# Pharmaceutical Data Protection in Supply Chain Using Hashing

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**Abstract—** ***Pharmaceutical data protection system is a secure system for supplying medicine from company to end user without changing its relevant information and without changing medicine itself. At manufacturing company unit, after packaging of manufactured medicine, unique code as well as hash code will be generated at each level through proposed system with manufactured medicine and its related information. This hash code will be verified at each level of supply chain.***

**Keywords- pharmaceutical; data; security; supply; genuine;**

## I. INTRODUCTION

Drug Counterfeiting is one of the most dangerous and major issues faced in today's world. It is observed from review that the pharmaceutical sector is not widely researched in developing countries because of many complexities in supply chain[1]. For securing chain there are many approaches which includes Hashing[4], Encryption Decryption, MAC, Digital Signature, Blockchain. Blockchain is a decentralized ledger used to securely exchange digital currency, perform deals and transactions.[2] According to World Health Organization (WHO), an estimated 1 in 10 medications in developing and under developed countries are either falsified or substandard. At least a 100,000 to 1 million people die every year due to counterfeit drugs.[7] Data security is the utmost critical issues in ensuring safe transmission of information through the internet.[5] In traditional supply chain[3] sometime Retailer or Distributor change the price of medicine and sell it with higher price, also sometime they change the medicine and sell duplicate drugs with original wrapper.

So, to solve drug counterfeiting problem we make one system for supplying medicine from pharmaceutical company to customer without being change any relevant information such as the, manufacturer date, expiry date, medicine price etc.

In proposed system we use the hashing to identify each user of supply chain like (manufacturer company, wholesaler, medicine shop) and also verify or check the genuineness of medicine information at each level.

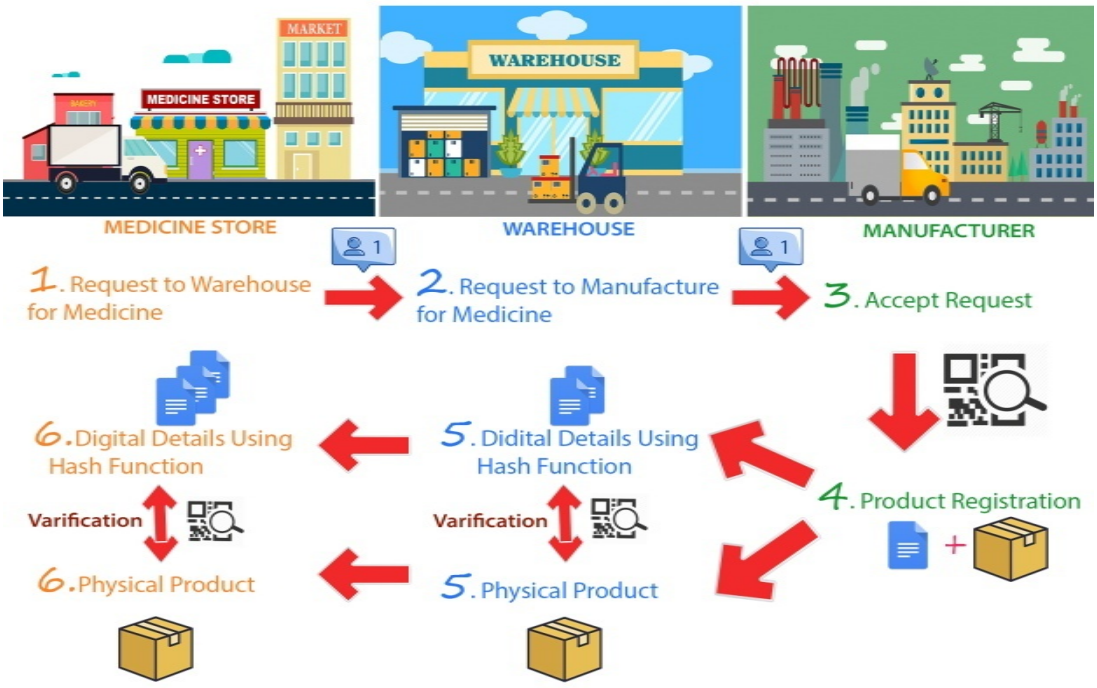



Figure. 1 Supply Chain

## II. LITERATURE REVIEW

Literature on How to Avoid Sell Fake Products Online

A new report has found that five major online retailers - including Amazon, Walmart, and eBay - were selling fake products that can be harmful to your health. Of the 47 products investigators bought, which ranged from Nike Air Jordan shoes to Urban Decay makeup, 20 were counterfeit. Looking for a few red flags will help you protect yourself from purchasing a fake product. A recent report from the Government Accountability Office revealed that products purchased from third-party sellers on five major e-commerce sites could be counterfeit - and harmful to your health. Out of the 47 products - all Nike Air Jordan shoes, Yeti travel mugs, Urban Decay makeup, and UL-certified phone chargers - investigators bought from Amazon, Walmart, eBay, Sears Marketplace, and Newegg, 20 were counterfeit. All of the shoes were authentic, and only one UL-certified phone charger was fake, but it was a whole different ballpark with the other two categories - six of nine Yeti travel mugs and all Urban Decay makeup were fake. It's unknown which products came from which retailer, but it is known that one counterfeit item and one authentic item was purchased from each site. Not only are consumers being duped, they're being exposed to potentially dangerous materials. [8]

## III. PROPOSED SYSTEM

### *A. Algorithm*

Hash Code generated from medicine price, medicine manufacturer date, medicine expiry date**,** medicine unique id etc.

