Development Trend and Investment Prospect of Intelligent Medication Management in China

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Abstract. With the implementation of the policy of "hierarchical diagnosis and treatment" in China and the gradual establishment of local medical associations, the service capacity of basic medical and health institutions has been improved, and some patients with common diseases will make more use of primary medical resources to relieve the overload of leading hospitals, thus giving rise to the extensive demand for the information management system of primary medical and health institutions, and promoting the expansion of the downstream market of the industry. Catalyzed by the epidemic, new domestic bases are expected to further drive the expansion of the intelligent medication management industry. Therefore, this paper analyzes the current development status of this industry including analysis on which specific area is now the most profitable and which one has the greatest potential in the future. The analysis also includes plights, new trends, and market demands in the industry. Most importantly, the main target is to discuss the prospect of development and potential in investment in this industry in China.

Keywords: Investment prospect; market demand; intelligent medication management.

1. Introduction

The segmented business of intelligent medication management includes intelligent pharmacy, intravenous medication distribution center (hereinafter referred to as "intravenous medication distribution center"), medication consumables management, intelligent dispensing and decocting of traditional Chinese medicine, etc. The market penetration rate of pharmaceutical automation management in China is still low, and the penetration rate of outpatient pharmacy automation equipment reached about 20% by the end of 2018 after the recent development. Compared with overseas developed countries, China still has huge room for improvement. The automation process of the static distribution center is just beginning, which could be a major investment. In addition, the strong support of national policies and the improvement of medical service demand will drive the increasing penetration rate of intelligent medical institutions. At present, China's top three first-class hospitals pay more attention to timeliness (high efficiency) than accuracy, while foreign developed countries pay more attention to accuracy than timeliness. The difference in demand leads to the equipment efficiency of domestic manufacturers being higher than that of foreign equipment manufacturers. The driving force of the increase in domestic penetration rate is the timeliness demand of the big three and the accuracy demand of small medical institutions. This study will discuss in detail the future investment, returns and risks of intelligent medication management industry.

2. Literature Review

It is estimated by International Data Corporation that the total value of the global artificial intelligence (AI) application market will reach $127 billion in 2025, among which the global AI medical is in a rapid growth stage, accounting for one-fifth of the artificial intelligence market [1]. China's AI+ healthcare industry as a whole started in 2014. In 2016, this industry ushered in explosive growth, with more than 30 newly established enterprises and more than 3.2 billion yuan of industry

financing. The overall financing scale of the industry shows an upward trend, which is similar to that of the artificial intelligence industry. At present, compared with the extensive application of artificial intelligence in the medical industry in Canada and the United States, the domestic intelligence big health industry is in the early stage. Samantha McGrail pointed out that medication development has become more competitive and expensive over the years, and the company is looking to AI as a new way to reduce research and development costs while avoiding costly mistakes [2]. Smart pharmacy is one of the ways that healthcare and artificial intelligence combine. Guanyanreport.com also mentioned that the advantages of smart pharmacy are high prescription dispensing efficiency, low dispensing error rate and low labor intensity [3].

Two research reports from Canada, ASHP national survey of pharmacy practice in hospital settings: Dispensing and administration-2011 and Decentralized automated dispensing devices: Systematic review of clinical and economic impacts in hospitals, shows that 53% of Canadian and 89% of United States hospitals, respectively, use automated dispensing equipment. According to the report of the American Society of Hospital Pharmacists in 2020, 74.5% of hospitals in the United States have taken automatic dispensing equipment as the primary plan of medication dispensing [4, 5]. According to Market Segment Research and Trend Analysis of Pharmacy Automation System in China, by 2013, the average penetration rate of pharmacy automation system in developed countries was about 30%, but the performance of each country was different [6].

However, Chinese pharmacy automation is in the stage of rapid development, and the market space is huge. According to the data of QYResearch, the output of automated pharmacies in China increased from 721 in 2015 to 1,074 in 2019, with a compound annual growth rate of 10.5%. The output value increased from 480 million yuan in 2015 to 670 million yuan in 2019, with a CAGR of 8.8% [7]. In the future, with the implementation of new medical infrastructure and strong policy support, it is expected that the output of automated pharmacies in China will reach 2,534 in 2026, with an estimated output value of 1.35 billion yuan [8].

