Providing service in the hospital .

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Annotation. This work provides an in-depth analysis of hospital service robots and their importance in the modern medical system. Robotic technologies play an important role in ensuring speed, accuracy, and safety in healthcare today . The study covers the main functions of robots - patient care , automation of logistics processes, disinfection work, monitoring systems, and participation in surgical procedures. It also scientifically analyzes their economic efficiency, metrological accuracy, and compliance with international standards, environmental impact, and future development prospects. The results show that medical robots are bringing the healthcare system to a more efficient, safe, and innovative level.

Keywords : Hospital robots, medical automation, artificial intelligence, robotics, logistics systems, disinfection technologies, surgical robots, ISO standards, IEC 60601, cost-effectiveness, environmental technologies, smart hospital, digital medicine.

ENTRANCE

are increasingly playing an important role in modern medicine . Hospital robots are one of the most important innovative directions in this process. They serve to facilitate human labor, improve the quality of medical services and ensure patient safety. Today, robots are used in hospitals not only as auxiliary tools, but also as independent intelligent systems . They participate in logistics, disinfection, diagnostics and even surgical processes, significantly increasing the efficiency of medicine. Therefore, this topic is very relevant in the field of modern science and engineering.

General description of hospital service robots

Hospital service robots are modern robotic systems designed to automatically perform various auxiliary and technical tasks in medical institutions. They operate on the basis of artificial intelligence, sensors, camera systems and software control and serve to facilitate human labor. Such robots are mainly used in the medical field to speed up workflows, increase accuracy and reduce errors associated with the human factor. They ensure effective coordination between different departments in hospitals and improve the quality of service.

include several areas . First, patient care : robots help patients provide necessary information, provide simple advice, or monitor their condition. Second, logistics tasks: quickly and accurately deliver medicines, test samples, or medical equipment to the right places within the hospital. This process saves medical staff time and increases work efficiency. Robots also play an important role in disinfection processes . They clean rooms using UV rays or special disinfection technologies, preventing the spread of infection. In addition, they perform auxiliary tasks - such as monitoring patients, collecting data , and transmitting it to doctors. In general, hospital service robots are an integral part of modern medicine, significantly increasing the quality, speed, and safety of service.

Robot capabilities (what they can do)

used in hospitals are multifunctional systems based on modern technologies, capable of performing a number of important tasks in medical institutions independently or semi-automatically. Their capabilities are expanding day by day. One of the most important tasks is the automation of logistics processes. Robots can quickly and accurately deliver medicines, laboratory analysis samples, blood packages and other medical materials to the necessary departments within the hospital . This process reduces human error and saves time. Robots are also able to monitor patients. Using special sensors, they monitor the patient's vital signs such as temperature, heart rate, and blood pressure and automatically transmit the data to doctors. This helps to detect the disease early and take prompt action.

Robots also play a major role in the field of disinfection . They use UV rays or special chemical systems to clean wards, operating rooms and other environments, preventing the spread of infections. This is especially important in areas with a high risk of infectious diseases . In addition, some robots also have the functions of simple communication with patients, providing them with the necessary information and providing psychological support. Surgical robots, on the other hand, assist doctors in complex operations with high precision. In general, hospital robots serve to further develop the medical system by ensuring speed, accuracy, safety and efficiency.

Financial aspects (economic efficiency)

of service robots in a hospital initially requires a large financial investment. The costs of purchasing, installing, programming and training robotic systems can be relatively high. Surgical robots or complex systems based on artificial intelligence are especially expensive. Nevertheless, in the long term, these technologies are economically beneficial. First of all, robots reduce or alleviate the need for human labor , which significantly reduces labor costs. For example, robots perform logistics or disinfection work, which reduces the number of additional employees. The second important aspect is the reduction of errors. Human error in medicine can lead to significant financial losses (incorrect medication administration, delayed diagnosis, etc.). Robots, on the other hand, reduce such errors and optimize treatment costs due to their precision. Also, robots increase hospital efficiency because they have the ability to work 24/7 . This will help serve more patients and increase the institution's revenue .

Metrological and standard requirements

hospital service robots are directly related to the medical field, their operation must meet high accuracy, reliability and safety requirements. Therefore, such robots are developed and used under strict metrological control and international standards . The most important metrological requirement is measurement accuracy. For example, sensors that measure a patient's temperature, heart rate or blood pressure must operate with very high accuracy. Any small error can lead to an incorrect diagnosis, so all measuring devices are regularly calibrated and checked. In terms of standards, medical robots must comply with several international standards. For example, the ISO 13485 standard is used for the quality and safety of medical devices, and the ISO 14971 standard for risk management . The IEC 60601 standard is very important for electrical safety and medical electrical equipment. These standards ensure the safe operation of robots for patients and medical personnel. In addition, data protection is also an important requirement. All medical data collected by robots must be confidential and stored in systems protected from unauthorized access. This guarantees the security of patient personal data. It is also necessary to comply with sterilization and hygiene standards. Since robots work in a hospital environment, they must not spread infections and help maintain a clean environment.

Future development and benefits

Hospital robots are expected to become one of the most important parts of the medical system in the future. The development of technologies, especially artificial intelligence (AI) and machine learning

systems, will further expand the capabilities of robots and make them more “ smart”. In the future, such robots will be able to assist doctors not only in auxiliary tasks, but also in making complex medical decisions . For example, they will be able to detect diseases at an early stage based on patient symptoms, automatically analyze test results and make recommendations for treatment. Robots will also be deeply integrated with telemedicine. This will allow doctors to see patients, make diagnoses and even manage some procedures through robots from a distance . This creates great opportunities, especially for remote areas. In the future, surgical robots will be able to perform more precise and minimally invasive operations . This will shorten the recovery time after surgery and reduce the risk of complications. In addition, robots will also make a significant contribution to the development of personalized medicine . Individual treatment plans are created based on each patient's genetic and biological information.

Environmental impact and “green technologies”

Hospital robots not only increase medical efficiency, but can also have a positive environmental impact. Their operation based on “green technologies” helps reduce harmful emissions and use resources more efficiently. One of the most important environmental benefits is energy efficiency. Modern medical robots are designed to operate on low-power electrical systems, which reduces overall energy consumption. In particular, automated logistics and disinfection robots require fewer resources than human labor. Another important aspect is the reduction of chemical waste. Traditional disinfection processes use large amounts of chemicals, which can harm the environment. Robots, on the other hand, sterilize using UV radiation or other environmentally friendly technologies, reducing the need for chemicals . Robotic systems also promote paperless work. Patient data, test results, and documents are stored electronically, which dramatically reduces paper consumption and helps preserve tree resources. Medical waste management is also environmentally important. Robots can help to accurately sort waste and separate hazardous materials, which prevents environmental pollution. In the future, the concept of "green hospitals" will be further developed. In it, robots can operate on solar energy or renewable energy sources, as well as have self-sufficient energy systems .

CONCLUSION

Hospital robots are one of the most promising areas of modern medicine , which are fundamentally changing the healthcare system. Their introduction will increase the speed of medical services, reduce human errors, and improve the quality of services provided to patients . From an economic point of view, although the initial investment is large , in the long run robots reduce costs and increase efficiency. Compliance with metrological and international standards ensures their reliability. From an ecological point of view, robots contribute to reducing waste, saving energy, and developing "green technologies" . In the future, it is expected that hospital robots will further develop through artificial intelligence, nanorobots, and cloud management systems, leading to a fully automated medical system.

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