Step 1: START

Step 2: Registration of pharmaceutical company, wholesaler and medicine store/pharmacy

Step 3: LOGIN each user in proposed system.

Step 4: Medicine store/ Pharmacy send medicine request to wholesaler using proposed system

Step 5: Wholesaler accept the request and forward that request to manufacturer company

Step 6: Pharmaceutical company accept the request and supplied requested medicine to wholesaler. At the same time proposed system generate hash code of requested medicine and send it to the same wholesaler.

Step 7: Wholesaler receives medicine stock.

(a) Verify the medicine details with hash code (sent by manufacturer) using medicine unique ID.

(i) If hash code matched then go to step 7(b).

(ii) If hash code not matched then report to manufacturer and go to END.

(b) Generate new hash code for further supply chain and supplied same medicine and new hash code in further supply chain system.

Step 8: Medicine store/ Pharmacy receives the medicine.

(a) Verify the medicine details with hash code (sent by wholesaler) using medicine unique ID.

(i) if hash code matched then go to step 8(b).

(ii) if hash code not matched then report to wholesaler and go to END.

(b) Generate new hash code for further supply chain and supplied same medicine and new hash code in further supply chain system.

Step 9: Customer get the QR code on invoice which is generated by proposed system through medical store/pharmacy. Scan QR code and check the medicine information such as price, manufacturer date, expired date on proposed system. If information is not appropriate then report to manufacturer company using proposed system and goto END

Step 10: END

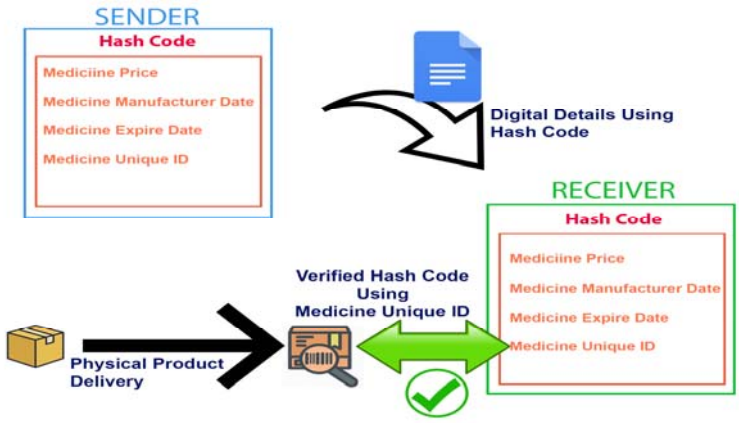



Figure. 2 Hashing and verification Process

*B. Innovative feature*

- Genuine Medicine supply: With the use of proposed system no one can change the medicine information like manufacturer date, expiry date, price etc. If anyone try to change the information then supply chain cannot able to go ahead.

- Detection of person who change the information: If any person change the information of medicine then upper level get the notification that he/she changed the information.

- Customer is able to check medicine details: Customer can able to check whole medicine details by just scanning QR code printed on invoice. Hence, customer also get the information of price and manufacturer or expiry date. And if customer found any wrong medicine the he/she can able to do report.

## IV. SYSTEM DESIGN

### *A. Use Case Diagram*

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses. [9]


Fig. 2 Use Case Diagram

## V. IMPLEMENTATION WITH RESULT

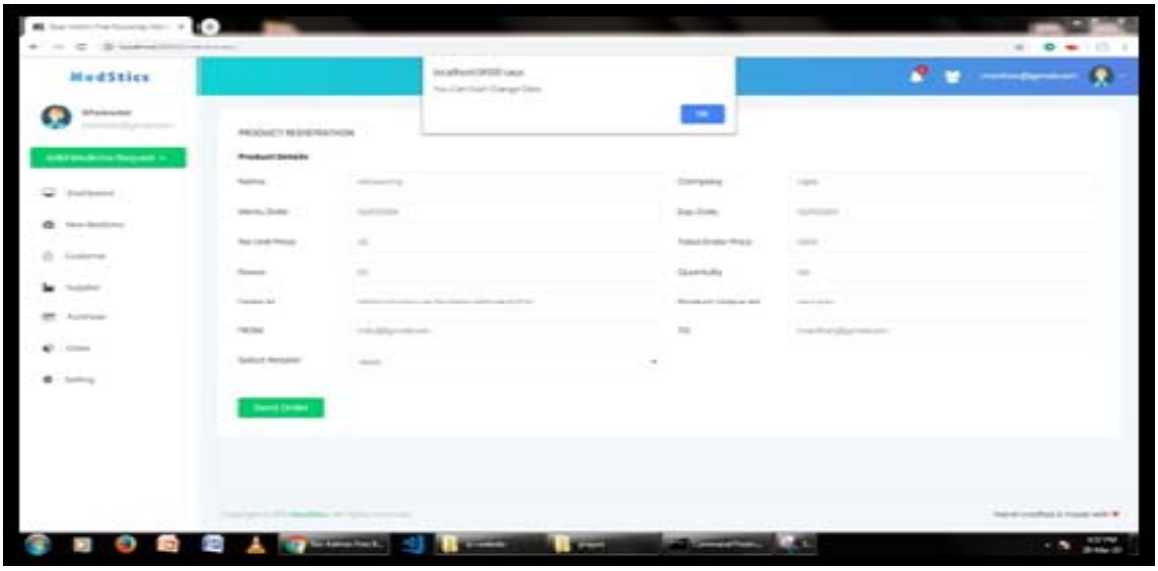
For the implementation of this system we used Django framework with python language and firebase for the database. The following is the comparison table to current pharmaceutical supply chain. For the hashing we use the SHA-256 algorithm as per reference number 6.

