Real-time Monitoring of Patient Electronic Sphygmomanometer Based on Internet of Things

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Abstract
Blood pressure is one of the most important vital signs in the clinic. Accurate and timely collection of blood pressure changes can help doctors understand the condition and adjust medication. Traditional sphygmomanometers monitor blood pressure by many other factors, such as time and location. With the development of the Internet of Things technology, the electronic sphygmomanometer based on the Internet of Things technology can continuously monitor the blood pressure of patients. Relevant information and data can be transmitted to doctors in a timely and accurate manner to help doctors understand the condition and guide medication. The Internet of Things technology is becoming more and more popular, the scope of research is expanding, and innovations are constantly emerging. This article introduces the Internet of Things technology in detail, and takes the development of electronic sphygmomanometer as an opportunity. Through the questionnaire survey of users, this paper analyzes the survey data. The survey results show that the sphygmomanometer based on real-time monitoring of patients based on the Internet of Things has been obtained. User support. At the same time, this paper also compares with the blood pressure results of OMRON HEM-7200 upper arm electronic sphygmomanometer. The comparison results show that the average deviation of blood pressure measured by real-time monitoring patient electronic sphygmomanometer based on Internet of Things is lower than OMRON HEM-7200. Upper arm type electronic sphygmomanometer blood pressure measurement results.

Key words: Internet of Things, Real-Time Monitoring, Electronic Sphygmomanometer

Monitoreo en Tiempo Real del Sphygmomanómetro Electrónico del Paciente Basado en Internet de las Cosas

Resumen
La presión arterial es uno de los más importantes signos vitales en la clínica. Colección precisa y oportuna de los cambios en la presión arterial puede ayudar a los médicos a entender la enfermedad y ajustar la medicación. Monitor de presión arterial tensiómetros tradicionales por otros muchos factores, como el tiempo y el lugar. Con el desarrollo de la tecnología de Internet de las cosas, el esfigmomanómetro electrónico basado en la Internet de las cosas, la tecnología puede vigilar continuamente la presión arterial de los pacientes. La información pertinente y los datos pueden ser transmitidos a los médicos de manera oportuna y precisa para ayudar a los médicos a entender la condición y guía de la medicación. El Internet de las cosas de la tecnología es cada vez más y más popular, el alcance de la investigación está aumentando, y las innovaciones surgen constantemente. Este artículo introduce la tecnología de Internet de las cosas en detalle, y toma el desarrollo de esfigmomanómetro electrónico como una oportunidad. A través de la encuesta de usuarios, este documento
needs to regularly measure blood pressure. Hospitals and medical institutions use electronic sphygmomanometers, and the workload is improved while the fault tolerance rate is reduced. In response to this situation, medical staff, especially for patients who need to monitor blood pressure frequently, such as critically ill patients, both normal and critically ill patients. This traditional measurement method brings great work pressure to the medical staff, especially for patients who need to monitor blood pressure frequently, such as critically ill patients, and the workload is improved while the fault tolerance rate is reduced. In response to this situation, some hospitals and medical institutions use electronic sphygmomanometers to measure blood pressure for patients [23, 24]. However, the current electronic sphygmomanometer still needs manual operation. The medical staff still needs to regularly measure blood pressure for the patient, and the work pressure is limited. Secondly, the blood pressure measurement algorithm of the electronic sphygmomanometer is simple, and the data repeatability and accuracy are reduced.

Palabras clave: Internet of the Things, Monitor in Real Time, Electronic Sphygmomanometer.

