

Blockchain and Health Care

Policy, Politics, & Nursing Practice
2019, Vol. 20(1) 1–4
© The Author(s) 2019
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1527154419833570
journals.sagepub.com/home/ppn



Nursing informatics as defined by the American Nurses Association is “the specialty that integrates nursing science, computer science, and information science to manage and communicate data, information, and knowledge in nursing practice” (Lippincott Solutions, 2016). Today, nursing informatics play an integral role in health care delivery and influencing health care information system features and functions (Murphy, 2010). By the end of 2020, there will be over 50 billion connected devices, all of which set the stage for millions of data transactions. As we move forward in this connected, digital first world, data are becoming a new kind of currency, or more specifically, we are moving into a data economy. In this new data economy, privacy, which is a fundamental human right, becomes increasingly difficult to maintain. With the Internet of Things, defined as “a network of physical and virtual objects, devices, or things that are capable of collecting surrounding data and exchanging it between them or through the internet” and applications such as wearable personal health trackers, consumers are becoming the center of their own personal care management (Sembroiz, Ricciardi, & Careglio, 2018, p. 215).

Privacy and security are foundational to the safety of health care data, especially given the epidemic of data breaches, generally, and health care data breaches, specifically. The latter have been traced to actors who have access to health records—so called insiders.

What then does this mean for nurses? Are we sufficiently engaged in discussions to support our patients? What aspects of the impact of this technology do we need to understand?

One key technology causing major disruption to tried and tested systems and processes is blockchain, which is defined as “a way for people to solve problems by sharing things” (Engelhardt, 2017, p. 22). Blockchain has been referred to as the largest technological and business revolution as the advent of the Internet. It is broadly understood to be on the same scale as both the Internet and artificial intelligence in its ability to impact the future. Blockchain’s growth has come from the need for heightened security, improved fraud prevention, transaction management, and a direct way for individuals to manage their own data.

Simply put, blockchain is a technology that allows for the secure storage, communication, and exchange of

data. However, unlike today’s databases, it has some key differences. *First*, it allows participants to see and verify all data involved. This minimizes chances of fraud because authorized participants can verify all the data and transactions contained in any one block of the chain. *Second*, all data are verified and encrypted before being added to the block. This process is managed publicly and organized in such a way that a hacker would need to have exponentially more computing power to break in than is required in today’s systems.

These characteristics allow blockchain to provide public ledgers that participants trust based on the agreed upon consensus protocol among them. Once data transactions are on a block, they cannot be overwritten, and no central institution holds control, as these ledgers are visible to all the users connected to them. Users’ identities within a ledger are known only to the users themselves.

Given the magnitude of blockchain, are we as nurses (and individuals) aware of what is occurring around us? More importantly, are we aware of the roles our patients may have in the future in terms of controlling their own data and influencing health care organizations? And, are we aware of what blockchain means for our roles as future providers of care? To answer these questions, it is important to first understand how blockchain works.

How Blockchain Works

Blockchain is composed of individual blocks. Each block contains information to be stored; a hash, which is a security key that uniquely identifies the information in that block, and a record of the hash on the previous block in the chain, as can be seen in Figure 1.

If any one block is tampered with, the hash or fingerprint of that block changes. As soon as this occurs, all subsequent blocks in the chain become aware of the tampering as the hash of the tampered block no longer matches previous records. By linking the blocks in this fashion into a chain, tampering becomes very difficult.

Uses of Blockchain

Strategically, blockchain offers ways for “people who do not know or trust each other to create a record of who owns what.” As a way of making and preserving trust, it

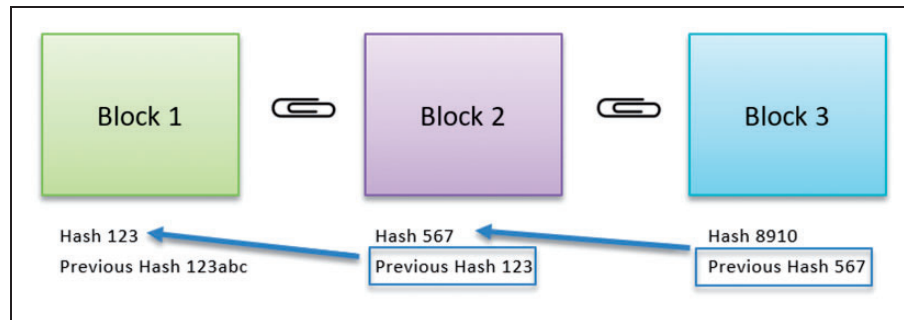


Figure 1. Blockchain components.

has far-reaching implications beyond financial (“Blockchains: The Great Chain,” 2015, p. 21).