3. Development Situation of the Traditional Medication Management

Traditional pharmacies are somewhat inefficient compared to today's dispensaries, which rely on manual dispensing, are subject to human error, and cannot efficiently keep each medication within its shelf life. The quality of service and working conditions in traditional pharmacies also vary, which can increase patient waiting times. And conventional pharmacies have limited working hours, and when patients are available at night, they cannot purchase medications promptly, and operational efficiency is always a problem. With intelligent medication management products, this series of issues will be significantly improved, providing patients with medicines 24 hours a day and reducing the operating costs of retail pharmacies as well as the work intensity of pharmacists, achieving a win-win situation.

Innovative pharmacies are also being driven to some extent by the epidemic's impact. For example, automated pharmacies can reduce human contact and the chance of pharmacists being infected by viruses, and in some places, an intelligent pharmacy can also reduce the need for medical staff when it is necessary to build a hospital. Traditional pharmacies require several people to work intensively, such as dispensers and storage keeper, but when using intelligent medication management products, only one dispenser can complete the work.

Under the catalyst of the digital economy, pharmaceutical e-commerce is also developing rapidly. Since the sales method of pharmaceutical e-commerce is basically patient self-selection, the accuracy of medications still needs to be higher, so the advantages for traditional pharmacies still exist. But conventional pharmacies still need to be renovated and upgraded to enhance the industry's competitiveness. In particular, traditional Chinese medicine pharmacies are characterized by many medications and are relatively mixed; moreover, they need to pay attention to the storage time of medications. Pharmacists also need to adjust the dosage of medications. Chinese medicine needs to

be decocted and packed by pharmacists, so the workload of pharmacists is more significant compared with that of western pharmacies.

4. The New Trend and Market Demand of Intelligent Medication Managemet

4.1 Development Status

4.1.1 Market structure analysis

In China, the medication intelligent management market is an oligopoly market. Statistics show that by the end of 2018, in the outpatient pharmacy automation market, the shares of Iron Technology and General Healthy Information are close, accounting for 28.5% and 30.2%, respectively. The third to fifth place are Swisslong, Becon, Dickinsonand Tangshan Production Company, respectively. The market share was 9.3%, 8.3% and 5.6%, respectively. The overall industry concentration is relatively high.

The market share of Iron Technology and General Healthy Information and Technology is significantly higher than that of Swisslong, Becon, Dickinson and Tang Shan. One of the important reasons may be: There are great differences between domestic and foreign medical systems, the number of hospital patients, the number of prescriptions, medication categories and other aspects. The products and equipment suitable for foreign hospital pharmacies have single functions, which cannot comprehensively solve the pain points and difficulties of domestic medical institutions.

4.1.2 Division of the market

Intelligent medication management mainly includes automatic storage, allocation, transmission and distribution of medications in outpatient and emergency pharmacies, intelligent pharmacy intravenous admixture service, intelligent medication consumables management, and intelligent dispensing and decocting of traditional Chinese medicine. Among them, automated pharmacy is in the stage of rapid development, and the penetration rate is expected to rise rapidly. Its profitability is strong, the gross profit rate in the past year is more than 62% (Iron Technology), revenue accounted for more than 70%. Under the control and management of the software system, the intelligent static dispensing center can realize the rapid and accurate allocation and distribution of intravenous infusion medications in storage, dispensing, configuration, review, sorting and other links, reduce the direct contact between medical personnel and toxic chemicals, and facilitate the control and traceability of the whole process of intravenous infusion medications. The center's annual gross margin is 60 percent under Standard, and its revenue accounts for more than 20 percent of Elon’s revenue [9].

4.1.3 Innovation trend

According to the current technical status and the changes in the demand of the smart medical market, the smart medical market will take the development of blockchain technology as the core in the future, establish a collaboration alliance based on cloud interconnection, and provide users with an integrated intelligent medical management system from the aspects of technology, services, products and so on [10].The construction of an intelligent medical management mode will not only be based on the single hospital mode but also based on a medical alliance or medical consortium, carrying the limitations of new technologies, to create a patient-centered cloud interconnected cooperation community.

