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AN OVERVIEW OF ROBOTS IN THE HEALTH CARE SECTOR

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ABSTRACT

A great deal of the technology invented by humans has been and will be motivated by the desire to go beyond our inherent abilities. Computers, for example, were created to automate mathematical operations at speeds far above those of even the most brilliant minds. The area of robotics has evolved as a result of our desire to go beyond what we were born to do. Originally designed in the early 1960s to automate processes in the manufacturing business, industrial robots are now utilized to aid and protect their human counterparts. Robots are currently used in industrial procedures that require extra strength and endurance, such as handling and palletizing, or precision, such as cutting and welding, or those in which people could be hurt, such as chemical spraying.[1] Now Robots are set to change medical practice. Medical robots had their start about 34 years ago when an industrial robot and computed tomography navigation were used to insert a probe into the brain to obtain a biopsy specimen.[1] The medical industry employs different types of robots to improve present standards of care while also assisting humans to perform things they weren't necessarily able to do previously, or to do things faster and with fewer errors.

Benefits of robots in healthcare system

High-quality patient care, effective clinical procedures, and a secure working environment for patients and healthcare professionals are all made possible by the use of robots in the medical area.[1]

Patient care

Intelligent therapies, frequent and individualized monitoring for patients with chronic diseases, minimally invasive operations, and social interaction for elderly patients are all made possible by medical robots. Additionally, when robots reduce workloads, nurses and

other healthcare providers can contact with patients more personally and show more compassion, both of which can improve patients' long-term wellbeing.[3]

Clinical workflow improvements

The use of autonomous mobile robots (AMRs) streamlines regular tasks, eases the physical burden on human workers, and promotes more reliable operations.[3] By keeping track of inventories and timely ordering, these robots can help ensure that supplies, equipment, and medications are available where they are required, addressing staffing shortages and issues.[3] cleaning and sanitizing AMRs make it possible for hospital rooms to be promptly cleaned and prepared for new patients, freeing up staff members to concentrate on patient-centered, value-driven work.

Workplace safety

In hospitals where there is a possibility of disease exposure, AMRs are used to convey supplies and linens to help keep healthcare staff safe. Hospital acquired infections (HAIs) can be decreased by deploying cleaning and disinfection robots, which are already being used by hundreds of healthcare facilities1. Another type of AMR, social robots, assist with heavy lifting by transferring beds or patients, easing the physical burden on healthcare professionals.

Typesmof robots used in healthcare system

1. Surgical robots

Major manufacturers are stepping up their robotic surgical system R&D efforts. Intuitive Surgical presently dominates the market as a whole, but things are quickly shifting. The market for medical technology surgical robots is being supported by the entry of large manufacturers like Johnson & Johnson and Medtronicare.

Each firm has a particular product line that focuses on a different therapeutic area for minimally invasive robotic surgery. One such general surgical robot is the da Vinci System, which specializes in a wide range of urological, bariatric, and gynecological surgical treatments. Furthermore, the Stryker MAKO System is a specialist in orthopaedic surgery, particularly partial and total knee replacements.

A leading robot in the medical robot market, Intuitive's Da Vinci platform is made up of integrated hardware, software, and medical equipment. The software aggregates analytics for teams to review, enabling them to improve patient experiences and procedure effectiveness. Teams can also use the platform to run simulations, giving surgeons real-world practice before they reach the operating room (OR).

2. Exoskeletons

Robots can help in surgery and recovery. For instance, Cyberdyne's Hybrid Assistive Limb (HAL) exoskeleton helps patients recover from conditions leading to lower limb disorders, such as spinal cord injuries and strokes, by using sensors placed on the skin to detect small electrical signals in the patient's body and responding with movement at the joint.[2]

Exoskeleton robots function as suits that are attached to human users and are made up of sensors, levers, motors, and other moving parts. These medical robots use sensors to identify electrical signals coming from a patient's body and either initiate movement or accommodate movement. Some robots allow human operators to utilize buttons and other devices to activate and control the exoskeleton.

