Using Blockchain Technology for Healthcare Administration

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A Place in Health IT and/or Healthcare Related Research

Several organizations have focused on Blockchain applications related to medical record and clinical data access and exchanges.[1] These are, of course, excellent candidate uses of Blockchain and HHS should certainly focus on these efforts.

However, in this paper, we'd like to highlight the less glamourous aspects of healthcare: the industry's complex administrative processes. For example, health insurance companies and managed care plans, must collect and maintain detailed data about their providers for several reasons; including state and federal laws, provider contracting, claims payment, state and federal reporting (so-called: "encounter reporting"), care quality measures, etc. This provider data includes demographic, office locations, specialty, hospital affiliation, office hours, languages spoken, etc.; and all of this information changes with varying frequency. Whole companies and industries are built in the health industry solely dedicated to furnishing accurate provider data to health insurers, MCOs, State Medicaid Agencies, and other "health payers". In short, provider data collection and maintenance is the bane of the industry, negatively impacting both payer and provider.

See Figure 1 on page 4, depicting a Blockchain system that would allow all authorized participants to have the most current, validated provider information available.

For example, a Primary Care Provider (PCP) could post ledger entries with his/her Tax ID number, National Provider ID (NPI), and other demographic and clinical specialty information. This information could be used by health plans for purposes of contracting with the provider, and could be used by other providers for purposes of referrals, care coordination and care transition (e.g. patient transitions from hospital to outpatient physician care).

The Provider Blockchain could also be used by health plans for the growing trend in "Alternative Payment Methods".

For example: suppose Dr. Jones has a smart contract with General Health Insurance on the Blockchain. Last quarter, Dr. Jones hit his HEDIS targets for General. An oracle is built to General's system (or perhaps to the local Health Information Exchange), signaling that Dr. Jones has met those HEDIS goals, and cuing the smart contract to pay Dr. Jones his bonus.

The Provider Blockchain could also have applications for Primary Source Verification. For example, an oracle connected to the Drug Enforcement Agency might update Dr. Jones' Blockchain ledger entries with his latest license information, allowing a credentialing verification organization to confirm Dr. Jones' DEA license for primary source verification.

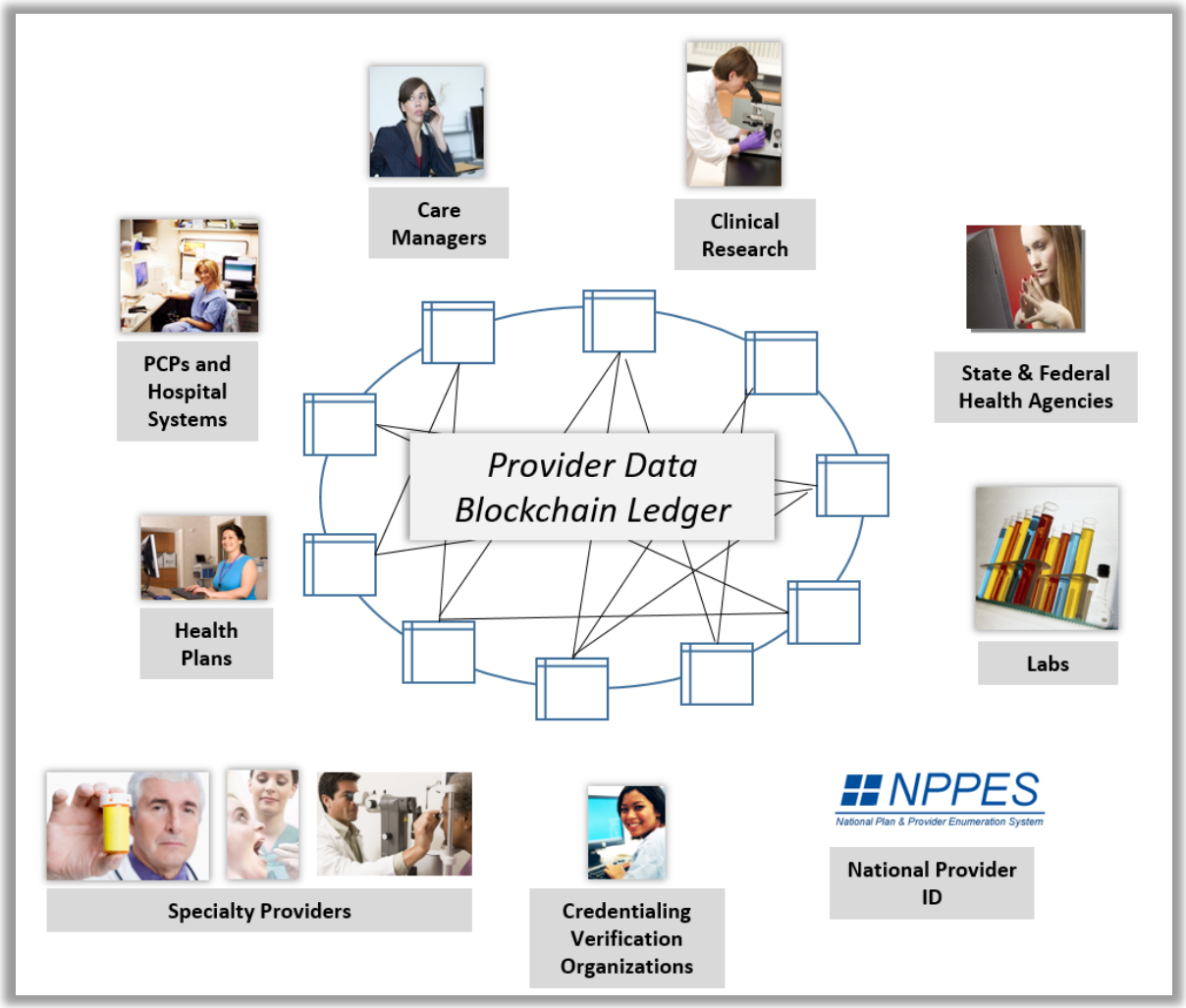
A similar Blockchain approach could be used for health plan members: that is: a Blockchain of "health plan eligibility". For example, if John Smith is enrolled in Medicaid, the State's Medicaid Agency could update Smith's records on the Blockchain by indicating eligibility. Then authorized parties (e.g. health

