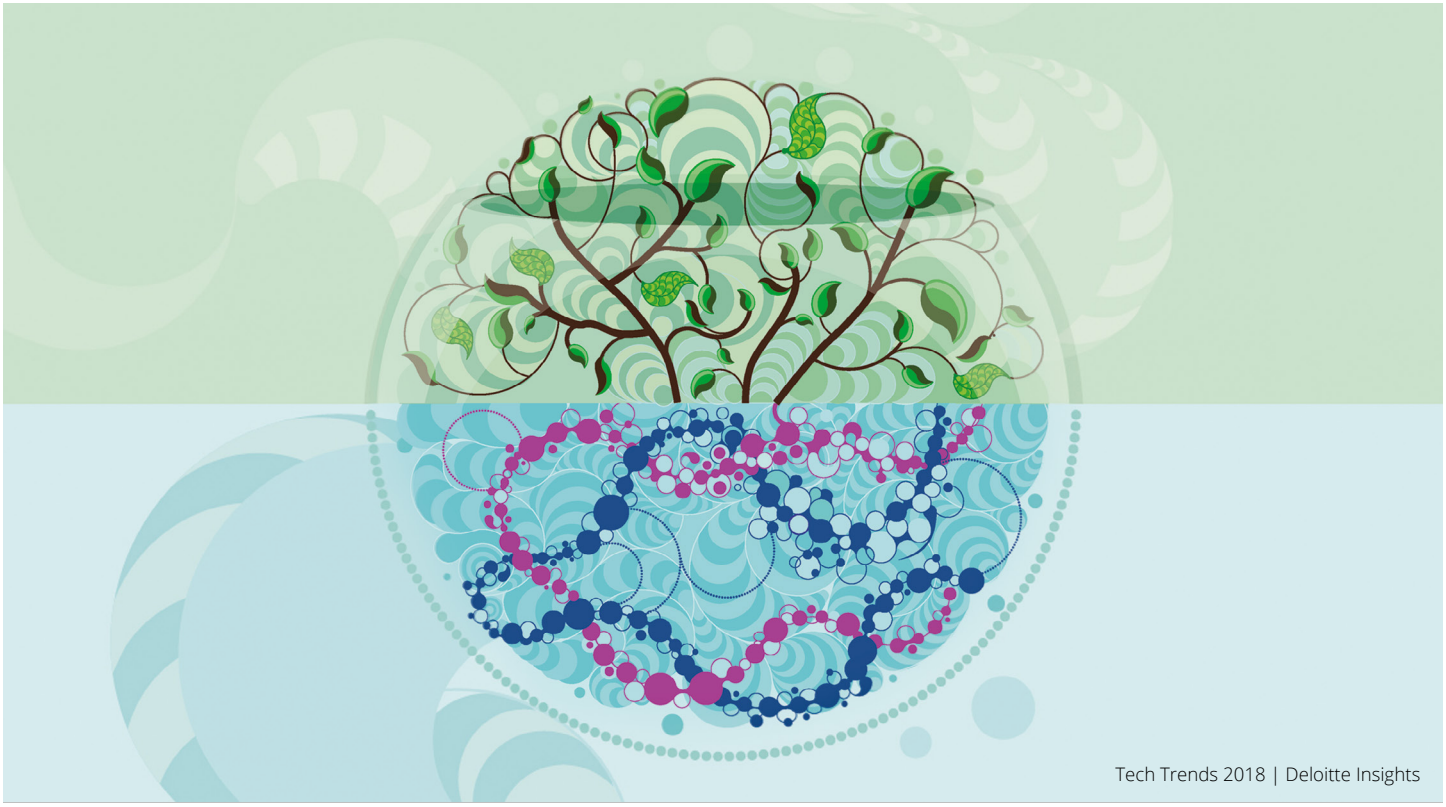

Tech Trends 2018 | A life sciences and health care perspective

Blockchain to blockchains in life sciences and health care

What broader integration is making possible today

Amid the media frenzy surrounding bitcoin a few years back, prescient technologists and business leaders recognized that the real story was bitcoin's technology endoskeleton, blockchain.

Blockchain is essentially a living list of linked digital records—a distributed ledger—that permanently stores updates via a consensus among those who share it. A record of every transaction is embedded in the information itself, without the need for a central repository. While information can be added, it cannot be copied or deleted. As a result, multiple groups—life sciences companies, health plans, physicians, hospital systems, and even patients for example—can add to and share information through a secure system.