The personal exoskeleton from ReWalk Robotics helps people who are relearning how to walk after spinal cord damage. The exoskeleton, which is made up of hip, knee, and ankle levers, aids users in maintaining a natural gait and may be adjusted to suit each person's

preferred gait. To navigate stairs, curbs, and other settings, users can additionally modify the robot's responses via wrist buttons and changes in their torso movements.

3. Care robots

Although there are now very few robots deployed to care for and support elderly and disabled people, this is expected to change considerably over the next ten years, especially in nations like Japan where a shortage of caretakers is anticipated.[2] These products' initial applications are fairly straightforward, like assisting people in getting into and out of bed, but they will be used for more complex tasks as time goes on, like reminding patients to take their medications or offering emotional support and interaction to those who don't get much human contact.[2]

Helping nurses with the many duties they complete every hour is another anticipated use case for care robots. Many of these activities, like collecting blood, keeping track of temperature, or enhancing patient hygiene, are straightforward but essential. If robots could assist with these straightforward, repetitive chores, nurses would have more time to devote to developing treatment strategies and providing individualized patient care. Patients and nurses in Japan are already benefiting from products like the Robear Japanese, produced by the research organization RIKEN and Sumitomo Riko.

4. Rehabilitation robots

Rehabilitation robots, like exoskeleton robots, use sensors to identify electrical signals along a patient's skin, activating motors to either aid with motion or carry out the patient's intended movements. The primary distinction is that these robots are experts at assisting patients in regaining lost abilities, body control, and autonomy.

The Burt robot from Barrett Technology can work with therapists to support patients trying to get over paralysis or weakness in their hands and arms. Burt fastens to a patient's forearm and enables upper-extremity movement as the patient plays games. Patients recuperating from a variety of diseases, including as strokes, brain injuries, spinal cord injuries, Parkinson's disease, and multiple sclerosis, benefit greatly from this type of robot-assisted therapy.

5. Service robots

To improve the operational efficiency of healthcare companies, service robots carry out simple, non-patient-facing duties. These robots use artificial intelligence and sensors to learn how to move around and communicate with patients and hospital staff. They can carry out straightforward tasks like delivering supplies and medications to patients and outfitting teams with personal protective equipment (PPE).

The Moxi robot from Diligent Robotics blends social intelligence with AI-powered automation to carry out routine medical tasks.[3] The robot can transport and dispense medications, move out of the way of people, and even take selfies. It also has the awareness to adapt to operations through repetition. By freeing both the hospital and nursing staff from routine tasks, Moxi can alleviate the nursing shortage and lessen burnout among present nurses.

6. Social robots

Social robots are created to maintain more intricate interactions with people, frequently displaying human qualities to transmit and elicit the proper emotional reactions. These robots have sensors, cameras, AI, and machine learning so they can comprehend human speech and actions and respond appropriately based on the situation.

Children with learning difficulties can develop their social and emotional intelligence with the aid of Embodied's Moxie robot. The robot acts as a kid-friendly AI companion by combining human-like movements and a soft body with conversational AI that facilitates fun interactions. Moxie provides kid-friendly activities that foster children's socioemotional development by providing a variety of games and a screen that filters out objectionable content.

7. Radiotherapy robots

Robotics was introduced into the field of radiotherapy in the 1990s. The initial system used a linear accelerator attached to a robotic arm that could move about the body, precisely treating tumors in various regions. Since then, robotics has been used in radiotherapy and radiosurgery. Robotic treatment couches, for example, precisely position the patient before

treatment begins. They also enable clinicians to move the patient without entering the treatment room.

8. Laboratory robots

Robots have been a common sight in labs for the past 30 years. The kinds of robots used in laboratories are created specifically to either automate procedures or help technicians with monotonous duties. Similar to the realm of industrial robotics, operations involving chemicals and other substances that are hazardous or toxic to humans are frequently handled by laboratory robots. By minimizing human mistake, the automation offered by laboratory robots boosts speed, capacity, and accuracy.

