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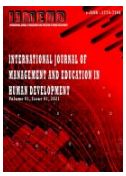

Application of Internet of Things Technology in Infusion

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ABSTRACT

In terms of human well-being, the level of medical care affects the survival and longevity of human beings. With the introduction and development of Internet of Things technology, the level of intelligence has been improved in many fields. Among them, technology has effectively improved the level of medical care and benefited the survival and development of human beings. Infusion during hospitalization is an experience that every patient will have, but during the infusion process, there is always no way to change the medicine at the first time for various reasons. According to some Chinese statistics, the annual infusion market size exceeds 10 billion bottles. According to the data of the Safe Injection Alliance, my country There are more than 390,000 safety accidents due to unsafe infusion every year. Although nurses carefully check every step during infusion, with the increase of patients, the probability of medical accidents will also increase. Therefore, with the development of technologies such as the Internet of Things and big data, the demand and market for auxiliary medical equipment are also increasing. Although there are many drip alarms on the market, they are not connected to the network, so they cannot convey information to medical staff in a timely manner and provide better patient service. This article introduces the idea of combining drip alarms with the Internet of Things, and does detailed plan.

Keywords: *IoT, Infusion, Medical Technology, Intelligent Equipment*

I. INTRODUCTION

According to national statistics, my country's annual infusion market is more than 10 billion bottles, which is equivalent to 8 bottles of infusion per person for 1.3 billion people. The data of China Safe Injection Alliance shows that the number of deaths caused by unsafe infusion in my country is more than 390,000 each year. Although nurses are cautious during infusion Each step is checked, but as the steps increase, the number of patients increases the chance of medical malpractice. Therefore, with the development of technologies such as the Internet of Things and big data, the demand and market for auxiliary medical equipment are also increasing. In 2019, the market size of medical equipment reached 634.1 billion yuan, and the average annual growth rate from 2014 to 2019 was about 20%, far exceeding the international growth rate of 5%.

Judging from the data surveyed by medical institutions such as municipal hospitals, community rehabilitation centers, and clinics in some cities, there are currently only clip-type infusion alarm devices on the market, and there is no use of IoT technology to provide patients, medical staff, regulatory agencies, and family members. Orientation interaction. If it can be low-cost, easy to maintain, and does not affect the infusion function, then the medical institutions surveyed have expressed their willingness to purchase, and assist medical staff to minimize the occurrence of medical accidents.

II. RESEARCH METHOD

This product uses a combination of front-end and back-end. The front-end uses a single-chip microcomputer as the control core, and a droplet sensor is used as the sensor system to monitor whether the liquid level reaches the lower limit in real time. The buzzer module is used as a sound prompt module to prompt the patient in the form of sound, and the Bluetooth/WiFi module sends an alarm to the back end. No.

The back-end uses Raspberry Pi as the core server, uses the Bluetooth/wifi module as the data receiving end, uses the buzzer to prompt the medical staff, and reminds the medical staff to deal with it in time. / Applet and other methods to send information to users and their families.

III. DISCUSSION

3.1 Features of IoT Infusion System

The biggest feature is that the original single alarm is connected to the network and displayed on the network platform in the form of sharing, which can monitor the flow of drugs and the remaining number of drugs in real time, and improve the medical efficiency.

1. With the rapid development of the Internet, the 5G era of the Internet of Everything has gradually entered people's lives. In this context, we are constantly committed to connecting the small things in life to the Internet to make people's lives easier It is more abundant, so it is not only to connect the infusion, which everyone has experienced, with the Internet of Things, but the large and small events in life are developing towards the trend of connecting people and things, and things and things.
2. Establishing a studio within the school and recruiting talents in the school can not only improve the practical ability of college students, but also provide high-quality talent resources for the studio.
3. Recycling points can be set up in various hospitals, and the damaged hardware facilities can be recycled at fixed points, in response to the national concept of sustainable development.

