Service robots at residential care facilities
How technical assistive systems can improve the quality of work

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The impacts of demographic change are becoming especially noticeable in the area of inpatient/residential care (care homes for the elderly and hospitals). While the number of people in need of care is growing, the age of the staff is continuing to rise. Many workers leave the profession early because of the high physical and psychological demands. These high levels of stress are reflected in an average 25 days’ sick leave per year and frequent interruptions in work. Service robots can help to relieve the pressure on care staff with regard to both time and physical effort, thereby contributing to improved working conditions.

There are significant consequences from the acute shortage of personnel and resultant lack of time: care staff is working at the limit. There is often insufficient time for extensive interaction with patients/residents. Therefore, to enable themselves to spend more time with patients/residents, care staff would welcome assistance with their routine day-to-day activities, such as transport tasks and documentation. In interviews with experts, care workers have expressed the wish that new assistive systems should also help to reduce their physical workload – especially in relation to the lifting of persons. In addition, it would be helpful if such systems could support and promote the independence of patients/residents.

Logistical helpers
If laundry or food is transported by a robot, this allows care staff to spend more time with patients/residents. While the use of transport robots is already commonplace in large hospitals (with over 600 beds), their economic deployment has to date not been possible in smaller hospitals and care homes. To fill this gap, the CASERO driverless transport vehicle has been developed by MLR System GmbH. Especially small and versatile, the robot is able, for example, to independently pick up and transport laundry containers. In addition, CASERO can assist care workers on night shift by carrying out patrols for them. If it finds a patient or resident wandering about, it notifies a member of staff.

Figures: CASERO used to transport containers in an elderly care facility.
Automatic provisioning of care utensils
Further research has resulted in the concept of a care trolley for automatically providing care staff with the necessary care utensils and also documenting their use. An electronic care management system allows care plans to be displayed on the trolley during rounds. Once performed, care activities are quickly and simply documented. In addition, the care trolley can be independently restocked in an automated store and then returned to the ward by a transport robot. This not only saves time, but also reduces the number of stores on wards, thus avoiding unnecessary stocking of care utensils. For a first prototype implementation, researchers at Fraunhofer IPA have equipped the autonomous mobile base of the Care-O-bot 4 service robot with a platform that can be filled with care utensils.

Figures: Intelligent care cart in use, touch screen-based documentation of used utensils

Support with lifting and moving patients/residents
Whether lifting a patient/resident to change the bed linen, moving them to a wheelchair or bathing them: lifting and moving is an elementary part of the care staff’s day-to-day work and can cause them to suffer health problems early on in their career. These activities have conventionally required the use of various lift systems, such as overhead lifts, belt lifts and bath lifts. However, such equipment is suitable only for the particular situation and is not always available. Frequently, it must first be fetched from another room. To save time, therefore, patients/residents are often moved manually, which, in turn, increases the physical workload of the care staff. For this reason, Fraunhofer IPA has developed the Elevon concept, which comprises a new lifter equipped with additional assistive features. For example, the care worker is able to electronically summon the lifter, which thereupon makes its own way to where it is needed. It can also help with lifting a patient or resident. Using sensors, the lifter automatically detects the person who needs moving and can therefore suitably position its lifting system.

Alternative approaches work with body-worn robot systems, so-called “exoskeletons”. In a medical context, these are already used for rehabilitation and also to compensate for disabilities. Similar systems could equally well be employed to assist care staff in physically stressful activities. Using sensors and drives, they reduce the force required and warn staff against ergonomically inadvisable movements. As in all other areas of application, the role of the robot is exclusively an assistive one, for only a human is able to assess whether a person is lying correctly or whether they are in pain.
Offering drinks to residents

On a limited scale, direct interaction with residents is also possible. For example, it is especially important for elderly residents in care homes to be offered a drink at regular intervals in order to avoid dehydration. Such an activity, however, is highly time-consuming for the care staff. This is where an autonomous robot can be of assistance. In a research project, this scenario has been successfully evaluated in a residential care setting. The robot assistant Care-O-bot was used in various lounges at a residential care facility. Using a database containing the residents’ details, the robot was able to identify and selectively address individual residents. It also offered them a drink if they had not drunk enough.
Outlook
At a time when skilled staff are in short supply, it is essential to give consideration to the use of assistive
systems in the care sector. Service robots can make a significant contribution to relieving the pressure on
care staff. Although each of the robot systems so far used in real-world applications has been a prototype,
it can be predicted that the first products for this area of application will be made available in the coming
years – e.g. transport robots or assistive systems equipped with robotic functions and easy-to-use control
interfaces. In all cases, these systems are controlled and used by humans. It is not the intention that robots
should independently administer care to patients/residents or make their own decisions. Humanity and
intuition are key elements of a care professional’s job profile, and they can and will never be delivered by
a robot. However, what robots can do is to free up care staff to spend more time with patients/residents.
In addition, state-of-the-art assistive systems can reduce the level of physical stress and generally upgrade
the care profession – an important prerequisite for staff retention and recruitment: so that all those who
feel the calling to care for others are able to enjoy a long career in this profession.

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