Today, blockchain is garnering headlines once again, this time for the vast ecosystem of cross-industry use cases emerging around it.

For example:

- Europe's largest shipping port has launched a research lab to explore the technology's applications in logistics.[1]
- Utilities in North America and Europe are using blockchain to trade energy futures and manage billing at electric vehicle charging stations.[2]
- Blockchain is disrupting social media by giving users an opportunity to own and control their images and content.[3]

This list is growing steadily as adopters take use cases and proofs of concept closer to production, and industry segments experiment with different approaches for increasing blockchain's scalability and scope. Indeed, the path to broad blockchain adoption looks strikingly well paved. Gartner Inc. projects that blockchain's business value-add will grow to $176 billion by 2025.[4]

The shift from blockchain to blockchains—to networks of networks—is particularly compelling in life sciences and health care where the distinct sectors work together in one broadly interdependent ecosystem.

So what are the possibilities within life sciences and health care?

For life sciences and health care, blockchain has the potential to enhance collaboration, trust, interoperability, traceability, and auditability across a range of functions such as clinical trials, supply chain management, financial transactions, credentialing, and claims processing. The shift from blockchain to blockchains—to networks of networks—is particularly compelling in life sciences and health care where the distinct sectors work together in one broadly interdependent ecosystem.

Blockchain adoption in the industry is still in its infancy, but in a Deloitte survey, the number of life sciences and health care organizations who said they planned to deploy blockchain last year (35 percent) outpaced similar outlooks from other industries.[5] A number of working groups are examining blockchain's potential in areas such as counterfeit drugs, licensure, and technical knowledge sharing. As the technology unfolds, it could help address legacy technology debt, shorten negotiation cycles, improve medical record centralization, improve network coordination, clarify drug traceability, and make clinical trial processes more consistent.

Among the earliest practical use cases in the industry are ones in which blockchain can help handle identity better—in electronic health records and beyond. In place of multiple, duplicative records crossing from silo to silo, imagine a single, massive, longitudinal patient record that every player in the system—from patient to doctor to insurer to researcher—can use without any loss of privacy or security.

Data of many types can be made more useful when it flows freely and securely across the ecosystem: pharma companies interacting with providers under the Sunshine Act, plans authenticating a patient's payment sources, and on and on. Today, each of the sectors pays billions to leverage some of the information that exists, with duplication in cost, administrative time, and data entry by patients. If participants in a cross-sector system can "chain" information to widely shared records, efficiencies could follow and privacy and security concerns that exist today could be addressed.

Prospects by sector

A long-term vision for the life sciences and health care industry is likely a holistic vision; after all, connecting disparate stakeholders is one of blockchain's core values. A shared network that links medtech and pharma, patients and providers, and plans and payers on the same standard could touch every part of the industry from drug trials to claims adjudication to clinical outcomes. For now, however, the challenges and the opportunities are worth exploring sector by sector.

Health Care Providers

Blockchain offers the potential to address poor network communication and a scattered view of transactions in the provider arena. It can also provide a bulwark against fraud and abuse. With fluent collaboration not only within but across networks, and visibility into patient transactions and measurable outcomes, blockchain may be a key element in the implementation of value-based care.

For providers, who rely on insurance-related transactions but don't own the processes behind them, blockchain may help reduce cost and inefficiency. "Handshakes" with health plan data can speed authentication of a patient's coverage, while data flow among providers and partners has the potential to make value-based care more real through the use of risk-sharing contracts that use data in real time. Overall, the fragmentation in the provider space, which generates disparate and redundant records, is an area where blockchain could potentially make a difference.

In addition to efficiency and accuracy, blockchain may also help providers take waste out of the system. Conservative estimates place the amount of fraud in health care costs to range in the tens of billions of dollars annually. Other estimates place that number at more than $270 billion annually, mostly from excessive billing, billing for services not performed, and false information.[6] When the information that goes into billing resides in a single, tamper-resistant blockchain, there are fewer cracks for issues like those to fall through.