1. Introduction

Blood pressure is one of the most important physiological parameters of the human body [1-5]. Blood pressure is divided into arterial blood pressure [6], capillary blood pressure and venous pressure [7-9]. Generally speaking, blood pressure refers to arterial blood pressure. Arterial blood pressure is usually expressed by systolic and diastolic blood pressure. When the ventricle contracts, the aortic pressure rise sharply and peaks [10-11]. The arterial pressure at this time is called systolic blood pressure (SBP) [12-15]; when the ventricle is dilated, the aortic pressure drops, and the lowest value of arterial blood pressure mentioned in the end of the heart is called diastolic Pressure (DBP) [16-19]. Proper arterial blood pressure is an important condition for the normal activity of the cardiovascular system [20-22]. When the blood pressure of the office is >140/90mmHg, or the dynamic blood pressure is white >135/85mmHg, and the whole day is >130/80mmHg, it can be diagnosed as hypertension. Hypertension is one of the common chronic diseases that seriously endanger human health. It is a major risk factor for coronary heart disease and can cause serious complications such as blindness, stroke, myocardial infarction and renal failure and cause death or disability. Therefore, controlling the normal level of blood pressure is an important part of health management. With the economic development, people’s diet structure and lifestyle have changed. The prevalence of hypertension in China continues to increase. Complications caused by hypertension Stroke and heart disease have become common diseases. According to the survey, there are at least 200 million hypertensive patients in China; in 2014, the death toll from cardiovascular disease accounted for 41% of the total death toll in China, which is the leading cause of death; more than 3.7 million people died of cardiovascular and cerebrovascular diseases in China, 70% of which % of stroke and 50% of myocardial infarction are associated with hypertension. According to research at home and abroad, it has been confirmed that lowering blood pressure can reduce the risk of stroke by 40% to 50% and the risk of myocardial infarction by 10% to 30%. At the same time, the daily management of blood pressure in China is still at a low level, and there is a common problem of low diagnosis rate and low treatment rate. In the people who have been diagnosed with hypertension, there are also irregular medications, which do not adhere to the measurement of blood pressure for control. The implementation of effective daily monitoring of hypertension is imminent. The revised edition of the 2010 Guidelines for the Prevention and Treatment of Hypertension in China states that blood pressure levels can be used to diagnose blood pressure, to diagnose hypertension, to guide the treatment of hypertension, and to evaluate the efficacy of blood pressure reduction. Human blood pressure measurements first occurred in the 18th century. In 1733, British physiologist Stephen Hales performed blood pressure measurements on a mare. In 1928, Boss leaves designed a U-type pressure gauge, which greatly shortened the glass tube used in blood pressure measurement, and specified mmHg as the unit of measurement of blood pressure. Subsequently, Russian surgeon Dr. Niklik Crotkov applied the stethoscope to the measurement of blood pressure. In order to raise awareness of the importance of accurately measuring blood pressure, the Canadian Hypertension Education Program (CHEP) Expert Committee issued the 2015 Guidelines for the Diagnosis and Treatment of Hypertension, which covers recommendations for blood pressure measurement, diagnosis, risk assessment, prevention and treatment. China has published the “China Hypertension Treatment Guide 2015 Revision”, emphasizing the importance of increasing the awareness rate, treatment rate and control rate of hypertension. It can be seen that hypertension is a common concern in the medical and health field, and daily monitoring and management of families achieving high blood pressure is an important issue.

At present, many hospitals still use traditional mercury sphygmomanometers to measure blood pressure for both normal and critically ill patients. This traditional measurement method brings great work pressure to medical staff, especially for patients who need to monitor blood pressure frequently, such as critically ill patients, and the workload is improved while the fault tolerance rate is reduced. In response to this situation, some hospitals and medical institutions use electronic sphygmomanometers to measure blood pressure for patients [23, 24]. However, the current electronic sphygmomanometer still needs manual operation. The medical staff still needs to regularly measure blood pressure for the patient, and the work pressure is limited. Secondly, the blood pressure measurement algorithm of the electronic sphygmomanometer is simple, and the data repeatability and accuracy are reduced.