Blockchain harnesses the power of encryption to assert its own immutability and become a safer option than any physical database. Blockchain places the patient at the center of the health care ecosystem more than any other systems (Linn & Koo, 2016). Zhang, Douglas, Schmidt, and White (2018) identified the following seven uses for blockchain in health care: (a) prescription tracking to detect opioid overdose and over prescription, (b) data sharing to incorporated telemedicine with traditional care, (c) sharing cancer data with providers using patient authorized access, (d) cancer registry sharing to aggregate observations in cancer cases, (e) management of patient digital identity for better patient record matching, (f) personal health records for accessing and controlling complete health history, and (g) adjudication automation of health insurance claims to surface error and fraud.

Blockchain’s value in health care extends beyond security and privacy (Marr, 2017). As a common database of health information for clinicians, hospitals, and patients to access at all times, its use can result in increased clinician time for patient care, more sharing of research results for new treatments, enhanced drug development through result accessibility, and minimization of claim and billing fraud. Figure 2 outlines one possibility for the use of blockchain in regard to patient record management and access. Having ensured and easy access to their health care records has enabled patients to share their records with other health care professionals in a seamless, time effective manner.

Most radically, blockchain can transform medical innovation—and perhaps even the prediction and prevention of cancer. A person’s genomic data hold high market value, particularly in relation to efforts to ameliorate cancer (Scott, 2018). In 2018, one start-up that utilizes blockchain technology announced a partnership with a leading molecular diagnostics company to accelerate the prediction of cancer for millions of individuals worldwide (PR Newswire, 2018).

Blockchain and Nursing

In the future, blockchain will also be used for professional nursing issues, and there will be no more issuing of paper certificates that are not verified or authenticated. Future nursing licenses and credentials will also be awarded through blockchain. Nurses will be able to send their blockchain links to regulatory and credentialing bodies or directly to employers without intermediaries, which will be a major cost saving and quality improvement measure (Althausen, 2017; Smolenski, 2018). The potential disruption blockchain will cause to organizations that rely on antiquated systems, paper-based and manually driven processes will be immense. *Nursing regulators, credentialing organizations and professional bodies be warned, disruption has started and will be coming your way soon.*

Nurses and other health professionals will need to advocate for patients to be in control of their data. But to do this, health care professionals will need new knowledge and skills to manage blockchain and other new technologies. Nurses also need to have access to ongoing professional education in relation to this new technology. This entails broad dissemination of information about where reliable and accurate information about blockchain is available, and how nurses as researchers, educators, practitioners, and policy makers applying it to our practice?

Nurses need to understand that patients must be the center of this dynamic universe; they must control their data and approve who accesses it. This will be achieved through increased availability of blockchain literacy programs. As nurses, it is important that we understand the benefits of blockchain and its ability to change the power dynamics in health care delivery,

Blockchain operates on the assumption (and evidence) that centralized systems are not secure, easily corruptible, and vulnerable to cyberattacks. In contrast, blockchain systems are decentralized and not prone to attack because no single control system has the key to the data. This is where blockchain and health care intersect. Blockchain

