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# Healthcare Futures: Opportunities, Challenges and Risks in a Blockchain-Driven Environment

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Economic studies show that medical innovation, particularly in the form of new medicines, reduces the average cost of care and, often, total healthcare spending.[1] In fact, the use of such new medicines also generates additional years of healthy living that translate into increased productivity and well-being.

However, insurers and government-funded health systems such as Medicare have tried to manage the short-term rise and fluctuations in health spending using approaches that reduce consumption of new therapies. Over the past decade, such market participants have tried to lay off risk by managing the surge and by imposing out-of-pocket costs, demanding rebates off the list price of medicines, and, increasingly, refusing to pay for new drugs altogether.[2]

In January 2026, Medicare price controls for some of the most prescribed medications for senior citizens across cardiology, metabolism, inflammation, and cancer will take effect through "Maximum Fair Price" mechanism that is part of the U.S. Inflation Reduction Act 2022.[3]

Meanwhile, biopharmaceutical companies and investors must charge higher prices. Because the main methods of restructuring, merging, or acquiring other firms are also costly and might not guarantee success in managing the financial risks of product development.

Finally, new medicines, immunotherapies, vaccines, and gene replacement are increasingly the first-line treatments because they cure or prevent disease. These innovations are likely to be very expensive in the short run. Yet, here too, the innovators face the same challenge as payers: how to maximize the long-term benefit of medicines that reduce hospitalization and physician costs and minimize the up-front costs of these treatments.

Developers, investors in new medicines, and their customers have a way to benefit from the value of downstream savings and health improvement generated by substituting older technologies for new ones and then being able to trade increments of short-term upstream investment for long-term gain. In other industries, contracts for specific products are traded to hedge risks in price and cost fluctuations. Buyers and sellers of products ranging from energy to weather futures create a market-based forum where risks are managed through price discovery and risk transference. In these industries, the development of financial instruments is predicated on an in-depth understanding of component costs. Such futures markets require indices that reflect the costs of specific products, which in turn could serve as the basis for futures contracts. These indices would allow stakeholders to hedge against potential cost increases, thereby ensuring financial stability and predictability.

## Benefits of Hedging in Healthcare

Futures contracts based on a well-constructed health improvement index could offer significant benefits. For healthcare providers, such tools could provide a hedge against rising drug prices and other variable costs, ensuring that budgeting remains stable despite fluctuations in the market. This approach not only aids in direct cost management but supports strategic financial planning across the healthcare industry.

Past efforts to create a health futures market failed because of a lack of reliable data on health spending, which is necessary for developing financial instruments. We believe that the convergence of blockchain technology and the availability of detailed data on health status, outcomes, and costs from medical claims and electronic health records provide a solution to the problem of uncertainty.

Current financial risk management techniques do not provide buyers and sellers of health insurance and medical care services with sufficient protection against unexpected price changes. We believe that in the healthcare environment, blockchain technology can be used to create indexes that accurately track and predict changes in healthcare spending and the social and economic impact of new medicines over time.

## An Edge and a Hedge: How Blockchain Technologies Can Enable Healthcare Futures Contracts

Distributed data technologies in the form of blockchain and related innovations can make it possible to generate financial instruments based on accurate, current, and reliable information that can be used to price such contracts. Patient data, claims information, health records, and pricing information can be stored in and transacted across distributed models that allow for data traceability and authentication, verification of transactions, and persistence of historical data without the risk of manipulation. Coupled with new advances in machine learning and artificial intelligence, these tools can enhance the capabilities of algorithmic models to extract insights from healthcare data and predict the value of futures markets.

Companies such as Chronicled and Curisium offer blockchain-based systems that allow various healthcare sector players, such as pharmaceutical companies, medical device manufacturers, wholesalers, insurers, and healthcare providers, to authenticate their identities, log contract details, and track transactions and payments. These systems go beyond traditional supply chain management by enabling fully digital, and sometimes automated, contract terms between trading partners and insurance providers.

