LETTER TO THE EDITOR

What can Blockchain technology bring to oral and maxillofacial radiology?

To the Editor:

Blockchain is known mostly as the technology powering Bitcoin, but the blockchain system, first introduced by Satoshi Nakamoto,[1] is used in many fields today. It is a huge public, secure, decentralized data store. Blockchain technology has brought many innovations to the field of medicine. The purpose of this letter is to emphasize what Blockchain can bring to oral and maxillofacial radiology under the guidance of the current literature. With Internet connections widely available in most places around the world, global information transmission has become quite inexpensive. The application of big data analytics in health care has yielded many positive and life-saving outcomes in radiology, but this has resulted in rising costs in some nations, such as the United States. As Kayyali et al. stated in a 2013 McKinsey & Company report,[2] "After more than 20 years of steady increases, health care expenses now represent 17.6 percent of GDP [gross domestic product]—nearly $600 billion more than the expected benchmark" for a nation with the size and wealth of the United States. Therefore, it is prudent to ask what the Blockchain system promises.

SECURITY

Although securing electronic medical records is a difficult task, it is vital in terms of both ethical and legal responsibilities.[3] Blockchains are implemented in a decentralized network of computing nodes, which makes them robust against failures and attacks. Decentralization also means that no entity owns or controls the blockchain.[4]

DATA STORAGE

Blockchain stores information in blocks that are linked together in a chronologic fashion to form a continuous line: metaphorically, a chain of blocks. If you make a change to information recorded in a particular block, you do not rewrite it. Instead, the change is stored in a new block showing that "x" changed to "y" at particular date and time.[3,4]

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DATA EXCHANGE

The metadata describing each transaction is available to everyone on the system, but that does not mean that the data stored within a blockchain is readable. Blockchain relies on pseudoanonymity (replacing names with identifiers) and a public key infrastructure (PKI), which allow for encryption of the blockchain's contents in a way that is prohibitively expensive to crack. When applying blockchain technology to health data, each of these foundational tenets applies.[4]

In addition to the basic features mentioned above, Blockchain has great potential for other aspects of radiology, as follows:

- It may assist in improving the diagnostic accuracy of radiographs and serve as a decision support tool for radiologists.
- It can improve clinical research quality and may create decentralized autonomous organizations (DAO) that generate smart contracts for sharing and securing patient data. Patients can receive a return on investment and income from these data.
- It can be applied to teleradiology, presenting an integrity check on patient images.[5]
- It can provide great convenience for the integration of artificial intelligence (AI) in radiology. AI holds promise for revolutionary opportunities in radiology but is limited by its requirement of a big data set, creating challenges for patients, developers, suppliers, and promoters. Blockchain facilitates secure transfer of great amounts of information between data holders and the centralized data store.[6,7]

In conclusion, Blockchain technology is poised to bring many innovations to the field of radiology. Therefore, oral and maxillofacial radiologists and radiology technologists should be aware of the current and possible future applications of this technology.

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REFERENCES

1. Nakamoto S. Bitcoin: A peer-to-peer electronic cash system, (2008). http://bitcoin.org/bitcoin.pdf.
2. Groves P, Kayyali B, Knott D, Van Kuiken S. The 'big data' revolution in healthcare: accelerating value and innovation. *McKinsey & Company Report*. 2013.
3. Centers for Disease Control and Prevention. HIPAA privacy rule and public health. Guidance from CDC and the US Department of Health and Human Services. *MMWRSuppl*. 2003;52:1-17. 19-20.
4. Ivan D. Moving toward a blockchain-based method for the secure storage of patient records. In: *Proceedings of the ONC/NIST Use of Blockchain for Healthcare and Research Workshop*, Gaithersburg, MD. ONC/NIST; 2016:1-11.
5. McBee MP, Wilcox C. Blockchain technology: principles and applications in medical imaging. *J Digit Imaging*. 2020:1-9.
6. Krittanawong C, Rogers AJ, Aydar M, et al. Integrating blockchain technology with artificial intelligence for cardiovascular medicine. *Nat Rev Cardiol*. 2020;17:1-3.
7. Mamoshina P, Ojomoko L, Yanovich Y, et al. Converging blockchain and next-generation artificial intelligence technologies to decentralize and accelerate biomedical research and healthcare. *Oncotarget*. 2017;9:5665-5690.