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accuracy are not high. Patients with critical life parameters such as critically ill patients are not suitable. In addition, the current intensive care unit in the intensive care unit is expensive and does not apply to general wards and community families. With the rise of home blood pressure monitoring, more and more blood pressure monitoring devices have entered the medical device market. At this time, the portable electronic sphygmomanometer has entered the eyes of hospitals and residents, and has become one of the most popular, most promising and widely used products. The rapid development of portable electronic sphygmomanometers is not accidental. The reasons include scientific progress, social progress and the improvement of people’s living standards. First of all, the development of microelectronics and life science technology, embedded systems and biosensor technology are deeply rooted in people’s lives. The development of electronic sphygmomanometers utilizes microelectronics processing and embedded sensor technology [25-27], which is low in cost, small in size and simple in operation. Beyond the potential of mercury sphygmomanometers, and with the improvement of algorithms such as oscillometric method, the accuracy of electronic sphygmomanometer measurement is gradually improved. Secondly, China’s medical reform is being promoted nationwide. The state is investing more and more in medical construction, especially in rural medical construction. As the price of portable electronic sphygmomanometers is getting lower and lower, its market is gradually shifting from large cities to small and medium-sized cities. Cities, and there are trends in the development of rural markets. The expansion of markets and demand has also promoted the competition and development of electronic sphygmomanometers; once again, the living standards of Chinese residents have increased, and at the same time, the problem of aging, cardiovascular and cerebrovascular diseases associated with hypertension has attracted a lot of attention, residents’ awareness of their own health care is getting higher and higher, electronic sphygmomanometer is gradually becoming one of the important household equipment such as refrigerators, televisions, mobile phones, etc., which also greatly promotes the development of electronic sphygmomanometers. China’s electronic sphygmomanometer market is developing rapidly, attracting the attention of many domestic and foreign large companies. Internationally renowned brands of electronic sphygmomanometers include: Omron, Aide, Panasonic, Johnson & Johnson, Nissei, Mike, etc. The domestic sphygmomanometer brands include Yuyue, Jiu’an, and Little Nurse. At present, the mainstream electronic sphygmomanometer products are divided into arm upper arm type, upper arm type and wrist type electronic sphygmomanometer according to different measurement positions, and can be divided into automatic pressure and manual pressure according to the measurement method. Below are examples of products from several electronic blood pressure monitors currently on the market: Movable arm upper arm type electronic sphygmomanometer. Fully automatic upper arm type electronic sphygmomanometer. Manual upper arm electronic blood pressure. Wrist electronic blood pressure monitor. The above several electronic sphygmomanometers are already mature products. Most commonly utilized transmissive sensors use a finger-clip design to measure problems such as poor comfort and vascular congestion. The new Japan Wireless company’s product does not need to pinch the body part of the measurement, completely solve the problem of feeling uncomfortable during measurement.

Originally, the concept of the Internet of Things came from the Internet Radio Frequency Identification (RFID) system proposed by the Massachusetts Institute of Technology (MIT) in 1999—using RFID devices such as radio frequency identification (RFID) to connect all items to the Internet [28]. To achieve intelligent identification and management of items. In 2005, the ITU officially proposed the concept of “Internet of Things” in Tunisia, and then released “ITU Internet re-ports2005-the Internet of things”, in which the structure, technical composition, future opportunities and future opportunities of the Internet of Things are introduced in detail. Challenges, etc. It believes that the era of IoT communication can realize the connection between people and goods [29, 30], goods and articles, so that information and communication technology can obtain a new communication dimension. On August 7, 2009, Premier Wen Jiabao put forward the concept of “perceiving China” when he visited Wuxi. On March 5, 2010, he officially listed “Improving the R&D and Application of Internet of Things” into the revitalization of key industries. Among them, as a result, China’s Internet of Things construction has officially entered a stage of rapid development. With the deepening of IoT research, its concept is constantly changing. In 2010, Sun Qibo and others proposed the definition of the Internet of Things in a broad sense, that is, the Internet of Things is the fusion of information space and physical space, digitizing and networking everything, between objects and things, between objects, The realization of efficient information interaction between people and the real environment, and the integration of various information technologies into social behavior through the new service model is the higher level of information technology in the comprehensive application of human society. In recent years, the Internet of Things has long been a hot topic. As early as 2015, China’s overall market size was around 700 billion yuan, and it is increasing at a rate of 30% per year. It is estimated that in 2020, the output value of China’s Internet of Things will reach 1 trillion, and related IoT equipment will exceed 20 billion. The prospects are great. The Internet of Things is a symbolic representative of the development of information society and the most important component of information technology. The foundation of the Internet of Things is Internet technology, and at the same time it is the development and extension of Internet technology. In the Internet of Things, the goal of resource sharing is
achieved by connecting virtual bodies. In the Internet of Things, by collecting technologies and collecting information resources, a series of communication sensing technologies are applied to network technologies. The special envoy is also a new wave in the development of the information age. The most crucial thing in the Internet of Things is innovation, which is also the new cornerstone of industrial development, effectively promoting the rapid development of information technology. With the expansion and innovation of Internet of Things technology, people at home and abroad will regard the development of the Internet of Things as a new technological innovation point and economic growth point.