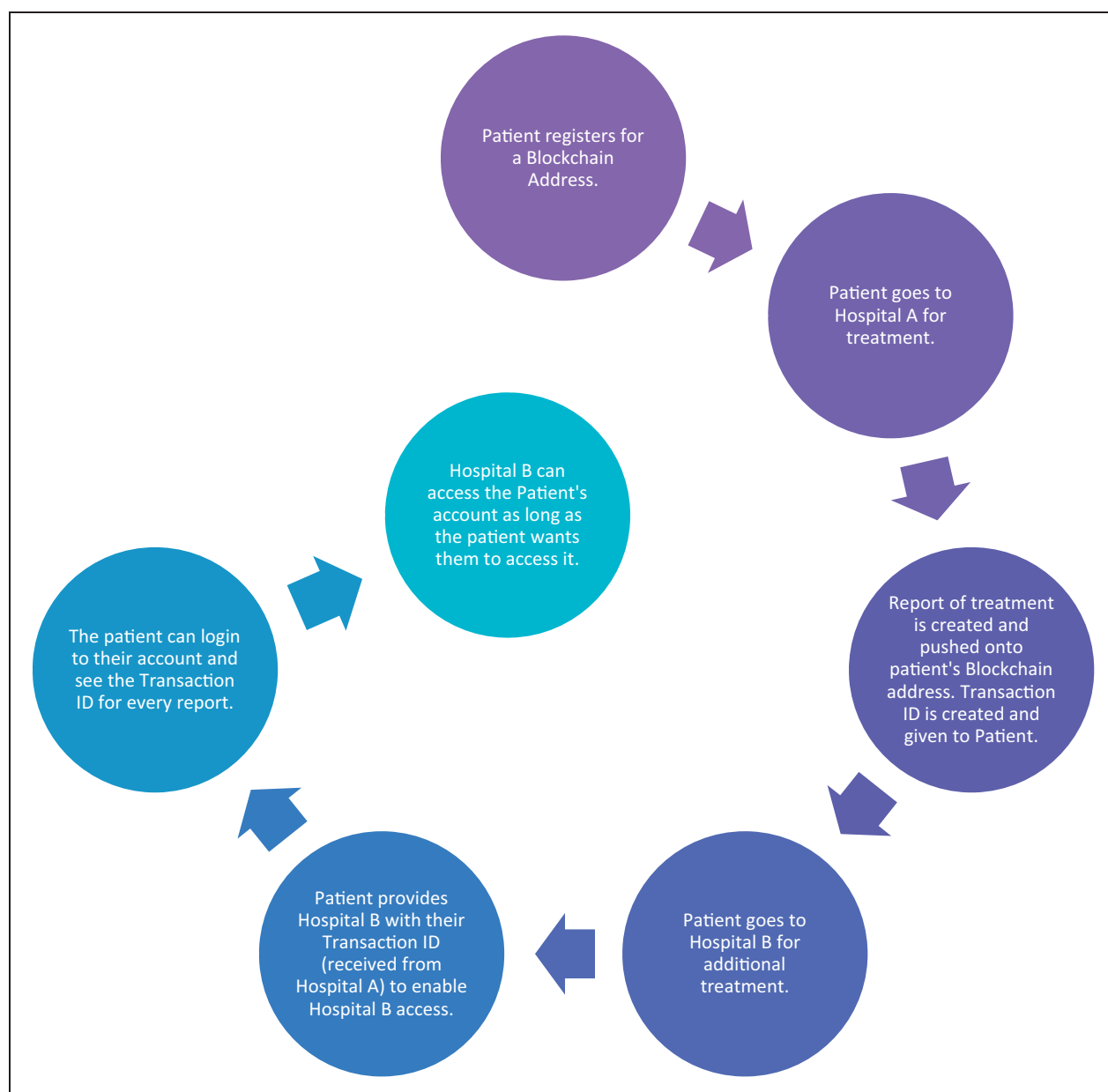


Figure 2. Utilizing blockchain with patient data and records.

networks have the potential to keep data private and secure, even among billions of connected devices.

Blockchain's implications for reshaping health care are its abilities to provide real-time research data when it comes to pharmaceutical safety and trials, auditing and accreditation, compliance, and other processes that are fundamental to health care delivery. With blockchain, patients and consumers become fully in control of their own data, challenging the power of funders, insurers, and administrators of large health care systems. When data are no longer controlled by the heretofore dominant structures in health care delivery, transparency, security, and trust will

prevail as never before. This transparency has enormous potential to illuminate nursing's contributions to care. This includes identifying both cost benefits and inefficiencies.