[1] See, for example the Gem Health Network, and Deloitte's work with SNS Bank NV.

plans, providers) can verify Smith's Medicaid participation anytime they want. No "HIPAA 834 feed" would be necessary.

Above are just two of numerous ways that Blockchain could significantly impact the "administrative" side of health care.

Figure 1


Care Managers
Clinical Research
PCPs and Hospital Systems
State & Federal Health Agencies
Provider Data Blockchain Ledger
Health Plans
Labs
Specialty Providers
Credentialing Verification Organizations
NPPES
National Plan & Provider Enumeration System
National Provider ID

Value of Blockchain to the Healthcare System

There are innumerable and profoundly impactful potential applications of Blockchain technology in healthcare: a natural consequence of the fact that Blockchain's innate characteristics seem almost custom made to support the fundamental aspects of the health care industry.

First, take a look at these four central Blockchain characteristics[2]:

Blockchain Characteristic	Short Description
Distributed Ledger	A distributed database that exists as one logical "ledger" but also as countless physical copies across a worldwide network.
Consensus	Systematic means of all participants in the ledger above to agree with each transactional update, with each update being immutable and permanent.
Cryptography	To protect the privacy of ledger data, authenticate each participant in the Blockchain, and protect the integrity of each transaction.
Business Logic	"If this then that" rules that can act on any transaction in the ledger.

Now let's see how the above fit with healthcare's operational aspects:

Blockchain Characteristic	Example Aspects of Healthcare Served by Blockchain Characteristic
Distributed Ledger	Data must be shared amongst geographic and organizationally fractious organizations: Patient, Doctor, Specialist, Lab, Hospital, Health Insurer, Care Manager, Family members, etc.
Consensus	Following from above, the "extended care team" (the patient, his/her doctor, lab, pharmacy, etc.) need to be on the same page when it comes to the pertinent health information of the patient. In other words: in health care we have a wide array of people needing access to timely, but volatile, information.
Cryptography	Demographic, clinical, and "social determinant" data related to a patient change frequently, thus we need to ensure that data posted to the ledger has integrity. Example: if a pharmacy posts a prescription refill on the patient's ledger, it is the hashing function in Blockchain which validates that a particular pharmacy posted that refill update to the ledger. It's vitally important that a patient and provider's identification is valid when looking at medical information, and Blockchain's use of private/public key authentication ensures that a person is who he says he is. Of course privacy is of fundamental concern in healthcare, and it is cryptography which also protects the health ledger entries of a patient from unauthorized parties.

[2] Source: IBM

Blockchain Characteristic	Example Aspects of Healthcare Served by Blockchain Characteristic
Business Logic	Healthcare administration is enormously complex, with time dependent rules on a patient's eligibility for benefits, the rendering provider, the place of service, the coordination of a patient's potentially multiple health plans (e.g. Medicare, Medicaid, commercial insurance), the provider's credentials, etc. Blockchain allows complex rules (also known as "smart contracts") to be an integral part of each ledger entry.

The "Example Aspects" offered above are just that: examples. The number of health care process scenarios supported cogently by Blockchain technology are arguably limited to one's imagination. However, in general, the Blockchain is suited to any industry where an often short lived team comes together to access data and contribute to that data, where data integrity and confidentiality are paramount – in other words: ***healthcare***.

Potential gaps in standards created and/or resolved by the use of Blockchain

From a health care administrative perspective, the standards most prominent are the HIPAA transactions and codesets (including ICD-10) and HL7. However these standards really represent "payloads" with respect to Blockchain, and could feasibly be included in Blockchain entries themselves (as opposed to having pointers from the ledger entry to the data), because these are not massive data objects.

The "standards resolved" by Blockchain includes the ability to have information constrained in proprietary (and often closed) provider and payer systems – and to make this information available on the General Ledger.

Effectiveness of Blockchain to function in the "real world."

Clearly the primary consideration is exposure to a hack (such as the recent hack attacking the Ethereum DAO). That's why we believe another attractive reason to focus on health administration (as opposed to direct health delivery) for initial Blockchain deployments is the lower downside risk to patients. In other words: having a hack impacting the clinical information accessed by a provider is more risky to the patient's immediate health than information concerning the patient's health insurance.

Blockchain's Support for Healthcare Delivery Priorities

Healthcare Delivery Priority	How Blockchain supports the priority
Nationwide Interoperability Roadmap	Section J: Secure, Standard Services – cryptography and public/private key encryption is built into the Blockchain. Section L: Accurate Individual Data Matching – via the use of Blockchain's cryptography and consensus capabilities.

Precision Management Initiative	Cryptography ensures confidentiality of the patient records on the Blockchain, while still allowing that data to be used by qualified providers when checking on a patient's genomic information, etc. in care planning.
Patient Centered Outcomes Research	Blockchain would allow the collation of medical records while not knowing "who" the patient is.