

Research on the Application of Blockchain Technology in the Design of Analgesic Drug Supply Chain

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Abstract: The supply chain of analgesic drugs has many circulation links and trading levels, and the trading channels are complex; Information asymmetry and low logistics efficiency; Wholesale links account for a large proportion of costs. Too many trading links and complicated trading channels make the trading information asymmetric, opaque and disorderly, which will inevitably lead to the loss of efficiency and benefit in the circulation process. In this paper, the application of blockchain technology in the design of analgesic drug supply chain is studied. The analgesic drug data management center is maintained by the pharmaceutical enterprises themselves or the third party, which is mainly responsible for distributing the unique identification code of drugs, backing up all records of the whole cycle of drug production, storage, circulation and sales, and realizing the two-way traceability function of drugs. In the production process, pharmaceutical enterprises attach electronic labels from single products and outer packaging boxes to realize the traceability and anti-counterfeiting of drugs throughout their life cycle. Correspondingly, it also integrates the advantages and disadvantages of self-management and outsourcing. At this stage, enterprises can choose to subcontract non-core logistics business first, so that enterprises can focus on their core business and avoid wasting too much money and energy in logistics.

Keywords: Blockchain Technology; Analgesic Drugs; Supply Chain Design.

1. Introduction

Chronic pain is a disease that not only manifests as pain, but more importantly, in chronic pain, long-term pain stimuli can in turn cause pathological remodeling of the central nervous system, leading to the progression and increasing difficulty in controlling pain disorders. Early control of pain can prevent or delay the progression of this process. Analgesics are a special commodity that provides patients with the wrong medication, counterfeit or expired drugs. On the one hand, they will pose a serious threat to people's physical health and life safety, further endanger social public safety, and affect social harmony and stability; On the other hand, it will seriously affect the reputation and development of pharmaceutical companies, and even give them a devastating blow. Supply chain is a business process that connects manufacturers, retailers, customers, and suppliers, and enables them to share technology and resources within this process [1-2]. The goal of supply chain management is to coordinate different organizations in business processes by paying attention to changes in demand, in order to ensure that finished products can be smoothly delivered from the production line to customers and profit from it. There are multiple circulation links and transaction levels in the analgesic drug supply chain, and the transaction channels are complex; Asymmetric information and low logistics efficiency; The proportion of wholesale costs is too high [3]. Excessive trading links and complex trading channels result in asymmetric, opaque, and disorderly trading information, which inevitably leads to a loss of efficiency and efficiency in the circulation process. This article conducts research on the application of blockchain technology in the design of analgesic drug supply chains, and improves the safety of drugs through two ways: firstly, strengthening the management of analgesic drug supply chains to reduce the possibility of counterfeit and substandard drugs entering the circulation; The second is to enhance the supervision of

analgesic drug regulatory authorities [4]. The high cost of wholesale inevitably leads to an increase in sales costs, which forces drugs to tend towards inflated pricing and keeps drug prices high. Faced with such huge market demand and problems in the pharmaceutical industry, it is very urgent to have a correct, in-depth, and comprehensive understanding of the current situation of the Huai'an pharmaceutical industry supply chain, and to improve it in a timely manner.

2. Development Status and Problems Analysis of Analgesic Drug Supply Chain

2.1. There are Many Links and Transaction Levels.

Analgesic drugs generally go through 7 ~ 8 links from manufacturers to final consumers. Only the wholesale link generally includes regional general distribution, municipal wholesalers and county wholesalers. In addition, manufacturers often have to set up offices to deal with wholesalers at all levels and hospitals or retail pharmacies. During the operation of analgesic drug supply chain, various information flows shuttle through it, especially with the strengthening of economic globalization, information is more complicated, and various departments, functions and processes will produce and involve a lot of different information [5]. For a blockchain with a growing length, it is almost impossible for an attacker to complete the modification of the corresponding block information. The decentralization of the blockchain and the mechanism of mutual proof by block owners have realized the effective proof of the transaction [6-7]. Wholesalers and factory offices at all levels can directly sell to hospitals and retail pharmacies. Therefore, it is often difficult to monitor the whereabouts of drugs in circulation.