9. Robotic prosthetics

This relatively recent use of medical robots focuses on providing wearers with life-like limb functionality. Prostheses are benefitting considerably from new structures and control systems.[2] Robotic limbs with bionic skin and neural system are allowing a remarkable degree of user control. Robotic exoskeletons (orthoses) are finding use in rehabilitation, assisting paralyzed people to walk and to correct for malformations.[2] Robots are also finding a place in keeping hospitals clean as hospital rooms are being disinfected with the use of high intensity UV light applied by a robot.[2]

10. Hospital robots

Hospital robots are already transporting medications, meals, and specimens throughout hospitals today, thanks to a pre-programmed architecture of their environment and built-in sensors. The ability to complete contactless sanitization has become more important for the health and safety of patients and healthcare employees as a result of the Covid-19 outbreak. Hospital robots are beginning to take over sanitizing rooms and areas, removing the need for hospital personnel to come into contact with any dangerous germs.

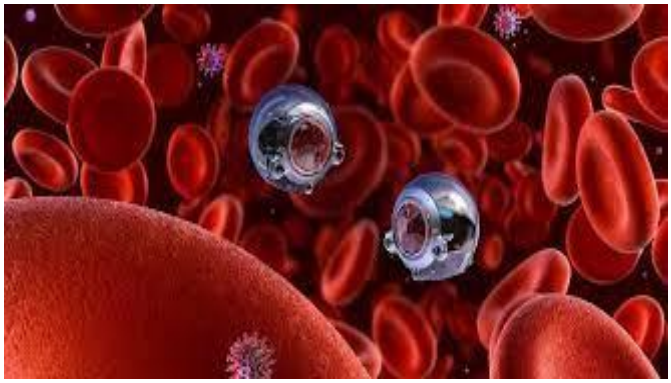
11. Pharmacy robots

Aside from robots that could be deployed in potentially dangerous circumstances for people, robotics could have a significant impact on pharmaceutical distribution networks. Robotic medical dispenser systems and drug management solutions enable each facility to "right-size" its system for its volume. It is also an emerging best practice for these robots to be equipped with powerful data mining capabilities, allowing pharmacies to continuously gather useful information about their traffic and efficiency. If such activities were performed by medical robots, pharmacists would have the time and incentive to participate in the social component of healing: educating people about preventive measures, providing practical advice, and ensuring that healthcare actually becomes caring.

12. Nanorobots

All of the nanorobots were developed in research labs as proof-of-concepts rather than practical applications. Theoretical/conceptual themes continue to dominate recent technology headlines. However, this is how digital health solutions frequently evolve: from conceptual phases in labs to multiple iterations and testing stages before being made available to a wider public. With the development of digestibles and digital pills, we are getting closer to nanorobots. On one front, Max Planck Institute researchers have been working with extremely micro-sized - smaller than a millimeter - robots that literally swim through your physiological fluids and could be used to give medications or other medical relief in a highly focused manner. These scallop-shaped microbots are meant to move through non-Newtonian fluids such as your bloodstream. These scallop-shaped microbots are meant to move through non-Newtonian fluids such as your bloodstream, lymphatic system, or the slick goo on the surface of your eyeballs.

Despite its small size, the origami robot is equally as remarkable as a super-strong carrier robot. When taken, the capsule containing it melts and unfolds in the patient's stomach. Controlled by a technician and using magnetic fields, it may repair stomach wounds or securely remove foreign objects such as swallowed toys.



REFERENCES

1. https://aabme.asme.org/posts/robot-assisted-surgery
2. https://interestingengineering.com/15-medical-robots-that-are-changing-the-world
3. https://www.intel.com/content/www/us/en/healthcare-it/robotics-in-healthcare.html
4. https://builtin.com/robotics/surgical-medical-healthcare-robotics-companies
5. https://www.brainlab.com/journal/types-of-medical-robots-in-use-today-and-in-the-future/