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Key potential blockchain use cases

- **Medical records and interoperability**
  A patient's medical history that is spread across providers, payers, etc., could be centralized in a blockchain, where the patient has visibility and control over their medical record. Providers, patients, insurers could see the relevant health information needed for enhanced patient care and experience.
- **Prescription sharing**
  A patient could provide consent to have personal prescriptions tracked and operated on the blockchain to improve transparency and data validation.
- **Patient wearables**
  A connected device that broadcasts patient information could offer a real-time, scalable solution for monitoring and treating patient outcomes.
- **Supply chain**
  Blockchain supply chain recording could begin at the manufacturer, undergo updates by intermediaries, and be authenticated by the buyer.
- **Clinical trials**
  The tracking and reporting of results could be directed to a blockchain to improve the efficiency of drug development.
- **Provider credentialing**
  Credentialing organizations could accrue data to the blockchain ledger and make it available to other organizations, potentially expediting the provider credentialing process.
- **Value-based care**
  Tracking a patient's episode of care and related medical events on a blockchain could be used to determine quality of care over time.
- **Discounts, rebates, and refund tracking**
  Blockchain could be used to help clear and settle transactions between drug manufacturers and intermediaries to track financial rebates and other incentives tied to drugs.
- **Study protocol management**
  The complete history of changes could be immutably tracked through blockchain to enforce controls and streamline adherence.
- **Adverse events**
  A blockchain solution could enable an incubation group of companies to securely share adverse events data, permissioned such that only contributing members could view others' data.
- **Consent management**
  A blockchain solution could manage and track informed consent across multiple sites, systems, and protocols. The consent and use could be tracked forward in research.

Life Sciences

As in other sectors, blockchain in life sciences is in a nascent form. But storing and tracking critical data on a blockchain could reshape the sector.

In clinical trials, blockchain could be a common frame of reference for an entire ecosystem of solutions that may improve participation and processes and ultimately lead to better health outcomes, with patients, investigators, managers, and doctors all touching different parts of the same ledger. A person's cloud-based "health passport" could use blockchain to carry consistent information securely across the entire process of searching for relevant trials, matching criteria and registering, documenting consent, and participation. The same unbroken information chain could then support trial functions such as sample collection, tracking, and analysis. Many of the current systems used to track clinical trial samples and document proper storage, transport, and handling leverage spreadsheets that are hard to read or automate. Blockchain could help the data follow the samples, promoting more efficiency in the process and greater confidence in the results.

An estimated 10–30 percent of the drugs sold in developing countries are counterfeit.[7] Blockchain could potentially help companies maintain drug traceability from inception to consumption in adherence with "trace and track" regulations. End-to-end traceability could help prevent serial number duplication, keep original drug unit changes unaltered, and validate the receipt of a drug. And because of its ability to facilitate secure, authoritative data-sharing among multiple parties, blockchain could be part of the foundation of the emerging value-based framework that makes payment dependent on documented contribution to patient outcomes.

In addition to the potential for improving established practices, it could help pave the way for new ones. Chimeric antigen receptor (CAR) T-cell therapy, or "CAR T-cell therapy," involves adding new proteins to a patient's own immune cells then putting them back into the body.[8] Handling a supply chain of material at this level of personalization and sensitivity is more than traditional data systems were initially built to support. As blockchain technology evolves, it could be used to address the complexity of the CAR T-cell therapy supply chain, where the patient is also part of the chain and both the information privacy and supply chain integrity need to be maintained.

Making inroads: Blockchain in action

- Prescrypt, a proof of concept developed by Deloitte Netherlands, in collaboration with SNS Bank and Radboud3, gives patients complete ownership of their medical records, allowing them to grant and revoke provider access to their data.[9]
- In the fall of 2017, Change Healthcare debuted an enterprise-scale blockchain technology for revenue cycle management in hospitals and health systems.[10]
- Philips Healthcare has partnered with Gem to develop enterprise health care applications, such as wellness apps and global patient ID programs, using blockchain technology.[11]
- Blockchain-based record-keeping service Factom partnered with major US medical services provider HealthNautica to deploy a blockchain solution for digital health records.[12]
- The MediLedger Project is a multi-party pilot that includes several large drug manufacturers who are working to track medicines on a single, shared blockchain to thwart drug counterfeiting and theft.[13]
- In 2016, the US Department of Health and Human Services' Office of the National Coordinator for Health Information Technology (ONC) launched a challenge to explore the potential uses of blockchain technology in health care and health-related research. From more than 70 submissions, winning papers covered topics including privacy, interoperability, claims processing, payment models, accountable care, and patient reporting of outcomes.[14]

