**Executive Briefing: Blockchain Applications in the Health Information Management**

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Within the realm of health information management, both proposed and currently operational blockchain projects provide clues for useful applications in libraries and information organizations. This should not be too surprising given the close historical relationship between medical information management and librarianship.

Within healthcare, blockchain continues to rapidly move from theoretical discussions to specific applications impacting areas as diverse as pharmacology and medical device supply chains, recruitment of patients for clinical trials, and improving security and interoperability of medical devices. In the realm of health care, blockchain is a reality now.

This is partly possible because of standards for medical information interoperability, equivalent conceptually to those in library and information science. For example, FHIR – Fast Healthcare Interoperability Resources – is a developing standard that defines data formats and elements, along with providing publicly accessible application programming interfaces (APIs) for the purpose of exchanging electronic health records (EHR). It is the health care equivalent of a completely normalized MARC with predefined access interfaces. FHIR offers the potential to extend EHRs outside the constructs of traditional electronic health care systems to mobile and cloud-based applications, medical device integration, and flexible/customized healthcare workflows.

This flexibility is important because blockchain technology will allow health data to be collected over the life of an individual. The benefit to the patient is a complete medical record that accurately details one’s lifetime health history. As the patient could make this data available to any health care provider, individual health outcomes should be improved. Furthermore, agglomerated data could also improve research as as a rich base of information to be analyzed to help predict future health concerns at the population level.

A critical factor in this approach is the patient has control over who has access to their data. They can provide access at varying levels, from full access to all of their health records to just a limited subset based on the application. A patient visiting their dentist can restrict their health data to just those aspects that would be relevant for dental practice, for example. Similarly, patients participating in research, such as drug trials, can limit the amount and type of data that is made available to researchers as well as what personal information the researchers can subsequently share. This same type of disclosure scheme could be applied within bibliographic systems to allow the patron to control their personal information as appropriate to the context, such as opting out of sharing circulation or electronic journal access information from recommender systems.

Currently, much work is being done on creating an environment where, eventually, a common database of patient information could be built using blockchain technology. This same idea could be applied to libraries and information organizations through the use of a common database of user information allowing for a common patron database that would allow universal access across library systems.

Looking at some current, real world applications of blockchain in health information management that provide a baseline of functionality that could be used in library and information science, we find:

* Provider directory services – a joint project between Optum, Quest, and Humana to provide common, distributed health plan provider directories. That is, a mega-directory of health care professionals within specific health care systems. This is a good example of an application that is trying to address the multiple sources of truth problem through reconciliation between those sources[[1]](#endnote-1).
* Validation of patient identities - a project by the government of Estonia to create a blockchain-based framework to validate patient identities[[2]](#endnote-2). All citizens are issued a smartcard, which links their EHR data with their blockchain-based identity. In light of recent concerns about scheduling fraud at the Veterans’ Administration and the risk for data manipulation of implantable medical devices, such as pacemakers, such a system has several potential benefits to guarantee that any modifications to the healthcare record are secure and auditable.
* MedRec, a project between MIT Media Lab and Beth Israel Deaconess Medical Center which provides a decentralized platform for managing permissions, authorization, and data sharing between healthcare systems[[3]](#endnote-3).
* Data Provenance Toolkit – A toolkit being developed by RAIN Live Oak technology to support the creation & validation of provenance records[[4]](#endnote-4). While focused on health technology, this application could be useful in a number of other settings including library and information science.

A major benefit of blockchain for EHRs is that an immutable audit trail guarantees the integrity and provenance of data. Once a transaction is committed, it cannot be changed which guarantees the integrity of the transaction data as well as the provenance of the data. Records are “signed” by the source which allows legitimacy of records to be verified and false records to be plausibly denied. Furthermore, security and privacy are increased because data is encrypted in the blockchain and can only be decrypted using the patient’s private decryption key. Even if the network is infiltrated by a malicious party, there is no practical way to read patient data.

As is clear, the basic architectural features of blockchain such as the immutability of transaction logs are of benefit to EHRs. This is true in libraries as well, such as in the context of demonstrating provenance; however, this also poses issues where data needs to be forgotten, such as with circulation and access information. Nonetheless, current applications such as health data exchanges can be examples for creative initiatives to share common data, such as using health data reporting models as a basis for a common library reporting system to gather data for advocacy and efficacy initiatives.

Clearly, much work is already going on that could be applied to applications in library and information science. The challenge will be how to best repurpose that work rather than reinvent the wheel.

1. <https://www.distilnfo.com/payer/2018/04/04/optum-quest-and-humana-in-blockchain-deal-to-improve-doctor-directories/> [↑](#endnote-ref-1)
2. <https://e-estonia.com/solutions/healthcare/e-health-record/> [↑](#endnote-ref-2)
3. <https://medrec.media.mit.edu/> [↑](#endnote-ref-3)
4. <http://www.liveoaktech.net/about.html> [↑](#endnote-ref-4)