By using shared digital contracts on a blockchain ledger, these systems can significantly reduce disputes over payment chargeback claims, which are common in the healthcare sector due to frequently changing pricing structures. A white paper produced by block chain startup, Chronicled notes that over one million chargeback claims are made annually, with more than 5% being disputed, leading to lengthy manual resolutions.[4] Similarly, shared smart contracts can streamline medical insurance claims management, reducing the 10% of claims that are typically disputed. Once data are digitized and accessible, insurers can apply advanced analytics to optimize health outcomes and costs.

## Establishing a Health Cost Index

A health cost index could be established by linking data from multiple sources across a distributed network, including, as examples, electronic health records, insurance claims, pharmacy records, and clinical studies. A distributed data network and related governance rules for the same can ensure that these data are secure, transparent, and tamperproof.

The health cost index can act as a benchmark for pricing futures contracts and other financial instruments in the healthcare sector. By providing a reliable and transparent reference point, such an index can help standardize pricing and reduce the risk of price manipulation.

Additionally, blockchain enables comprehensive logging of detailed clinical and cost data from hospitals, clinics, and pharmacies records. Continuous updates to the blockchain reflect new data about the cost of treatment and patient outcomes as they become available.

## Cancer Care Cost Index and Futures Trading Using Blockchain

As an example, a cancer care index could be anchored to reflect the average cost per patient per year of $40,000. Suppose a biotech company wants to sell a futures contract for their new cancer drug, with one contract at $50,000 per patient sold in 100-patient increments. This $5,000,000 futures sale generates immediate revenue for the biotech firm in the form of non-dilutive capital. Simultaneously, insurers and hospitals can buy contracts to hedge against the rising costs of cancer treatment.

By purchasing futures contracts, insurers lock in the cost of the cancer drug at $50,000 per patient. This ensures that they are not exposed to potential price increases in the future, providing cost predictability and aiding in budget planning. Meanwhile, if the index value increases, so do revenues that are generated by selling contracts.

More significantly, blockchain can be used to capture longitudinal data to transparently track spending, utilization, and prices, and then generate algorithms that predict the savings generated from using a new cancer treatment. The combination of secure, tamper-proof, and continuously updated data reduces the cost of building and refining accurate and timely algorithmic models for predicting both the social and economic impact of new medicines using a transparent method.

An algorithm is used to predict that spending $50,000 on a new therapy saves $20,000 per patient by reducing hospitalization and the need for at home care. As Figure 1 shows, a healthcare plan can lock in the net cost of the new immunotherapy at $30,000 per patient through a futures contract on the blockchain by paying a margin requirement or a small percentage—from 2% to 12%—of the contract's cash equivalent value to owning the asset, or the total value of the contract. Over the next year, the actual net cost of the treatment (upfront cost minus



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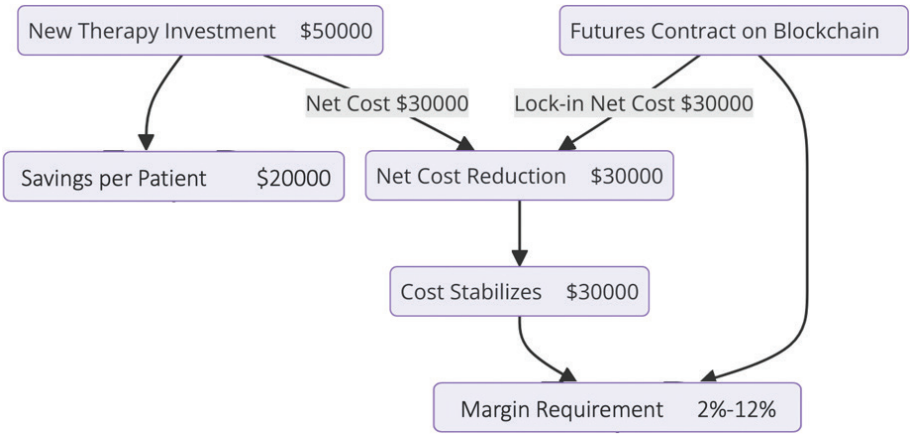


*Fig. 1.* Trading to benefit from improve health outcomes.

savings) stabilizes at $30,000 due to efficient implementation and patient outcomes.

What if the actual cost of the therapy is predicted to drop further after the contract is settled? Both biotech companies and health plans can still use the futures market to hedge against this potential shift.