Health Plans

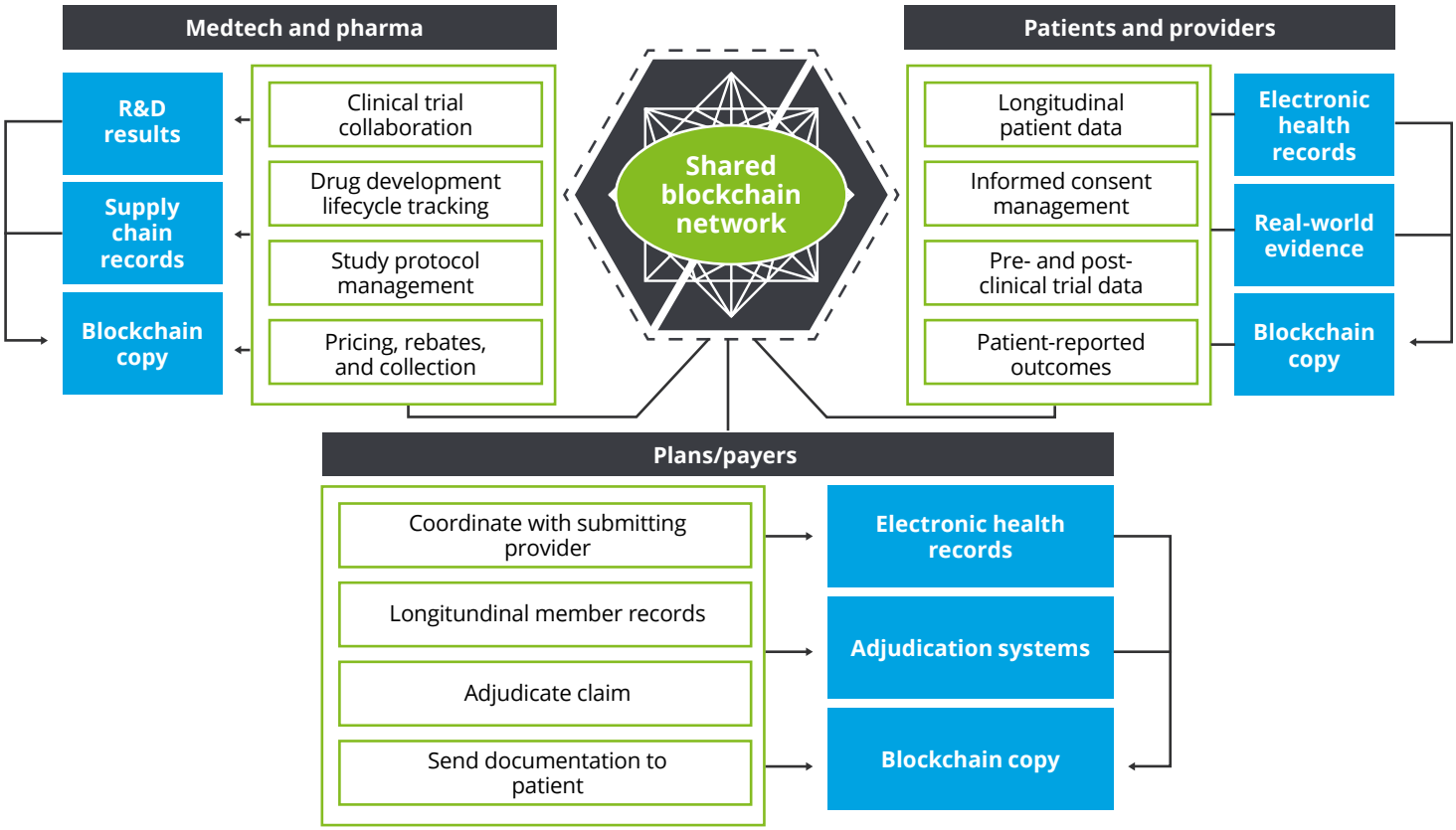
For payers, blockchain could be used to help ensure the control, integrity, and traceability of data and serve as an essential tool for creating trust and reliability when sharing data across multiple parties. More specifically, blockchain could have a significant impact in areas such as medical records, claims processing, payments, provider data management, insurance design, and consent management. Broadly shared, consistent data on a blockchain might help health plans streamline administrative processes and combat fraud, waste, and abuse.

Blockchain-based medical records and interoperability have been a focal point in streamlining patient-centric care management and delivery. Members want control of personal medical data and often are frustrated with the need to repeat data entry processes. This could be addressed by a customer-controlled blockchain for identity verification. While there is consensus around the longitudinal medical records use case, there has been some disagreement on how quickly this would happen. Challenges still exist around data protection and consumer incentives.