2.2. Large Third-party Pharmaceutical Logistics Enterprises Lacking Operational Experience

At present, although some large logistics companies are optimistic about the pharmaceutical logistics market, such as China Post Logistics, Bonda Logistics, and a few others can provide comprehensive pharmaceutical logistics services, most of the pharmaceutical logistics services are undertaken by logistics companies affiliated with pharmaceutical enterprises, with a single service function. This inevitably leads to the phenomenon of stickiness in information transmission, where various types of information are often stuck around their own information sources, seriously affecting the effective transmission of information [8]. Most pharmaceutical operating companies lack sufficient understanding of the total composition of logistics costs. Often only direct transportation and warehousing costs are seen, while management and inventory costs are excluded from logistics costs. However, analgesic blockchain itself is an information technology that relies on networks and encryption algorithms as its core. Therefore, there are still many technical problems that need to be solved at present. For users with limited knowledge of network security, its operation is not yet completely friendly [9]. Excessive inventory and slow turnover of working capital not only become the main factors that increase logistics costs, but also become important factors that affect the competitiveness of pharmaceutical enterprises.

2.3. Wholesale Links Account for a Large Proportion of Costs

In addition to the above reasons, the high cost of wholesale is another important factor in China's unique "reverse adjustment" mechanism of drug prices. Because of the consumption characteristics of medical commodities as special commodities and the market characteristics of hospitals as strong buyers. When an overall task is decomposed into different processes and functional departments, these tasks will have different requirements for different functions, departments and processes in terms of completion time, operation mode and resource allocation, which makes each functional organization tend to consider and deal with problems from its own perspective, ignoring the role and cooperation of other functional departments or processes. The organizational domain of supply chain management of analgesic drugs is not static, that is, it is necessary to dynamically and automatically discover and integrate high-quality members that can enhance the competitiveness of the supply chain, remove eliminated members, and realize the organizational dynamics of supply chain management [10]. Driven by the unique interest mechanism of "taking medicine to support doctors" in China's medical institutions, a unique "reverse adjustment" mechanism of drug prices has been formed, that is, the higher the price of drugs, the more profits hospitals make, and the more kickbacks doctors give, which in turn leads to the higher product pricing of enterprises.

3. The Application of Blockchain Technology in the Design of Analgesics Supply Chain

3.1. Promote Collaborative Management of Analgesic Drug Supply Chain

Due to the fact that each link in the analgesic drug supply chain has its own specific target task, if this difference leads to conflicts and conflicts between each link. Even affecting the efficiency of the entire supply chain. So, in the complex process of building an international supply chain, we need to adapt to market demand. Their own abilities and each team complement each other. Maximize benefits and minimize risks. It provides a mechanism for making business and organizational decisions based on principles rather than power, and is an important source of competitive strength in the analgesic drug supply chain. The entire activity cycle of analgesic drug supply chain management involves multiple entities such as government regulatory departments, data management centers, pharmaceutical companies, drug logistics providers, hospitals, pharmacies, and consumers, as shown in Figure 1.

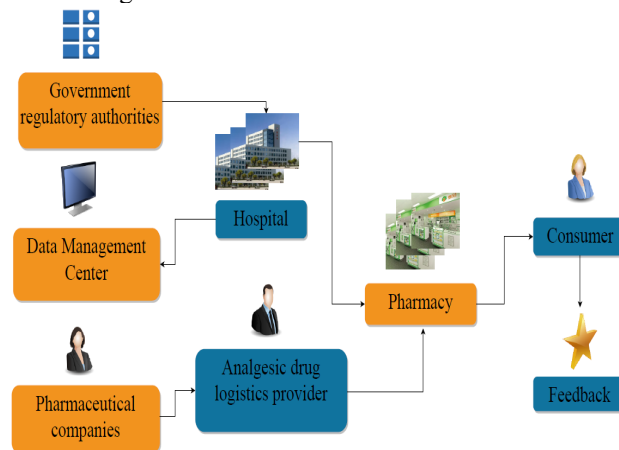


Figure 1. Entity Elements of Analgesics Supply Chain Management

The Analgesic Drug Data Management Center is maintained by pharmaceutical companies themselves or third-party organizations, mainly responsible for assigning unique drug identification codes, backing up all records of drug production, warehousing, circulation, and sales throughout the entire cycle, and achieving bidirectional drug traceability function. This means that the modification of the service implementation automatically integrates newly modified functions when it is called, truly making the modification of the internal function implementation of the service transparent to the caller and reducing the complexity of maintenance. The circulation and exchange of drugs provide a material foundation: drug wholesale enterprises are the bridge connecting drug production enterprises and drug sales terminals; the pharmaceutical services and drug consumption provided by hospitals and drug retail enterprises are the key to achieving the value-added of drugs. During the production process, pharmaceutical companies attach electronic labels at multiple levels from individual products and outer packaging boxes to achieve traceability and anti-counterfeiting throughout the entire drug lifecycle.

