

Robots and Aging

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“Rest assured, this world in which robotic caregivers are looked upon to help with our world’s greying population is very much a reality. It’s not a question of if, but when.”

Jason Walker
 Waypoint Robotics

Robot & Frank is a classic movie in which an aging Frank becomes cognitively impaired and his son purchases him a robot to allow him to stay at home. Frank, a lifetime thief, discovers he can teach his robotic companion to help him rob banks. While we are not quite there yet, the development of robots to help care for older persons is increasing exponentially.

Robot was introduced as a term in a 1920 play called “R.U.R” (Rossum’s Universal Robots) by Karel Capek. It is a Slavic word which means labor. A robot can be defined as a machine that can do work that would normally require a human to complete. A variety of computerized systems have been developed to enhance the quality of life for older adults. These

include remote monitoring, systems to enhance movements, including brain machine interfaces, systems to assist or replace nursing, robotic companions, cognitive devices, diagnostic devices, robotic transporters and robotic therapist (Table 1) (1-5). These robots can be used for loneliness, social and cognitive activities, safety and security, digital health and quality of life (6, 7).

Robotic nursing assistants are on the verge of becoming a key component of medical care. Nursebots have been developed to help with the transfer of individuals from bed to chair. Robots can assist with feeding individuals. Robots can dispense medicines in nursing homes and hospitals. Research into the role of intelligent sensors has made major advances in the last decade (8-10). These sensors can create health alerts that can alert nurses when a patient is getting out bed without assistance to complex systems that measure a person’s gait and fall risk. They can also detect persons who have fallen. Sensors can measure the use of the refrigerator or toilet and the time spent sleeping. Robots can also be used to disinfect the environment using xenon rays or ultra violet light.

A second role of robots is to provide companionship and to improve the ability of older persons to live independently (11). Numerous studies have shown that robotic animal companions, such as AIBO the dog, PARO the seal and Hasbro

Table 1. The role of robots in the care of older persons

Type of Robot	Function	Examples
Nursebot (Care Robots)	Transfer Medication Dispenses Measure vital signs Feeding Safety sensors Disinfecting robots (UV rays)	ROBEAR In home fall assessment Bed sensors Toilet use sensors
Robotic companions (Companion bots)	Provide socialization Provide reminders Telepresence/communication Improve independent living	Companionable PARO AIBO Hasbro cats ELLIQ BOMY
Movement bots	Exercise therapists Activated prostheses Brain machine interface Robotic transport	Exoskeletons
Cognidevices	Cognitoys Cognitive stimulation therapy Robot therapists	MARIO
Diagnostic devices	AI/computer assisted diagnosis	Annual wellness visit

cats, can improve happiness and quality of life in older persons living in nursing homes (12-19). These robots improve social interactions and activity among older persons with cognitive impairment. Overall, social robots appear to improve well being of older adults (20). Robots can also provide a telepresence and provide communication with families. Humanoid robots appear to be as successful as robopets (6, 21).

Companionable is a European Union project to develop a sophisticated robot (Hector) and an intelligent home system to allow frail older persons to support their ability to live at home independently (22). This robotic system supplies companionship, sensors to monitor the person and to detect falls, provide reminders and bring items to them and provide video connections to others (22). Hector can move around the house and provide cognitive stimulation.

Older persons need to do exercise to prevent and reverse the development of sarcopenia (23). Humanoid and nonhumanoid robots can provide group or individual exercise sessions. Exoskeletons can be used to allow a person with paralysis to walk. In addition, activated prosthesis and brain-machine interfaces can be used to enhance limb function (24). Self-driving robotic transport systems can be used to help transport an older person. Robots can also provide walking support for frail people (23).

Social robots have been developed to provide therapy for depression (25). Humanoid robots can provide support for persons with dementia and their caregivers (26, 27). Telehealth can be used to deliver an individual Cognitive Stimulation Therapy utilizing a robot (28, 29). Cognitoys may also help to stimulate memory.

Diagnostic devices can utilize robots to collect data and use Artificial Intelligence to make the diagnosis (30). This is ideal for the Annual Medicare Wellness visit.

Overall, there are a number of roles that robots can be used to provide services for older persons. As these robotic services are developed, they will reduce the need for human involvement. These devices are generally well accepted by older persons (31). In the future it can be expected that these robots will play an important role in allowing older persons to age successfully.

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