Through the above introduction, our electronic blood pressure monitor and the origin of the Internet of Things have a certain understanding. We also know that the Internet of Things technology has developed more and more mature, and it has brought great convenience to people in other aspects such as medical treatment. The paper takes this as an opportunity to introduce the related knowledge of the Internet of Things in the second part, and lays a foundation for the third part of the real-time monitoring of patients’ electronic sphygmomanometer based on the Internet of Things.

2. Proposed Method

The Internet of Things has been widely used since its appearance. It has greatly promoted people’s lives and promoted the rapid development of the social economy. As a key technology to support the operation of the Internet of Things, wireless sensor networks have been predicted by the large Internet of Things, and the Internet of Things is the core technology to change the world. The following is an introduction to the knowledge of the Internet of Things.

2.1. Iot Overview and Basic Concepts

(1) Overview of the Internet of Things. The Internet of Things is developed on the basis of the Internet and is an extension and expansion of Internet technology. It is a network concept that senses and recognizes objects through sensors and identifiers, scans objects through a scanner, and locates objects through a positioning system, ultimately enabling the exchange of intelligent information between any item and item. The emergence and development of the Internet of Things has led to new ideas for the integration of control and management projects. The Internet of Things is an extended application of the Internet, which relies on the Internet and extends as a core. The most important idea is to form an Internet connected to objects, extend the Internet to any object and object, and transmit various kinds of information of objects in the physical world to the Internet to form a new type of intelligent network. The Internet of Things can install sensors, processors, and communication modules on a variety of objects, connecting them to the Internet to connect objects and objects. From this perspective, the Internet of Things can be seen as a broader network than the Internet. It is based on perception, transmission and control. It connects people and things reasonably, making it easier for people to access, analyze and process the surrounding information.

(2) Basic concept of the Internet of Things. The Internet of Things refers to the collection of information from the physical world through various types of information sensing devices, such as radio frequency identification, infrared sensors, GPS and sensors, to form a network of “objects connected” with the Internet as the core. . The Internet of Things belongs to a new type of information technology, which is a network between things. The foundation of the Internet of Things is the Internet, which is an extension of the Internet. Internet of Things exists between any items.

2.2. Basic Characteristics of the Internet of Things

From the perspective of communication objects and processes, the core of the Internet of Things is the interaction of objects and objects and between people and things. The basic characteristics of the Internet of Things can be summarized as comprehensive awareness, reliable delivery, and intelligent processing.

Comprehensive perception, the utilization of radio frequency identification, two-dimensional code, sensors and other sensing, capturing, measuring technology to collect and acquire information from objects at any time and any place.

Reliable delivery, by connecting objects to the information network and relying on various communication networks, reliable information interaction and sharing can be performed anytime and anywhere.

Intelligent processing, using a variety of intelligent computing technologies to analyze and process massive amounts of perceived data and information to achieve intelligent decision-making and control.

In order to more clearly describe the key links of the Internet of Things, according to the information science point of view, around the flow of information, abstract the information function model of the Internet of Things, as shown in Figure 1.
(1) Information acquisition function. Including the perception of information and the identification of information, information perception refers to the sensitivity and perception of the state of things and how they change; information identification refers to the expression of the movements of things and the way they change.

(2) Information transmission function. Including the information transmission, transmission and reception, and finally the task of transferring the state of the transaction and its change from one point in space (or time) to another, this is the communication process in the general sense.

(3) Information processing function. Refers to the processing of information, the purpose of which is to acquire knowledge, realize knowledge of things, and use existing information to generate new information, that is, the process of making decisions.

(4) Information application function. Refers to the process of information finally functioning, with many different forms of expression, the most important of which is to adjust the state of the object and its transformation, so that the object is in the expected state of motion.