Another popular payer use case is secure claims management and verification across multiple parties. By leveraging blockchain technology, payers could accurately track, in real time, the status of claims submissions and the handling of policies and claims. This real-time tracking could be combined with approvals and verifications from other policyholders who would serve in the role of evaluators and remitters across the complete claim lifecycle. Fraud, waste, and abuse is a major issue for payers. Blockchain could potentially help to effectively detect identity fraud, falsified claims, or authenticity of documents. "Smart claim contracts" that execute processing functions on their own might rewire the claims handling and adjudication process, creating a detailed audit trail that could shave cost and time off a process that can take as long as 45 days per claim today when handled across disparate legacy systems.

Provider credentialing is a costly, complex, and industry-wide process to ensure the accuracy of provider directories. Health plans are under pressure to maintain accurate provider directories, or they risk regulatory fines and potential third-party lawsuits. By leveraging blockchain technology, payers could form a collaborative exchange designed to allow counterparties to define and exchange identity and credential assets using the data, rules, and validation checks applicable to their specific organizational requirements. Further, blockchain technology could facilitate the provenance, accuracy, and immutability of provider information within the exchange—which may substantially reduce the time, cost, and effort payers spend performing the redundant sourcing, aggregation, and verification of provider information.

Figure 1. A shared blockchain network



Challenges to overcome

The use of blockchain in life sciences and health care will require involvement from multiple stakeholders including providers, health plans, and individual governments. Unifying this group to form standards will be a challenge. Additionally, there will be technological challenges. Because of the nature of health care information, having secure data is of great importance. Multiple solutions exist for addressing privacy concerns such as focusing on the value of blockchain to provide unalterable evidence of facts by writing the hash of transactions to it, while the transactions themselves are stored outside the blockchain. This maintains the integrity of transactions, while enabling the ability to erase the transactions, leaving only vestigial traces of forgotten information in the blockchain without protected health information (PHI) or personally identifiable information (PII) being exposed. While blockchain provides a potential solution to one aspect of security, it will require additional steps to ensure that the data itself is secure. In life sciences and health care in particular, the distinction between identified and de-identified data will be critical to how a blockchain operates and how well it upholds privacy standards.

While every need and implementation will be different, there are areas where organizations can conduct self-assessments to determine how blockchain could make an effective difference:

- **Scalability.** Many of the processes for blockchain would require more scalability and balance between permissionless blockchains (which offer more computing power) and permissioned ones (which offer faster processing).
- **Standardization.** To foster greater efficiency and performance, organizations can consider implementing governance to control what type of data may be written into a blockchain.
- **Incentives.** Blockchain participants should determine technical, financial, and business incentives that could encourage organizations to adopt the technology and lend their computing power.
- **Cost.** Organizations need to determine their costs for operating a blockchain.
- **Regulatory.** While a blockchain solution could address the Health Insurance Portability and Accountability Act (HIPAA) privacy rule in part by separating and encrypting PHI/PII data, regulatory bodies should consider deep collaboration with the industry to facilitate adoption.

Making the technology serve the business will require working out a number of understandings. The current regulatory environment includes many rules that predate blockchain, and changes may be necessary to permit the data-sharing and tracking that can now be done with a level of security that wasn't possible before. In a shared information system, there is also a question of governance: Who owns the data?

Risk considerations

Blockchain is a technology designed to reduce risk, but implementing it carries uncertainties all the same. One thing not to take for granted is the breadth of the ledger—the extent a blockchain covers. Some, like the famous cryptocurrency that put the technology on the map, are global. But there are national, regional, and even private ledgers that use the same methods. Knowing which one is right for an organization or ecosystem starts with knowing how far information will need to travel to be useful, and where to draw the line.

Controls inside and outside organizations may hinder blockchain adoption. Internally, long approval and capital cycles mean the technology projects active today are often the ones designed and approved based on the technology of three years ago. Externally, regulators are still working to account for blockchain and its implications for privacy and other considerations. While blockchain has properties that can help protect against unauthorized tampering and other cyber threats, few are ready to make absolute claims regarding its security. Industry consensus on protocols and standards keep many industry players sidelined.

Blockchain's broad implementation in the life sciences and health care ecosystem will require a "tipping point" of trust and adoption among stakeholders, including patients.

