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Study on application of intelligent electronic devices in medicine

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ABSTRACT:- With the development of computer and medical technology, intelligent electronic devices used in clinical treatment and medical education has brought about a "revolution". Intelligent electronic devices systematically reviewed in this paper in clinical care, research, teaching, and application of rehabilitation and development for intelligent electronic devices in the medical application of informatization construction to provide reference and reference.

Keywords:- Intelligent electronic device, Wise medicine, Mobile health, Telemedicine, Clinical medicine

I. INTRODUCTION

At present, the sharp increase in chronic disease and subhealth, makes the current treatment for the purpose of traditional medical model facing great challenges, to new models of health prevention Center became the new direction of medical reform [1]. Traditional doctors and patients face to face medical model has been unable to meet the health care needs and how effective prevention, detection, treatment, and other health problems have become a major concern for social problems. With the rapid development of computer technology, medical technology and material science, intelligent electronic devices used in clinical treatment, research, teaching, and aided solving clinical and educational issues in the areas of rehabilitation, has been widely recognized [2]. Intelligent electronic devices are widely used in the medical field, the market has great potential, many startups as well as professional companies are active in the field network medical service to develop intelligent electronic devices. Intelligent electronic devices in the field of medical application of promoting change in the traditional medical model, promoting health care reform, personalized medicine is very important reference and reference value.

II. CONCEPT AND CHARACTERISTICS OF INTELLIGENT ELECTRONIC EQUIPMENT

Intelligent electronic device is the application of computer technology to the daily use items for intelligent design, develop a portable, easy to use equipment. With advances in technology and changes in user requirements, forms and application of intelligent electronic devices also changes [3]. High performance and low power processing chip launch and development of medical technology, part of the intelligent electronic devices from conceptualization to commercialization, such as Google, Sony, Baidu, Lenovo, and many other technology companies also began exploring in this new field.

Compared with the traditional medical equipment, intelligent electronic device is the user used when medical personnel are not around, while using minimal impact on normal daily activities [1]. Based on the above considerations, the intelligent electronic devices usually have the following characteristics: 1) security. Security is important features of medical electronic instrument different from other types of instruments is not only the instrument's own security, but also to consider the privacy of users ' personal data. 2) portability. Devices compact, long term use does not obstruct the user's daily activities. 3) ease of use. Accessibility refers to the device friendly human-machine interface, operation is simple and convenient, and plug and play features. 4) intelligence. Device has the ability to feel strong, you can capture individual physiological information and effective mechanism for the implementation of reminders and treatment [4,5,6,7,8].

III. INTELLIGENT ELECTRONIC DEVICE USE IN CLINICAL MEDICINE

3.1 Disease prevention and detection

At present, the intelligent electronic devices most widely used in disease prevention and detection, various devices one after another. In September 2012, United States Maxim Integrated, and Clearbridge VitalSigns and joint of Orbital Research company monitoring service launches new signs, all diagnostic tools into shirts, used to measure ECG, temperature and movement, enable health care professionals to patients '

frequent low-cost monitoring, more effective preventive health care [9]. United States Rest Device company launches Mimo for 1-12 monthes baby baby kimono jumpsuit, the physiological status of the baby can be transmitted over the network to the parents of smart mobile phones, via cell phone for baby's body temperature, respiration and sleep Physiology information real-time monitoring [10]. Japan Toray and Telegraph and telephone companies are also jointly developing asmart underwear, load the embedded sensor used for detecting human physiological information [11]. In addition to textiles, some wearable hardware. Intel Corporation launched the heart rate tests headphones, Motorola introduced the SF700 and SF500, Heart Rate Eaephones of LG company through smart headset to test the user's heart rate data [12]. Sporting goods company Diabang (Jawbone), Nike, adidas also launched bracelets, can people sleep, exercise, aerobic activity and pulse information wirelessly will record data on Smartphones [13]. China's Baidu, Gecko, TCL and Huawei also launched a wearable smart devices help the user to detect signs of data [14]. United States scientists have developed an ultra-thin flexible electronic circuits, named "Epidermal electronic systems", can stick to the skin like a tattoo anywhere on the tensile, bending and rotation, and can record the changes of physiological information in the user's body. China's Fudan University jointly Sweden Royal Institute of technology had been developed, like a band-aid affixed to the surface of the skin Bio-Patch soft wearable medical devices used to measure ECG, and temperature information, laid the groundwork for creation of flexible intelligent medical devices [15].

3.2 Adjuvant therapy

Recently, the United Kingdom Imperial College scientists successfully created a smart scalpel iKnife cell through the knife blade into the micro analysis devices installed on the handle, to distinguish between cancer cells and healthy cells. At present, new surgical brain cancer cell cultures are being tested [16]. University of Washington team led by Samuel Achilefu developed intelligent devices help surgeons see clearly when cancer cells [17]. The device by means of molecular imaging agent makes the cancer system to blue, surgeon with the help of assistive devices can be distinguished, and excision of necrotic tissue. Given Imaging developed by capsule endoscopy PillCam Colon, is very small in size, similar to a pill size, swallowing intestinal feedback can be collected after attending physicians, not only reduce pain but also can save health care costs. At present, the device has received United States food and Drug Administration approval [18]. Google United United Kingdom pharmaceutical company in your stomach, the Proteus meters to launch a new wearable device of testing the body data "smart pill (SmartPills)". By integrating on the pill a miniature radio transmitter and sensor array, the collected data to the patient wears sensors monitoring users can display data on the dose of medicine, the device will push towards a new stage in the pharmaceutical industry [19]. United States food and Drug Administration has approved Belgium launched the electronic equipment to treat migraine Cefaly。 It is a battery-operated headband "wearable device" by diamond-shaped objects stuck in the forehead by sending electrical signals to stimulate nerves (trigeminal nerve) to reduce the effects of pain [20]. China's Beijing University of Chinese medicine research team Diagnostics of traditional Chinese medicine and signal management technology developed by pulse screening device, realized the objectification of pulse diagnosis, clinical applications and achieved a good result [21]. In March 2014, GE Healthcare China also introduced a revolutionary IGS intelligent mobile robot--Discovery IGS730 involved in the industry and issued cardiac, neurological, vascular, interventional clinical tumor four solutions and hybrid operating room solutions, to promote cardiovascular, cancer and other chronic diseases clinical intervention have a positive significance [22].