3.2 Purpose and scope of application

1. Mainly for hospitals and medical institutions. According to the data survey, the number of medical institutions nationwide reached more than 1 million in 2019, with 266 million inpatients and more than 8 million beds.
2. Patient: During the hospitalization period, due to the unaccompanied person in the hospital, or the nurse is too busy to take care of it, blood flow will be caused. The patient has been worried about blood flow back during this period, and there will always be more or less psychological pressure.
3. Medical staff: Medical staff are always thinking about the amount of medicine in the medicine bottle during their busy work, and more often they have no time to take care of it. Therefore, the monitoring system can effectively solve this problem and make medical treatment more efficient. Scope; can be promoted in hospitals and medical institutions across the country

3.3 Advantage

Technology: The Internet of Things + method is adopted, front-end + back-end interaction is used, and medical services and interactions are provided in an all-round and three-dimensional manner. Cost: CC2540 + Raspberry Pi is used, of which CC2540 is a single chip + Bluetooth integrated chip, and the Raspberry Pi is an ARM + Linux microprocessor and interactive core, replacing the traditional MCU + data transmission module + PC computer, which effectively reduces the cost.

Service attitude: Established in the school laboratory, in Rizhao, you can come to check the problem at any time, and you can make improvements and upgrades in time according to the feedback data. Technical level: Established in the Internet of Things studio of Rizhao Vocational College of Navigation Engineering, there is a double-qualified teaching team, and a school-enterprise cooperative technology enterprise, which cooperates to ensure product research and development and subsequent follow-up and upgrades, so it has a higher technical level.

Based on the above, the prospects of the infusion monitoring industry are quite promising, and our entrepreneurial plan is highly executable.

3.4 Similar Products Were Researched

Name	Principle	Features	Common Ground
Water level detection system	The radar pulse is transmitted from the radar water level sensor antenna, and the antenna receives the pulse reflected from the water surface and records the time. Since the propagation speed of the electromagnetic wave is a constant, the distance to the water surface is obtained.	1. The query results can be converted (tables, curves, histograms) 2.At the same time, it has the function of data import and export 3. It can display multi-point water level record data at the same time, and can transmit data wirelessly	Through the radio frequency identification technology, the designated things are dynamically and statically detected to obtain the data, and then the data is transmitted to the network platform through the wireless transmission device to achieve the purpose of real-time monitoring.
Body temperature detection system	With the help of advanced Internet of Things technology, wireless transmission technology, and infrared temperature measurement technology, the body temperature of mobile personnel is detected, and the data is transmitted to the platform through the Internet	1. Effectively reduce the direct contact between staff and migrants. 2. It can work in a variety of crowded places at the same time to improve the speed of people's passage and the efficiency of work	

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3.6 Market competition analysis

Advantage:

On the basis of the ordinary infusion alarm, connecting it to the Internet can monitor the liquid level of the liquid in the hanging bottle in real time, and display it in the background in an intuitive form, so that medical staff can see it more quickly and clearly. The number of drugs to facilitate timely dressing changes.

Disadvantage:

1. Since most of our teams are college students and their professional knowledge is at a basic level, we are not mature in technology compared to the infusion alarms on the market, and need time to continuously improve.
2. The project is in the research and upgrade stage, and there is no independent packaging and brand.
3. Lack of market experience and keen insight into market risks

3.7 Marketing team

Our creative philosophy is "patient-centered, close to the patient, close to the clinic, and close to the society". Under the application of the infusion monitoring system, it can solve the concerns about the need for personnel to take care of patients during the infusion process, eliminate the mental burden and anxiety of patients and their families, and effectively shorten the "distance" between consumers and consumers. The products are not only suitable for the vast majority of crowd, and the price is cheaper, more convenient, suitable for all ages, you only need to connect with the nurse's mobile phone during use, so that the nursing information can be grasped more accurately, the situation can be handled in a timely manner, and the nursing service can be more in place.