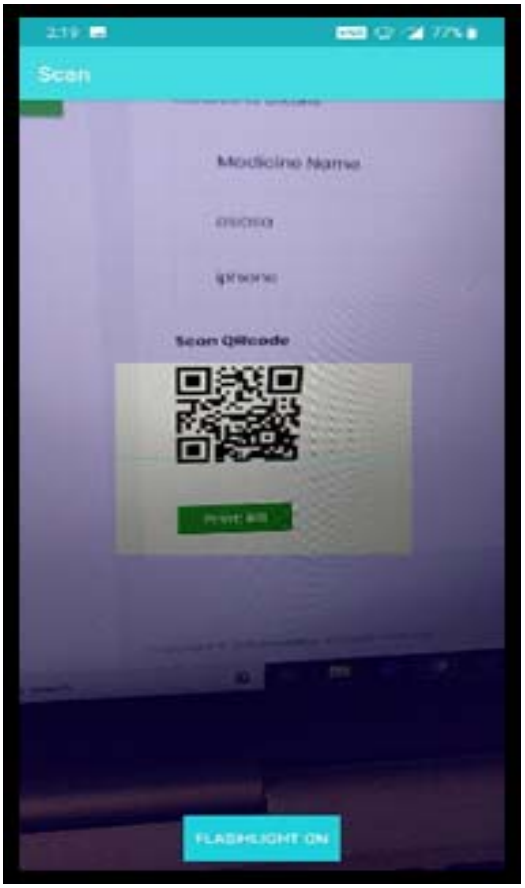
TABLE I. RESULT TABLE

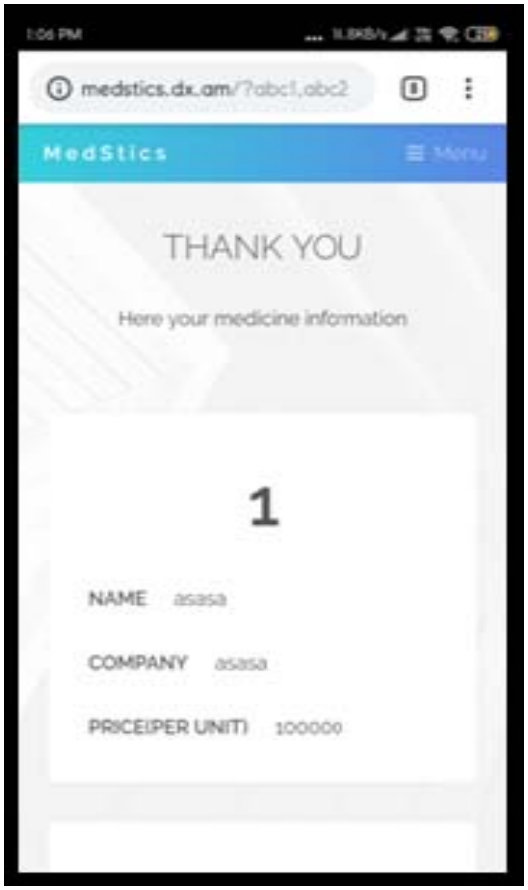
| Sr. No | Parameters | In Traditional Systems* | In proposed System |
|---|---|---|---|
| 1 | Secure Supply Chain | **No** | **Yes** |
| 2 | Any one can change the information of medicine | **Yes** | **No** |
| 3 | Detection of Intruder (a person who change the data) | **No** | **Yes** |
| 4 | Customer can able to check information of medicine | **No** | **Yes** |

* indicates that we have used E2open, SAP SCM, Logility Oracle SCM to compare with proposed system.

## VI. SAMPLE SCREENSHOTS



## VII. CONCLUSION

Pharmaceutical Data Protection, we have tried to develop a system for supplying medicine from company to end user without changing its relevant information or without changing medicine itself. So at company level when medicine is produces there is a secret code is generates from its related information and attach with medicine, and where medicine is reach there can be verification of that medicine using that secret code and if it is changes at any place so we can find that place and we can eliminate that misuse.

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