Conclusion

With the proliferation of platforms and protocols in the marketplace today, no single solution has emerged as the clear winner; consequently, no technical or process standards are yet in place. Likewise, operational silos often keep companies from either developing clear business plans around blockchain or collaborating with ecosystem partners for mass adoption. Because a hot blockchain hype cycle is only now coming to an end, many people assume that enterprise blockchain adoption is further along than it actually is. In reality, it will take time and dedication to get to large-scale adoption.

Companies should look to standardize the technology, talent, and platforms that will drive future initiatives—and, after that, look to coordinate and integrate multiple blockchains working together across a value chain.

An effective way to get started is by getting to know blockchain—the reality, not the hype:

- Dive deep into workshops and proofs of technology.
- When it's time to launch the first pilot, define the use case in detail, and plan an iterative, agile way to deliver a measurable solution to an identified business challenge.
- Focus blockchain development resources on use cases with a clear path to commercialization.
- Support standardization in technology, business processes, and talent skillsets.
- Work to integrate and coordinate multiple blockchains within a value chain.

As with many new frontiers in IT, this can be a place where it pays to think big but take measured early steps.

Blockchain's broad implementation in the life sciences and health care ecosystem will require a "tipping point" of trust and adoption among stakeholders, including patients. Collaborating with different stakeholders on pilot uses of the new architecture could represent a way to share the cost of experimentation and a way to model the multi-party commitments that a later, full-scale implementation will involve. An architecture that *can* connect everyone must have broad acceptance before it *does* connect everyone.

For more on blockchain to blockchains, visit:
www.deloitte.com/insights/blockchain-to-blockchains

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Endnotes

[1] Port Technology, Rotterdam Port celebrates new blockchain lab, September 25, 2017, https://www.porttechnology.org/news/rotterdam_port_celebrates_new_blockchain_lab.

[2] James Basden and Michael Cottrell, How utilities are using blockchain to modernize the grid, Harvard Business Review, March 23, 2017, https://hbr.org/2017/03/how-utilities-are-using-blockchain-to-modernize-the-grid.

[3] Brian D. Evans, Blockchain is now aiming to disrupt social networks in a major way, Inc., August 14, 2017, https://www.inc.com/brian-d-evans/blockchain-is-now-aiming-to-disrupt-social-network.html.

[4] John-David Lovelock and David Furlonger, Three things CIOs need to know about blockchain business value forecast, Gartner Inc., August 2, 2017, https://www.gartner.com/doc/3776763/things-cios-need-know-blockchain.

[5] Deloitte survey: Blockchain reaches beyond financial services with some industries moving faster, Deloitte Blockchain Survey 2017, Deloitte Consulting LLP.

[6] The U.S. Health Care System and the Challenges of Fraud, The National Health Care Anti-Fraud Association, Septmeber 2017, https://www.nhcaa.org/media/127538/nhcaa_ushealthcaresystem_2017.pdf.

[7] Counterfeit medications are common in some countries, Center for Disease Control and Prevention, https://www.cdc.gov/features/counterfeitdrugs/index.html.

[8] CAR T-Cell Therapies, American Cancer Society, https://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy/car-t-cell1.html.

[9] Redman, Jamie. (2016, May 28). Prescrypt Brings Medical Prescriptions to the Blockchain. https://news.bitcoin.com/prescryptblockchain-prescriptions/.

[10] Change Healthcare Introduces Enterprise Blockchain for Healthcare Industry, BusinessWire September 25, 2017, https://www.businesswire.com/news/home/20170925005820/en/Change-Healthcare-Introduces-Enterprise-Blockchain-Healthcare.

[11] The Blockchain for Healthcare: Gem Launches Gem Health Network With Philips Blockchain Lab, Nasdaq, April 26, 2016, https://www.nasdaq.com/article/the-blockchain-for-heathcare-gem-launches-gem-health-network-with-philips-blockchain-lab-cm611549.

[12] Factom Announces Partnership with HealthNautica, PRWeb, April 23, 2015, http://www.prweb.com/releases/2015/04/prweb12673607.htm.

[13] Jeff J. Roberts, Big Pharma Turns to Blockchain to Track Meds, Fortune, September 21, 2017, http://fortune.com/2017/09/21/pharma-blockchain/.

[14] ONC Announces Winners of Blockchain Challenge, HIMSS News, September 9, 2016, http://www.himss.org/news/onc-announces-winners-blockchain-challenge.

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