Apart from that, automated medicine management is also part of smart medical market innovation development in which automated medicine management system is aimed to allocate medicines to different types of hospitals, clinics in communities and pharmacies more effectively to improve inventory management and patients’ demand. Meanwhile, the development of automated medicine management is also an essential component that helps to boost the development of smart medical innovation. For example, some developed regions such as Shanghai and well-known medical institutions such as General Healthy have already launched their programs the upgrade medicine

management in a better way. It can be implied as the future growth trend in the medical innovation sector.

4.2 Market Demand Analysis

At present, there is a shortage of high-quality medical resources in China, and the utilization rate of beds in grade hospitals is high, especially in public hospitals. The bed utilization rate of tertiary hospitals in national hospitals is still close to 100% saturation. State expenditure on medical and health care. Gradually increase the number of hospitals increased year by year promoting the industry demand. In addition, national policies tend to support the construction of "smart hospital", which will promote the market demand expansion. All of the above have led to a wide range of demands for information management systems in medical institutions, and ultimately promotes the market expansion and development opportunities.

5. Market Potential and Investment Prospect

5.1 Market Size

Intelligent medication management caters to the market demand, and the three terminal markets have broad space: the increase in the penetration rate of automated equipment in hospital outpatient pharmacy in the future mainly comes from the sinking of the channel. It is estimated that the stock market space of domestic intelligent outpatient pharmacy will be between 9.2-13.3 billion yuan in 2030. In 2030, the estimated stock market space of static distribution center is between 7.8-11.2 billion yuan; The incremental market space of intelligent retail medication stores is between 5.1-7 billion yuan a year.

5.2 Leading Companies' Financial Performance

In this section, the study mainly analyzes two leading healthy companies' financial performance in 2021. The two leading companies are General Healthy and IRON Technology. Table 1 summarizes General Healthy' main financial figures while Table 2 shows major figures about IRON over the recent years.

Table 1. Data Comparison of General Health from 2019-2021

General Healthy (RMB)	2019	2020	2021
Revenue	300,239,668.97	286,806,988.65	489,755,358.90
Revenue margin	17.07%	-4.47%	70.76%
Net income	105,379,712.83	106,788,728.00	127,162,573.51
Profit margin		1.34%	19.08%

Table 2. Data Comparison of Iron Technology from 2019-2021

IRON technology (Million RMB)	2019	2020	2021
Revenue	291	310	389
Revenue margin	21.81%	6.53%	25.48%
Net income	54.42	70.57	95.64
Profit margin		29.68%	35.53%

Based on these major financial figures and ratios, it can be seen that both companies have done well in the significant growth of their revenues and profits. General Healthy has achieved major growth in revenue with a 70.76% growth rate in 2021, which is much higher than IRON Technology's 25.48% of its revenue margin. However, IRON Technology's profit margin of 35.53% in 2021 is higher than General Health's profit margin of 19.08%. In addition, in 2020, both companies have

shown a large narrow in business scale and activities meanwhile General Healthy has reported a negative rate of revenue margin of -4.47%. The weak financial performance in 2020 might be mainly affected by the environmental impact of the Covid-19 pandemic with lockdowns and a sluggish economy within the domestic market.

5.3 R&D Investment and Talent Cultivation

Through IPO and investment, the R&D expenses of General Healthy increased from ¥ 7.636 million in 2016 to ¥ 16.344 million in 2020, with a compound annual growth rate of 23.99%. The company has 65 technical staff, accounting for 19% of its total workforce. Under the talent cultivation plan, General Healthy has proposed that the company will attract senior technical talents in the industry to expand the scale of senior R&D personnel, and introduce a group of professionals in related disciplines. Through strengthening internal training, it will enable the company to develop the comprehensive ability of disciplines while giving full play to specialties in professional fields, so as to establish a multi-level technical talent echelon and improve the company's overall R&D strength. In addition, the company will introduce a group of industry management, production and marketing talents according to demand to maintain the operation of the company.