3.2. Strengthen the Mixed Mode of Combining Self-management and Outsourcing

The mixed mode of self-management and outsourcing refers to outsourcing one or several parts of logistics links, and the rest of logistics links are still done by themselves. Logistics mode adopted by most pharmaceutical enterprises in Huai'an at present. Under the new situation, the dynamic nature of the supply chain makes the business process have to be constantly adjusted. The workflow technology is used to separate the process processing model from the organization model of the supply chain, and the workflow model is encapsulated in the service to achieve automatic adjustment to adapt to the changed business process. To improve the efficiency of collaboration, on the other hand, it can use the competitive pressure of outsourcing market to provide a kind of collaboration power for the unit, so the interface design should be able to modularize the non-core business as much as possible. The flow of analgesic drug supply chain management system through blockchain technology is shown in Figure 2. Pharmaceutical enterprises purchase raw materials and put them into pharmaceutical production according to the demand of specific drug orders. In the production process, electronic labels are attached to the drug items and the outer packaging boxes. After the mounting is completed, the tag is scanned by a special reader on the production line to determine the validity of the tag and bind the database content.

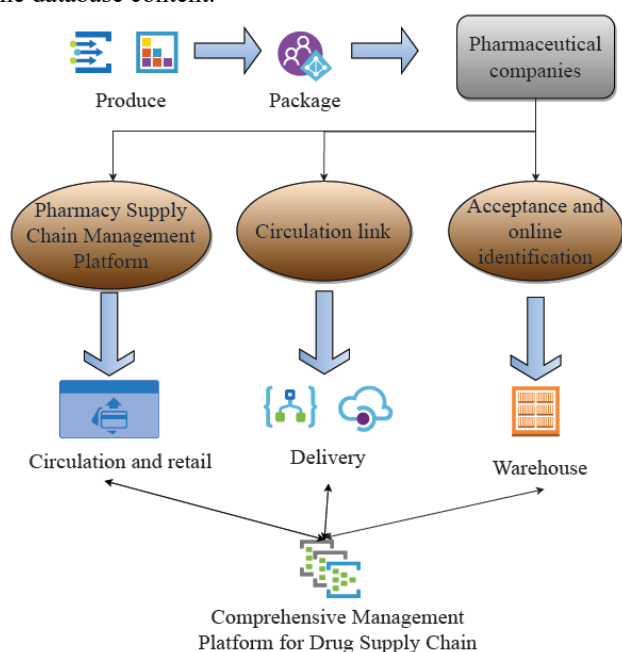


Figure 2. Process of supply chain management of Analgesics Based on Blockchain Technology

After confirming that everything is normal, enter the enterprise warehouse management system and perform management such as inbound, outbound, inventory, allocation, query, and statistics. The drug distribution unit is equipped with a dedicated reader to identify the authenticity of the product and provide detailed distribution information to the drug management center. During the circulation of analgesic drugs, government regulatory authorities use handheld dedicated readers to conduct on-site inspections and identification of any drugs in circulation or on sale, and record the inspection records in the drug management center.

The transaction relationship structure between suppliers,

internal transaction entities, and sellers and customers constitute the supply chain. The transaction process of each transaction entity is implemented on the basis of blockchain technology, which can ensure that the analgesic drug supply chain, which includes a large number of transaction entities, has evidence that can be queried. Correspondingly, it also combines various advantages and disadvantages of self-operation and outsourcing. At present, enterprises can choose to subcontract non-core logistics business first, so that they can focus on their core business and avoid wasting too much funds and energy in the logistics process.

4. Conclusion

Drug therapy is an important aspect of pain treatment, and it is necessary to use analgesic drugs reasonably according to the principle of drug therapy. However, pain treatment is not just drug treatment. When the drug treatment effect is not good, non-drug treatment means such as surgery, nerve block therapy, interventional therapy and psychotherapy are needed to alleviate the pain of patients to the greatest extent. In this paper, the application of blockchain technology in the design of analgesic drug supply chain is studied. The blockchain technology needs to be continuously improved, and a global unified trading system architecture and protocol should be established to improve the convenience of operation, friendly interface and processing speed, and reduce the capacity space required for the storage of analgesic drugs in the supply chain. Realizing the timely and effective tracking and monitoring of drugs in the whole life cycle and process can effectively improve the level of government supervision, achieve the organic unity of pre-prevention, in-process supervision and post-treatment, and realize the full coverage of supervision work; And it can prevent counterfeiting and selling fakes to the maximum extent and improve the ability to deal with accidents. In the future, in the application of analgesic drugs in the supply chain, many problems need to be studied, such as how to effectively and reasonably divide the service granularity within the supply chain entities, how to coordinate the implementation of services among the supply chain entities, and how to evaluate the performance in practical application.

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