If biotech companies expect the therapy cost to drop to $25,000, they can sell additional futures contracts at the current price of $30,000. By doing this, they lock in a higher selling price before the drop occurs, hedging against the loss of revenue from the price decrease.

They can also buy put options, which give them the right to sell the therapy at the current price ($30,000) before a specific date. If the price drops, they can exercise these options and sell at the higher locked-in price.

If health plans expect the therapy cost to drop below $30,000, they can buy futures contracts at the $25,000 predicted lower price. In this way, they lock in the future lower price. Once the price drops, they benefit from purchasing the therapy at the lower cost through the futures contracts, which helps them save on treatment costs.

Health plans can also buy call options, which give them the right to purchase the therapy at a lower price in the future. If the cost drops, they can exercise these options and buy at the reduced price, thus hedging against paying higher costs.

Blockchain technology can facilitate hedging for insurers investing in expensive medicines that improve health and reduce costs, even if patients switch to another health plan. At present, there is no method for capturing and transferring that value from plan to plan. Between 15% and 20% of both privately and publicly insured individuals experience coverage disruptions or change plans each year.[5]

## Tokenization of Health Cost Savings and Improved Outcomes

We believe blockchain's full potential to promote hedging is its ability to convert health outcomes and cost savings into small units priced according to an index, thereby allowing biotech companies, insurers, and other market participants to retain downstream economic benefits. For example, if a patient's treatment with an expensive medicine results in improved health and reduced long-term costs, this benefit can be represented as a token.

It is possible to create health futures units by developing smart contracts to automate the issuance, distribution, and trading of tokens based on predefined criteria and real-time data. Smart contracts also automate the issuance, allocation, and distribution of tokens.

Smart contracts have been used to increase trust in and trading of carbon futures. Société Générale, S. A. (SocGen) issued its first green bond on the Ethereum blockchain. The transaction is valued at $10.8 million (10 million euros), with 3-year maturity. The smart contract for the tokenized green bonds includes carbon footprint information and is available for anyone to access. As a result, issuers, investors, and service providers can now measure the carbon footprint generated by financial securities on the blockchain. At the issuer's request, SocGen plans to offer reports on the estimated carbon footprint of its security tokens. These data will be embedded in the smart contract, allowing investors to assess the carbon emissions associated with the infrastructure supporting the tokens in their portfolios.[6]

## Challenges Associated With Developing a Blockchain Futures Index and Contract Trading Platform

Creating a blockchain-based futures index and contract trading platform, particularly for healthcare costs such as cancer treatment, involves several significant challenges. It will be critical to ensure data from multiple sources (e.g. hospitals, clinics, pharmacies) are standardized and consistent. This is critical for accurate indexing. Additionally, inaccurate or incomplete data can lead to incorrect predictions and undermine trust in the platform.

Above all, using blockchain to promote a health futures market requires that the creator of the index and trading platform ensure the security of sensitive healthcare data against cyberattacks and unauthorized access. A recent report from the Royal Society identifies Privacy Enhancing Technologies (PET) that can be used to transparently extract information from private health data in federated learning, zero knowledge proofs, and multiparty computation.[7]

A combination of encryption, permissioned blockchains and data anonymization will have to be used to control access and ensure compliance with privacy regulations. In addition, blockchain adoption is still hindered by the cost and difficulty of ensuring data sharing across diverse systems and institutions. Finally, the development of Application Programming Interfaces that adhere to interoperability standards like the Fast Healthcare Interoperability Resources blockchain will find it difficult to scale up without the establishment of federated data systems.

## Conclusion

Developing a blockchain-based futures index and contract trading platform for healthcare costs presents a range of challenges, from data integrity and scalability to regulatory compliance and user adoption. Addressing these challenges requires a combination of advanced technological solutions, strategic partnerships, and ongoing stakeholder engagement. By overcoming these obstacles, such a platform can revolutionize healthcare cost management and create new opportunities for financial innovation in the healthcare sector.

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## Conflicts of Interest

Dr. Hinkel is Editor-in-Chief, Blockchain in Healthcare Today.

## Contributors

Each author contributed to and approved this work for publication.

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N/A.

## Application of Ai-Generated Text or Related Technology

N/A.

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