



Blockchain, meet healthcare

By John Fox | April 4, 2018

John D. Halamka, M.D., chief information officer of the Beth Israel Deaconess Medical Center in Boston and dean of technology for Harvard Medical School, explains blockchain technology and its potential uses in healthcare to athenaInsight editor in chief John Fox. We're feeling less confused now, and hope you will, too. – The editors



Halamka

Q ▪ John, I know what the word “block” means, and I know what the word “chain” means, but when you put those two words together, I’m deeply confused. Could you give us a 30,000-foot definition so that I can say, “Okay, I get blockchain.”

A ▪ Let’s look at banks, which we are forced to trust because there hasn’t been an alternative. But a bank is one corporation. A corporation can come and go. A corporation can falsify a corrupt record.

The whole blockchain concept came out of the idea, as an alternative, of a decentralized public ledger: A network of thousands of independent server farms. And then, add to that, an algorithm that says once something is written to this chain, it can never be erased or altered.

And, by the way, let’s put in cryptography that ensures integrity. And the chain is in thousands of different places, so there’s like absolutely no way any part of the record could be faked. The blockchain is decentralized, incorruptible recordkeeping.

Q ▪ **Baby steps here, John. How does cryptography work in blockchain?**

A ▪ Boy, I hate to use this example because I'm a vegan: You can make corned beef hash from a cow, but you can't make a cow from corned beef hash.

There's a function in cryptography called a "one-way hash." It is a mechanism of transferring data from a large sum of stuff into a small representation of it. That's a one-way transformation. There's no way you could take the hash and recreate the original data.

That's the function we use in blockchain to say, "We've taken a large amount of data – a note in a medical record, for example – and reduced it to a few characters. And you can't reverse-engineer it. And we put that in the blockchain. It guarantees that the note is as we said it would be."

So this is really what the blockchain is: A public ledger, widely distributed, using cryptographic functions that ensure the data is not altered.

Q ▪ **And remind us again how blockchain is going to fix everything.**

A ▪ So I'm now the editor-in-chief of a new journal, Blockchain in Healthcare Today. In my editorial in the premiere issue, I say, "Let's be really careful when we use the term 'blockchain' in healthcare. Because it's not going to save us all. But there are a number of use cases where it's actually very helpful."

Q ▪ **And those are?**

A ▪ I know this is going to sound crazy, but, on occasion, physicians are sued for malpractice. And when that happens, a plaintiff attorney will say, "Seven years ago, this happened to my patient. Send me every medical record you have from seven years ago." And we do. And they say, "Oh, no, these are fake. Somebody changed them, redacted them because they're covering up their error."

We can say, "That's not possible. I'll print the audit trail for you." But the attorney responds, "The audit trail is fake, too. The doctor paid a programmer to go into the source code," and so on.

But imagine this scenario instead: A clinician writes a note, seals a record, and a hash – a data input/output function – of that record is written into a blockchain.

Seven years go by. An attorney request medical records, and you say, "Here's the public ledger that's been there for seven years with a hash value. Here's today's medical record that I'm sending you. Note the hashes match, proving it could not have been altered in any way, shape, or form over seven years."

Q ▪ **Is blockchain going to replace electronic health records?**

A ▪ Absolutely not. How many transactions a second at Beth Israel Deaconess do we have in our EHR? 12,000. What is the total throughput of the blockchain today? Seven transactions a second. Total. For the world. And why? Because of the computational intensity of all that encryption, it just can't get faster than that.

Remember, the blockchain is a ledger of data integrity. It is not a database. So you will continue to have the EHR, whether your database is relational or non-relational, distributed or centralized. The blockchain is just an added layer for some additional functions.

Q ▪ **So how will a physician taking care of patients day in, day out benefit from blockchain technology in the future?**

A ▪ Blockchain is unlikely to replace EHRs. And bitcoin is not likely to be a new professional fee currency. However, blockchain is very useful for proof-of-work, auditing and data integrity.

Blockchain can prove that medical records are complete and unmodified. Blockchain can document what was done and when. Blockchain can record patient consent for data sharing, enhancing interoperability.

Practicing docs can expect blockchain to be an invisible technology behind the scenes that provides enhanced security and information verification as practices increasingly depend upon digitized information.

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