As nurses, we face ever changing and challenging practice situations. Competency in nursing informatics promises to strengthen our clinical decision-making skills. Informatics will continue to enhance nursing practice. Blockchain has the potential to radically disrupt many industries. Health care is an industry long due for disruption. Are we ready for this disruption as nurses? Are we involved in discussion and policymaking within our profession, practice settings, and with our

patients? Some people refer to blockchain as the fourth revolution. The first three being the steam engine, the age of science, and mass production. Watch this space as the fourth revolution emerges and reaches all patients and nurses around the world.

References

- Althausen, J. (2017, September 2). *Illinois government pilots blockchain technology for birth certificate digitization*. Retrieved from Cointelegraph: <https://cointelegraph.com/news/illinois-government-pilots-blockchain-technology-for-birth-certificate-digitization>
- Bakken, S. (2001). An informatics infrastructure is essential for evidence-based practice. *Journal of the American Medical Informatics Association*, 8(3), 199–201.
- Blockchains: The great chain of being sure about things. (2015, October 31). *The Economist*, pp. 21–24. Retrieved from <https://www.economist.com/briefing/2015/10/31/the-great-chain-of-being-sure-about-things>
- Engelhardt, M. A. (2017). Hitching healthcare to the chain: An introduction to blockchain technology in the health care sector. *Technology Innovation Management Review*, 7(10), 22–24. Retrieved from https://timreview.ca/sites/default/files/article_PDF/Engelhardt_TIMReview_October2017.pdf
- Linn, L. A., & Koo, M. B. (2016). *Blockchain for health data and its potential use in health IT and health care related research*. Retrieved from <https://www.healthit.gov/sites/default/files/11-74-ablockchainforhealthcare.pdf>
- Lippincott Solutions. (2016, February 17). *Where caring and technology meet* [Blog post]. Retrieved from http://lippincotttsolutions.lww.com/blog.entry.html/2016/02/17/where_caring_andtec-vXWt.html
- Marr, B. (2017, November 29). This is why blockchains will transform healthcare. *Forbes*. Retrieved from <https://www.forbes.com/sites/bernardmarr/2017/11/29/this-is-why-blockchains-will-transform-healthcare/#5e91c8e11ebe>
- Murphy, J. (2010). Nursing informatics: The intersection of nursing, computer, and information sciences. *Nursing Economics*, 28, 204–207.
- PR Newswire. (2018, March 6). *Shivom partnership with genetic technologies will enable better cancer prediction and prevention through mass genomic data analysis*. Retrieved from <https://www.prnewswire.com/news-releases/shivom-partnership-with-genetic-technologies-will-enable-better-cancer-prediction-and-prevention-through-mass-genomic-data-analysis-675989513.html>
- Sembroiz, D., Ricciardi, S., & Careglio, D. (2018). A novel cloud-based ItoT architecture for smart building automation. In M. Ficco & F. Palmieri (Eds.), *Security and resilience in intelligent data-centric systems and communication networks* (pp. 215–233). Barcelona, Spain: Academic Press.
- Scott, M. (2018, March 12). *What can blockchain technology mean for cancer prediction and prevention*. Retrieved from Nasdaq: <https://www.nasdaq.com/article/what-can-blockchain-technology-mean-for-cancer-prediction-and-prevention-cm933364>
- Smolenski, N. (2018, February 22). *Introducing blockcerts* (YouTube). Retrieved from https://www.youtube.com/watch?time_continue=4&v=5wAyS1e_hOo
- Zhang, P., Schmidt, D., White, J., & Lenz, G. (2018). Chapter one-Blockchain technology use, cases in healthcare. *Advances in Computers*, 111, 1–41. doi:10.1016/bs.adcom.2018.03.006.

Frances Hughes, RN, DNurs, CMHN, FAAN, FACMHN, FNZCMHN, ONZM
Center for Health Outcomes and Policy Research,
University of Pennsylvania, Banyo, Australia

Monique J. Morrow
The Humanized Internet, Switzerland