Iron Technology, another industry leader, increased its R&D expenses by 22.9% year-on-year to 39.61 million yuan in 2021. R&D personnel accounted for 21% of the total. About 115 research and development staff make up 21% of Iron Technology's workforce. The average salary of R&D personnel is 68,500 yuan, and about 61 percent of R&D personnel have a bachelor's degree or above.

5.4 Investment Prospect and Risk Analysis

5.4.1 Investment prospect

The investment prospect of smart pharmacy depends on many factors, including market demand, competition, policy environment and technological development. In many countries and regions, the government is stepping up efforts to promote smart pharmacy and taking a series of policy measures to support the development of smart pharmacy. For example, in the 14th Five-Year Plan for the Development of Traditional Chinese Medicine, the Chinese government clearly proposed to promote smart pharmacies, accelerate intelligent construction, and improve the quality and efficiency of medical services.

In addition, with the continuous development of information technology, the technology of smart pharmacy is also improving. For example, the application of artificial intelligence technology can help smart pharmacies process large amounts of data more quickly and accurately, improving the operating efficiency of pharmacies. As an emerging market, the demand for smart pharmacies is growing year by year. With the support of the government and the development of information technology, the application range of smart pharmacy is also expanding.

5.4.2 Main risk

However, smart pharmacies are facing competition from traditional pharmacies as well as emerging competitors, such as online pharmacies. This may affect smart pharmacy's market share and profitability. Because smart dispensaries rely on smart systems for management, when systems fail or are hacked, operations will be affected. Pharmacies also rely on highly skilled talents, and the talents of operating intelligent system are insufficient. In addition, the development of smart pharmacy is influenced by the policy environment. If the government adopts the policy in favor of the development of smart pharmacy, the smart pharmacy will face rare development opportunities. Conversely, policies that are not conducive to smart pharmacy development may inhibit it.

At present, the business model of the smart pharmacy business suppliers is still mainly the sales of equipment and software. With the increase of the market penetration of the smart pharmacy business, the business growth of the suppliers will decline, and the suppliers need to gradually transform to the business model of providing the overall solution of the smart pharmacy and charging service fees, so as to ensure the long-term growth of the company's performance. The three-year

pandemic leads to the general deterioration of hospital cash flow, which may have a negative impact on the development of smart pharmacy in the short term. With the end of the epidemic and the efforts of domestic economic steady growth policies, this negative impact will gradually disappear. Finally, technological developments in smart pharmacy will also affect market value.

6. Conclusion

This paper proposes an intelligent pharmacy management system, which is intended to help patients and medical institutions carry out accurate and intelligent management and operation of medication. Intelligent pharmacy management improves the efficiency and accuracy of medication management to avoid the use of wrong medication. According to this study, it can be found that the subdivisions of intelligent medication management include intelligent pharmacy, static dispensing center, medication consumables management, intelligent dispensing of traditional Chinese medicine and decocting on its own.

At present, due to the policy of hierarchical diagnosis and the gradual establishment of local medical association, the service capacity of basic medical and health institutions has been improved. Some patients with common diseases will make more use of primary medical resources to relieve the overload of leading hospitals, which has generated the extensive demand for information management system in primary medical and health institutions and promoted the expansion of the downstream market of the industry. Catalyzed by the epidemic, the new domestic base is expected to further drive the expansion of the industry, which provides huge profit space for the development of smart pharmacy management system in the Chinese market. As a large number of Chinese hospitals pay increasing attention to the medication management and intelligent system, the accuracy of medication management and distribution has become an important indicator in the hospital management system. Therefore, China's medical system needs to further innovate the technology to meet the demand for the future medical management system.

Based on the current market environment and future trend changes, this paper explores the smart medical enterprise case represented by Iron Technology, and analyzes the investment prospects and potential risks of enterprises related to the smart pharmacy management system. The study evaluates the effect of outpatient pharmacy, static dispensing center, drug consumables management, intelligent dispensing of traditional Chinese medicine and the accuracy of decoction according to market influence, and suggestions were put forward for its potential improvement in future research.

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