Figure 1. IoT information function model

2.3. Key Technologies and Structural Features of the Internet of Things and System Architecture

(1) Key technologies of the Internet of Things

As the research hotspot in the field of information science and computer network, the Internet of Things has the characteristics of interdisciplinary crossover and multi-technology integration. Every key technology needs to be broken. The key technologies of the Internet of Things can be divided into hardware and software. The technology includes RFID (Radio Frequency Identification), WSNs (Wireless Sensor Networks, WSNs), Intelligent Embedded Technology (Embedded Intelligence) and Nanotechnology (Nanotechnology); software technologies include information processing technology, self-organizing management technology and security technology.

(2) Hardware technical analysis

The role of key technologies of IoT hardware can be further illustrated by defining three abstract concepts as follows.

1. Object

Anything in the objective world can be seen as an object, and tens of thousands of objects prove the existence of an objective world. Each object has two characteristics: attributes and behavior. Attributes describe the static characteristics of an object, and behavior describes the dynamic characteristics of the object. Any object is often composed of a set of attributes and a set of behaviors.

2. Message

A message from the objective world to an object. The existence of the message indicates that the object can respond to external stimuli in the objective world. Information can be transmitted and communicated between messages through various objects.

3. Package

Integrate related attributes and behaviors into one object to form a basic unit. The relationship between the three is shown in Figure 2.
Software technical analysis

The software technology of the Internet of Things is used to control the working mode and working behavior of the distributed hardware of the underlying network, and provides a reliable operating platform for the design of various algorithms and protocols. On this basis, it is convenient for users to effectively manage the IoT network, realize the functions of information processing, security, and service quality optimization of the IoT network, and reduce the complexity of the use of the Internet of Things for users. The layered architecture of IoT software running is shown in Figure 3.

Figure 3. IoT software layered architecture

As mentioned earlier, IoT hardware technology is the basis of embedded hardware platform design. The board-level support package is equivalent to the hardware abstraction layer and is located on the embedded hardware platform to separate hardware and provide a unified hardware interface for the system. The system kernel is responsible for the scheduling and allocation of processes, and the device drivers are responsible for driving the hardware devices, which together provide an interface to the data control plane. The data control layer implements software support technology and communication protocol stack, and is responsible for coordinating data transmission and reception. The application software program needs to be designed according to the interface provided by the data control layer and related global variables.

(4) Structural features

In the actual production and life applications, networking has the following distinguishing features from other networks:

1. The Internet of Things brings together more information than the Internet. The information dissemination of the Internet is only spread among the devices that access the Internet, and the various forms of data obtained by the sensor devices in the Internet of Things are spread in the network.
2. The large amount of information collected by the sensor needs to be accurately transmitted to the computing center, which requires strong reliability and security when transmitting over the network.
3. The Internet of Things handles information more centrally and comprehensively. The Internet of Things can use the large amount of data collected to conduct scientific and comprehensive analysis of large amounts of data through advanced methods such as cloud computing. People can send corresponding instructions to the control device according to the analysis results to realize remote control of objects.

In particular, one of the important features of the Internet of Things is to exchange information between objects and objects. Each object is an object. Therefore, the underlying IoT network responsible for sensing and recording information must be able to reflect the characteristics of each object.
(5) IoT system architecture

The architecture of the Internet of Things system is shown in Figure 4, including the underlying network distribution, aggregation gateway access, Internet convergence, and end-user applications. In Figure 4, a large number of underlying network systems are selectively distributed in the physical space, and the network distribution is formed in a corresponding manner according to respective characteristics. The underlying network collects the object exchange information through RFID, WSNs, wireless LAN and other network technologies and transmits it to the intelligent aggregation gateway, accesses the network convergence system through the intelligent convergence gateway, and finally uses the network channels including the broadcast television network, the Internet, and the telecommunication network. The information arrives at the end user application system. At the same time, the end user can influence the underlying network to face different applications through subjective behavior, so as to realize the information exchange between people and objects, objects and objects, and objects.