3.8 sales plan

In order to deepen customers' understanding of the company's services and increase business volume, we have the following promotion plans:

1. Hold an opening event. In order to attract more customers in the early stage of opening, we can take the activities of price reduction and conduct on-site explanation work, so that more customers can understand the practicability, reliability and convenience of the products, and express that they can enjoy discounts when purchasing during the opening period.
2. Students with student ID cards and senior citizens with senior citizen ID cards can enjoy half-price discounts.
3. Free sample distribution.
4. Free trial. Promotions that offer free samples for consumers on-site.
5. Cooperate with pharmacies and hospitals, and let more people know about the product through the promotion of pharmacies and hospitals.
6. Price concessions. In the early stage of promoting products, price promotion methods such as price reduction, full discount and combined sales are adopted to return the interests of consumers.

3.9 Market Protection Measures for Projects Margaret

Our entrepreneurial plan proposes a way of cooperating with the medical structure under the premise of the above-mentioned industry and market background.

1. Plan to negotiate and cooperate with regulatory agencies and medical institutions, and apply for relevant licenses.
2. Facing the market, keep abreast of market dynamics, collect relevant information on products and technologies, and master new technologies.
3. Strengthen exchanges and communication with peers, learn from each other, and compete with each other.
4. Strengthen the publicity of the product and improve the popularity of the product.
5. Through the connection with some relevant government departments, the market of after-sales service will be better opened.
6. Strictly control various expenses, pay attention to internal cost accounting, reduce cost input, and increase profit accumulation.
7. Do a good job in the development of internal and external markets, new product development, promotion of new processes, and improvement of working hours efficiency.
8. Responsible for organizing the operation of the project department, analyzing project budgets, checking prices, reviewing final accounts, product distribution and settlement.
9. During the project process, the project team members must keep a personal work diary, and the project manager should designate a special person to be responsible for the project team’s problem records, including the project team’s internal discussion records every time, and the purchaser in the project process. file records.

3.10 Project production plan

1. The technical model stages. The technical model, the plane structure does not consider the miniaturization problem, and the main goal is to realize the function. Do not put into production, do not enter the market.
2. The first-generation product: Consider miniaturization, try to use a small-sized chip, temporarily use the WiFi+NB solution for the communication part, and use the voice + applet prompt as the interaction.
3. Second-generation products: Considering the stability problem, the back-end will be added to the display interface, and the cloud platform will be added to better interact with the product. Redesign the PCB to achieve a monolithic PCB design. Use 3D printing technology to make suitable product casings.
4. Conduct technical exchanges with enterprises and experts for second-generation mature products, and product exchanges with medical institutions, select foundry companies, mass-produce products, and have heard about promotion and sales by enterprises, governments, and medical institutions.

3.11 Price Strategy

We select a strategy that can attract customers and realize marketing mix by estimating customer needs and analyzing costs. According to customer needs, we comprehensively use various possible marketing strategies and means to form a systematic overall strategy to Achieving the marketing goals of the enterprise and obtaining the best economic benefits, taking the acceptable level of consumers as the benchmark, and responding flexibly according to market changes, so as to achieve a win-win situation of mutual benefit.

We are a student entrepreneur, and the school provides venues and R&D equipment. Our professional advantages make us more confident in the development and use of products, so our prices are 5%-10% lower than the prices of similar products in the market, and we can flexibly adjust our price curve, to gain market share at a lower price, so we have a higher price advantage.

Through our cooperation with pharmacies and hospitals, we can get 10%-20% of the commission for medical construction when they promote it once. Through the promotion of pharmacies and hospitals, we can bring in more customers and make the products gradually known to the public.

