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A Survey On Detection of Falsified and Substandard Drugs

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Abstract: A world-wide crisis to public and the consumers with high risks can be drug counterfeiting. The standardization of drug safety has become difficult and is a major concern due to the rise in the number of internet pharmacies. Since the drugs pass through difficult and complex distribution networks, it becomes difficult to detect counterfeits. Thus increasing the opportunities for falsified medicines to enter the actual supply chain. In this particular paper, we are using blockchain technology to mention data immutability to chop back the cost of operation within the pharmaceutical supply-chain hence making it safer. This is often implemented through blockchain technology which might be an allegedly immutable cryptographic ledger which has repeated sequential hashing and is fault-tolerant using a consensus algorithm by adding an alert system thus notifying when there's any fault.

Keywords: Pharmaceutical Supply Chain Management; Counterfeit Drugs; Blockchain Technology

I. INTRODUCTION

Drug counterfeiting is a worldwide crisis with significant risks to end users and also the public. The drug expenditures are adding on to the government's economic burden. However, there are no written proofs, regarding the impact on the distribution of such drugs.

The standardization of drug safety has become difficult and is a major concern due to the rise in the number of internet pharmacies. Since the drugs pass through difficult and complex distribution networks, it becomes difficult to detect counterfeits. Thus increasing the opportunities for falsified medicines to enter the actual supply chain. Recent report from the World Health Organization classified drug counterfeiting as a worldwide problem.

According to a study, approximately 1 in 10 drugs in a low- to middle- income country's markets are falsified or substandard. They are uncontrollable during disease outbreaks. That is when shortages of vital drugs are likely to occur and falsified drugs are presumably to rise.

This project is developed to test a pharma surveillance blockchain system which supports sharing of information in the authentic drug distribution network. Using blockchain, we can enhance the protection by creating an alert on any deviation at any phase during the tactic.

II. RELATED WORK

A. Near Infrared Spectroscopy (NIRS):

The detection of falsified and substandard drugs may be done using technologies like near infrared spectroscopy, which gives us with the simplest way to check the composition of the medicines to check if its authentic or not. Although the film coating on tablets may not have much effect on the spectra of tablets as it is very thin and blister packaging often has a low absorbance so that the NIR spectra of a tablet in its blister packaging and on its own are very similar. This technology is extremely reliable, fast and straightforward which makes it highly penetrating. An advancement in NIRS technology, is predicted to consume lesser amount of time and resources than before.

The same technology resulting in the estimation of a low-cost NIRS device. This uses a library of artemisinin-based combination therapy (ACT) medicines to analyse and determine its usefulness. This being a handheld device is a drug-screening tool which has paved way for Low-cost rapid testing. These NIRS scanners are extremely efficient devices for screening drugs from well-structured brands with quality manufacturing. Less capacity to detect the substitution of falsified products due to small library of spectra is also a reason behind the concern within the technology. However, various

methods are being employed to enlarge the library of spectra.

B. Convolutional Neural Network (CNN)

Using CNN a set of cheap paper cards, called Paper Analytical Devices (PADs), have already been developed which can efficiently classify drugs based on their chemical composition. The average accuracy is more than 94%, and the performance in accurately classifying the PAD images have increased. However, loss of internal data about the pose and the orientation of the object, significantly slower performance and usage of a lot of training data makes this method cumbersome.

C. Internet of Things (IoT) and Blockchain Technology

Some works include the blockchain technology clubbed with the IoT which allows the customers to combine and transparently trade loyal rewards thus leading to more transparency and making it immutable. Although there are gaps within the pharmaceutical supply chain industry, it aims at achieving traceability along with visibility.

D. Blockchain Technology and Machine Learning

Other technologies target on achieving more transparency, this particular technology of Blockchain combined with the Machine Learning algorithm, aims to propose a system consisting of 2 modules and not just 1. One for the drug supply system and another for the drug recommendation makes it not just secure and robust, but also helps in achieving more transparency. The foremost drawback being smaller network size and lesser accuracy, its near goals include increasing the network size and improving the machine learning models with respect to accuracy.

E. Machine Learning

This algorithm presents XRF-Minipal2 elemental composition devise that preforms as fast screening technique in forensic to determine genuine and counterfeited medicine. While a drug dealer is meant to be permissioned by the system for countering Sybil attacks, certificate service provider controls the accesses of participants to the drug dealer. Apart from the fact that it is slightly impractical, it aims on enhancing this technology by adding better traceability.

III. COMPARITIVE STUDY

Developing a Distributed Application (DApp) which runs on smart contracts, employing Swarm as the Distributed File System (DFS). The entire drug supply chain management and recommendation mechanism is introduced with a blockchain network along with its participants where the complete supply chain activities can be managed and updated by users.

The blockchain-based system stores information pertaining to the users of the system suppliers, manufacturers, distributors, doctors, hospitals, pharmacies, and patients. Drug, order, material and record repositories are the major resources of the DSCMR systems.

Detecting substandard drugs using an unsupervised data mining algorithm, which implements a detection model to help the experts.

IV. CONCLUSION

Since the systems aren't robust, the existing methods don't seem to be feasible. To improvise this, implementation of blockchain technology that is an allegedly immutable cryptographic ledger which has repeated sequential hashing and is fault-tolerant using a consensus algorithm with an alert is being proposed. Hence it saves time, resource and the society from the hands of falsified drugs in a more secured manner.

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