The Internet of Things is recognized as having three levels. The bottom layer is the sensing layer for sensing data, the middle layer is the network layer for data transmission, and the upper layer is the content application layer. As the cornerstone of the development and application of the Internet of Things, the sensing layer mainly includes sensing and control technologies, RFID technology, and wireless communication technologies. The perception layer is the skin and facial features of the Internet of Things, used to identify objects and collect information. The sensing layer includes information collection devices such as sensors and RFIDs, including the network before the information is accessed to the gateway device. It is mainly the identification of objects, the collection of information, and functions similar to the skin and facial features in the human body structure. The network layer will be built on the existing mobile communication network and the Internet, as the nerve center of the Internet of Things and the brain to transmit and process information. The network layer includes a mobile communication network, the Internet, a network management center, an information center, and the like. Perceptual data management and processing technologies include the storage, query, analysis, mining, understanding, and theory and techniques based on sensory data decisions and behaviors. As a storage and analysis platform for massive sensing data, cloud computing platform will be an important part of the Internet of Things network layer, and it is also the basis of many IoT applications in the application layer. The network layer processes and transmits the information acquired by the sensing layer, similar to the functions of the nerve center and brain in the human body structure. The application layer uses the perceptual data analyzed and processed to provide users with a rich and specific service. It is the “social division of labor” of the Internet of Things and the combination of industry needs, achieving a wide range of intelligence. The application layer is the deep integration of the Internet of Things and industry expertise, combined with industry needs to achieve industry intelligence, which is similar to the social division of labor and ultimately constitutes a human society.

2.5. Real-Time Monitoring of Patient Electronic Sphygmomanometer Based on Internet of Things

Generally, the sphygmomanometer based on the Internet of Things technology mainly includes the following modules: a data storage module and a real-time monitoring module.

(1) Data storage module. A database is a “warehouse” that organizes, stores, and manages data according to a data structure. The main data amounts are environmental parameter data, user data, and sensor data. With the continuous storage of blood pressure parameter data, the database read and writes operations become very dense, and there is a high concurrent demand for the database. With the increase of data volume and the emergence of the storage function of the Internet of Things module, cloud storage has become a new concept. It is an...
emerging network storage technology, which will bring a large number of networks through cluster applications, network technologies or distributed file systems. Various types of storage devices work together through software to provide data storage and service access functions. In the greenhouse monitoring system, the cloud platform mainly refers to a storage platform based on data storage, a computing cloud platform based on data processing based on the cloud platform, and an integrated cloud computing platform that combines both computing and data storage processing, and the cloud platform. The establishment is mainly to show the content that users need in a friendly way, and to provide a variety of services using a variety of equipment and technology. The popularity of the cloud monitoring platform is not very high. The cloud platform stores more database content than the traditional storage platform, and the security is also improved. The cloud computing should deliver the centralized cloud computing data to the center, and then return the result, wherein the risk in data transmission can be reduced by technical means.

(2) Real-time monitoring module. Uninterrupted monitoring of ambulatory blood pressure requires the aid of an intelligent sphygmomanometer, which relies on modern electronic technology and indirect measurement of blood pressure, is displayed in numerical form and automatically transmitted to the data management center via the network. The intelligent sphygmomanometer is an intelligent sphygmomanometer certified by the US FDA and certified by the European ESH clinical test. It integrates the Internet of Things technology into the detection instrument and realizes the intelligent transmission of measurement data to the Boumi Heart Health Management Platform. The function, this is an example of IoT technology for intelligent blood pressure monitoring, but how to realize the miniaturization of smart sphygmomanometers and develop new products like watch-like products is the research direction. In addition, we should try to achieve intelligent blood pressure monitoring in regional medical care, effectively improve the quality of medical services.

3. Experiments

3.1. Research Method

(1) Field research: It is mainly the process of directly contacting the respondents and obtaining first-hand information. Field research can truly feel the user’s usage scenarios, observe the behaviors and attitudes of users during use, and tap the potential needs of users.

(2) Questionnaire: It is a written question to the respondent, which can quickly collect a lot of information from the user and present it in a quantitative form, which is convenient for the investigator to count and analyze, and save the corresponding manpower and material resources. The questionnaire survey is divided into a structured questionnaire and an unstructured questionnaire. In this questionnaire survey, a combination of the two methods can be used to not only quantify statistics, but also to collect opinions from the respondents and then to suggest and achieve complementary advantages.

(3) User interview: It is a qualitative research method that investigates a small number of targeted people, finds key problems, and discovers potential problems and needs through a topical conversation with a small number of people. According to the targeted outline, this survey talks with hypertensive patients, community doctors, and family members to record the user experience in the health management process, and comprehensively understand the information about patients, medical staff, and family members’ behaviors and attitudes. Real and effective research materials.