According to the business scope and company and company operation mode, we determine the profit method as follows:

1. Additional profit from consumption of medical supplies;
2. High-tech product profits;
3. Additional service profit;

3.12 Economic benefits of this project

1. After the project is completed, it can provide huge benefits to the national medical construction, improve the medical environment, and provide convenience for more doctors and nurses.
2. After the project is put into operation, it can create profits every year, increase taxes, realize sales revenue, and increase local services at the same time.
3. Added value, contributing to the growth of local GDP. After the project is put into operation, it will promote the development of the supporting processing industry of other local enterprises, attract foreign investment, and improve the local investment environment. Liquid level monitoring, each alarm corresponds to its bed number.
4. The cash flow statement is a financial budget that reflects the cash inflow and cash outflow of an enterprise in a certain period. It reveals the operating activities, investment activities and financing activities of the enterprise in a certain period from two aspects of cash inflow and outflow generated cash flow.
5. The projected income statement is a financial budget that comprehensively reflects the results of the business activities of the enterprise during the budget period. It is a financial analysis that reflects the production and operation status of an enterprise during the planning period, and is an important basis for predicting the final results of the enterprise's business activities. The budgeted income statement also reflects the profit achieved by the company in a certain accounting period and the compensation of the company's losses.
6. The estimated balance sheet is a financial budget that comprehensively reflects the financial status of the enterprise during the budget period. It is based on the balance sheet at the beginning of the period and adjusted and prepared according to the relevant data of the sales, production, capital and other budgets.

IV. CONCLUSION

1. At present, China's public medical management system is not perfect, and problems such as high medical costs, few channels, and low coverage are plaguing the people's livelihood. In particular, medical problems represented by "low-efficiency medical system, poor-quality medical services, and difficult and expensive medical treatment" are the main focus of social attention. Large hospitals are overcrowded, community hospitals are unattended, and patient procedures are cumbersome. These problems are caused by poor medical information, polarization of medical resources, and incomplete medical supervision mechanisms. These problems have become important factors affecting the harmonious development of society. Therefore, we need to establish a set of intelligent medical information network platform system, so that patients can enjoy safe, convenient and high-quality diagnosis and treatment services with shorter waiting time and paying basic medical expenses.
2. At the policy level, with the implementation of the "13th Five-Year Plan" proposal, Healthy China has been officially upgraded to a "national strategy", and the construction of a healthy China with three medical linkages, separation of medicines, hierarchical diagnosis and treatment, and Internet medical care will become the "Thirteenth Five-Year Plan". The highlight of deepening the reform of the medical and health system during the Five-Year Plan period. Among them, "Internet +" will become an important technical means to deepen medical reform and promote the construction of a healthy China. After two years of model innovation, commercial trial and error, and capital competition, the Internet medical industry has finally entered a golden age. As its component, smart medical care The industry will also enter a period of rapid development.
3. Based on the combination of emerging technologies such as the Internet of Things, mobile Internet, wearable devices, and big data and new business models, the cognitive structure of medical care is being completely subverted. All medical fields of medicine will fully open an era of intelligence. The new multi-win business model of hospitals, patients and insurance is emerging in the exploration. The diagnosis and treatment technology based on the medical big data platform will push smart medical care into an unprecedented space.
4. Based on the above-mentioned background of the times and national policies, after three years of production, if our products can smoothly follow the R&D plan and production plan, and the government, enterprises, and schools can

follow the predetermined plan, then we will start slowly. After implementation, it will be gradually promoted and operated in the future. It is estimated that within three years, at least 10% of the patients will receive infusion, so the annual infusion volume will be 1.65 million. The single price of the product is 30-40 yuan. According to the preliminary estimate, according to the purchase ratio of 10%, the market size is expected to reach a market size of about 5 million to 6.6 million in Rizhao. According to the 30% profit of each equipment, the annual profit will reach 1.5-1.98 million. This is quite impressive in the early days. of ultimate control and dominance there is a question on whether technology will enslave humanity under a modified form of governance.

5. he challenge then is: Will humanity surrender its freedom to AI or will AI in the hand of a few control humanity.

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