3.3 Medical apparatus and instruments

In the aspect of medical equipment, the development of intelligent electronic equipment to medical equipment manufacturing technology has also brought great changes. Scientists at the University of Wollongong, Australia has developed a biological pen (BioPen) use formed new bone from human cells and a polymer as a "stem cell ink, print patients need organ [23]. Britain's Design Fripp and Manchester City University jointly designed a 3D printing program, designed for the production of the accident victim 3D design and production of facial prosthesis design and printing process, such as the nose and ears, etc. [24]. Scientists in the United States and Germany have developed a plastic that can automatically be used as a surgical suture and medical implants. The material has a memory function, can be used for the production of implants or bone nails, such as wound healing, the material will be automatically decomposed, and can be harmless to the human body absorption [25]. Argentina interaction dynamics and Rosario neural rehabilitation fund researchers recently combined with automatic control and brain neurology, developed a new type of wheelchair, it can complete mobile task according to the user's brain wave signal instructions, users only need to wear a helmet of a with brain wave detection device, can alone, "Imagine" mobile wheelchair control, the sensitivity of less than previously existing manual wheelchair control system [26]. Researchers in Japan developed a just part of the remaining muscle strength can achieve stable walking the new intelligent prosthesis, is controlled by a computer, and can assist amputees to keep a stable standing posture, and at different speeds natural walking [27]. South China University of science and technology newly developed intelligent crutch according to the built-in

sensors to collect data, determine the user's walking, especially according to the walking remind users to rest and in user sudden illness fainting or other fall automatically send out a distress signal and via SMS to inform the location information of elderly relatives, the intelligent crutch safe and strong practicability. Tsinghua University, Northeastern University and the joint development of the Harbin Institute of Technology, a multi degree of freedom bionic hand has also achieved some success, to bring the gospel to patients [28].

3.4 Clinical education

Traditional classroom teaching contains limited resources, especially in the teaching of surgical operation. Virtual environment and lack of interaction with the real world. The introduction of intelligent devices in clinical medicine education can be real-time capture, the operation of video, audio real-time interactive communication, through the device to show to the viewer. U.S. Eastern Maine Medical Center's Grossman Rafael doctor using Glass Google and Google+ video social application loop chat (Hangout) successfully conducted a surgical operation on a whole live. The image captured by Glass Google can be transmitted and displayed on a iPad tablet. The whole live process is very smooth people can clearly see through the iPad abdominal surgery every step of the operation details [29]. The Beth Israel Deaconess nice medical center, emergency department developed a prototype software based on the Google glass, doctors need to scan the QR code of a representative patient can quick access to the patient's history and current state of health, as the doctor provides a convenient [30]. Israel to develop a medical 3D holographic projection device, through the new technology, the doctor can with 3D holographic projection simulate surgeon practice, to create a new platform for surgical treatment and telemedicine can provide anatomic images of the human body, it is very realistic. The doctor can visually see everything in the body, including the location of the organs and the operation of the human body. With its help, you can better surgery, a better understanding of the physical structure of [31]. Virtual reality and Visualization Technology Research Institute of Beijing Normal University virtual endoscopy and visualization tools and other tools also have a good effect in clinical education [32].

IV. EXISTING PROBLEMS AND DEVELOPING TRENDS

The application of intelligent electronic devices in the field of medicine has been formed and the situation of contention of a hundred schools of thought All flowers bloom together. However, there are still some problems need to face and think. Mainly divided into two parts technical problems and industrial problems. In the technical aspects, because there is no uniform standard, resulting in data redundancy and waste of resources; due to the special nature of intelligent electronic devices in medical use, high security and reliability is also facing the problem. Artificial intelligence technology, cloud computing technology, network security technology and data mining technology is also one of the bottlenecks in the application of intelligent electronic devices in the field of medicine. In terms of industry, the transformation of different units, the transformation of traditional testing process, the perfect industrial chain and large-scale application and equipment price issues, but also need to be further considered.

Now, although there are some problems in intelligent electronic devices, but with the breakthrough of technology, cost reduction, the application of smart devices will be more and more widely. Future of various intelligent electronic devices standards and protocols will according to current medical standards and indexes formed unified norms and standards of the medical, for resource sharing; according to the collecting physiological information of a user, can in critically ill life signal automatic identification and alarm, automatic analysis and disease treatment, auxiliary rescue; according to different individual needs, for different users, different functions and types of design, to realize the individualization of medical; equipment more portable, more security, the user wearing more comfortable.

V. CONCLUSION

Application of intelligent electronic equipment in the medical field has great potential can not only help hospital to realize intelligent medical and management, also can be faster and better service to society, to realize the digitization of medical information of, equipment process information, prevention intelligent detection etc. With the continuous development of science and technology, a more intelligent, convenient medical system is bound to become the inevitable trend of future development.

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