3.2. Statistical Processing

EPI3.1 establishes a database and uses PASW Statistics18.0 statistical analysis software package for statistical analysis. The mean comparison between the two groups is performed by independent sample t test, and the count data is analyzed by chi-square test.

4. Discussion

4.1. Target User Statistical Analysis

First, understand the target user’s ratio of male to female, age group, blood pressure level, and medical history.

In 150 volumes, the ratio of male to female is basically the same, and the number of patients with hypertension is basically above 46 years old, accounting for 75%. The specific statistical data is shown in Figure 5.
Among the 150 valid questionnaires, moderately hypertensive patients accounted for 46%, severe hypertension accounted for 21%, and 8% of patients did not even understand blood pressure levels. The specific statistical data is shown in Figure 6.

Among the 150 valid questionnaires, the history of hypertension patients has a wide range, including 1-3 years of medical history accounted for 35%, 4-6 years of medical history accounted for 29%, and 7-10 years of medical history accounted for 23%. As shown in Figure 7.
Secondly, understand the user’s blood pressure detection frequency, blood pressure detection commonly used, and blood pressure control method.

Among the 150 valid questionnaires, the proportion of hypertensive patients was 1-3 months, accounting for 37%; the proportion of 4-6 months was 17%. The proportion of inspections over 6 months is 27%. As shown in Figure 8.

4.2. Real-Time Monitoring of Patient Sphygmomanometer Performance Testing Based on Internet of Things

To measure the real-time monitoring of the patient’s sphygmomanometer based on the Internet of Things and the brand electronic sphygmomanometer, the product used for comparison was the OMRON HEM-7200 upper arm type electronic sphygmomanometer. 150 people of different ages were randomly selected as the subjects, and the measurement results of 8 of them are shown in Table 1.
The measurement data was analyzed using the OMRON brand sphygmomanometer as a standard. Everyone completed the OMRONHEM-7200, a sequential measurement of the sphygmomanometer in this paper within 3 minutes. The OMRON brand sphygmomanometer gives a test accuracy range of ±5 mm Hg for systolic and diastolic blood pressure, and a pulse range of ±5% for pulse rate. From the measurement data summarized in Table 1, the average deviation of the measured values of the patient’s sphygmomanometer based on real-time monitoring of the Internet of Things is low, and the practicability is very good. In addition, the measurement data wireless transmission cloud platform is tested, the signal transmission distance is long, and the connection is not broken for a long time, and the data transmission is stable and reliable.

4.3. Attitudes to Real-Time Monitoring of Patient Sphygmomanometers based on IoT

Among the 150 valid questionnaires, we found that most patients were positive about the real-time monitoring of patients’ sphygmomanometers based on the Internet of Things, accounting for a total of 88%. 10% of patients are neutral. Only a small number of people hold a negative attitude. The specific statistics are shown in Figure 9.

5. Conclusions

Traditional mercury sphygmomanometers or ordinary electronic sphygmomanometers repeatedly measure blood pressure, which greatly wastes medical resources. Modern technology is changing the medical industry model. With the advent of the mobile Internet, cloud computing, the development of the Internet of Things and the terminal of medical smart wearable devices, the treatment of the disease beyond the space has been realized, and the patient can receive supervision at any place. This article is based on the real-time monitoring of the patient’s electronic sphygmomanometer based on the Internet of Things. After the patient measures blood pressure at a location in the outpatient clinic, the patient’s information and blood pressure values are shared.
when any clinic visits. At the same time, it will save medical resources and save doctors’ time. The two most important points are as follows: ① the program can also be extended to the diagnosis and control of other diseases throughout the country, which will greatly improve the efficiency of the entire medical system. ② If the program is implemented nationwide, it will be of great significance to the establishment of off-site medical and medical databases.

Acknowledgements

This work was supported by the Scientific and Technological Research Program of Chongqing Municipal Education Commission (Grant Numbers are KJ1602901 and KJQN201803102 respectively), Chongqing College of Electronic Engineering Scientific Research Project (Grant Number is XJZK201809) and Xinxiang Medical University Education and Teaching Reform Research Project (Grant Number is 2017-XYJG-41).

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