

ROBOTICS IN THE CARE SECTOR – CHALLENGES FOR SOCIETY

TAB-Fokus no. 17 regarding report no. 177

May 2018



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Summary

- › There is hardly any social field that is more affected by ageing of society than care. In the future, significantly increasing care needs as well as a growing shortage of skilled care personnel are to be expected.
- › As a matter of principle, robots offer the potential for supporting both people in need of care and carers. There are prototypes at the development stage that can be used for various tasks with regard to care of the elderly. So far, however, they have been implemented into practice only rudimentarily.
- › Fundamental questions are raised with regard to whether a widespread use of robots would be socially desirable – particularly in view of the essential significance of human interaction for care work.
- › Designing good care is a task of society as a whole. Besides a demand-oriented technology development, this also implies a public debate on the future role of robotics in the care sector.

What is involved

In view of increasing life expectancy and declining birth rates of the German population, the **German care system has to face financial and personnel challenges** which are already noticeable today and will become even more acute in the future: On the one hand, **society's care needs** are growing continuously. According to current forecasts, there will be at least 3.5 million people in need of care in 2030 in Germany which corresponds to an increase of approximately 30 % compared to the figures of 2013 (2.63 million). On the other hand, the **working-age population** significantly financing long-term care insurance by means of their contributions and providing the basis for recruiting care professionals is decreasing simultaneously. There are already indications of an **imminent crisis in care**.

Politics and society are discussing intensively about how to deal with the anticipated financial and personnel bottlenecks. Besides continuing political efforts to make long-term care

insurance sustainable with regard to the demographic development, **technical innovations** are increasingly focused on. In this regard, in Germany, great hopes are particularly placed in age-appropriate ambient assisted living (AAL) systems, i.e. smart home solutions such as fall detectors, communication services etc. **However, service robotics is also coming increasingly to the fore.** This new generation of robots is characterised by being able to provide services in everyday environments thanks to a high degree of autonomy, sophisticated artificial intelligence (AI) and lightweight design. In contrast to AAL systems, robots are also **able to interact physically**. Thus, they offer a **versatile support potential** with regard to care of the elderly.

At the international level, particularly Japan has been pushing intensively the development of robotic solutions for the care sector for several years. But **German politics** has also taken up the issue – though perhaps not quite so proactively – and **promotes innovative technologies** that are intended to improve self-determination of people in need of care and to reduce the burden on care professionals. **However, the use of robots gives rise to difficult ethical questions.** This is because people in need of care and elderly people are left particularly helpless when facing machine access due to cognitive or physical limitations. At the same time, however, this group of people relies on technical support to be able to live an independent live.

Robotics in the care sector – a vast field of application

Care of the elderly is a strongly differentiated service sector. Basically, it can be distinguished into outpatient care and in-

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patient care which can be divided into very different fields of work. There are **possible applications of robots** mainly in the following fields:

- **support of routine care activities** (e.g. smart care trolleys which can take over logistical tasks [fig. 1] or lifting aids helping the personnel with physically demanding lifting activities),
- use as an **aid for the treatment of dementia**,
- use as a mobility aid to **help walking-impaired people or the care personnel** with physically demanding tasks (smart walkers and wheelchairs as well as exoskeletons, i.e. robots that are worn on the human body),
- use for household activities in order to **support elderly people and people in need of care**, whether as communication aid, as a simple handling aid or as complex multifunctional robot assistant.

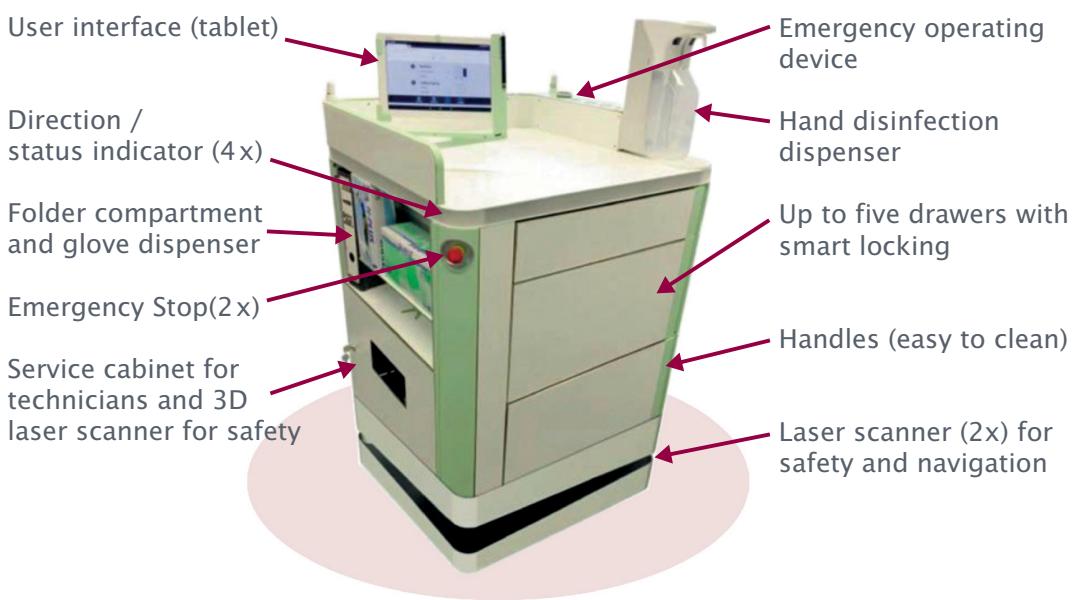
In all these fields of application, there have been **intensive development efforts** for a long time already. However, only few products have been used in care practice so far: simple handling aids such as eating aids, socially interactive therapeutic robots like the robot seal PARO (fig. 2) which is already being used in care facilities or, in a few cases, telepresence robots serving as a remotely-controlled communication platform. **More complex robot assistants**, however, have not yet progressed beyond the **status of a research platform**. This is due to the enormous technical complexity of those systems, their high overall costs and the high demands regarding a safe use.

Application-oriented development increasingly focuses on **specialised systems for inpatient care** that offer a better utilisation and thus a higher economic benefit. Altogether, **simpler systems with limited assistance functions and a low degree of autonomy** are expected to remain predominant for many years to come.

Implications of the applications: Care interaction in the spotlight

From the perspective of care science, it is widely undisputed that **the key to good care is a caring interpersonal encounter**.

Fig. 1: Prototype of a smart care trolley navigating autonomously to its place of use and being equipped with documentation functions



ter. This is why ethical debates focus on the question how the use of robotic technologies will affect the core processes of care work. There is a broad consensus that **it would be ethically unacceptable to replace care personnel by machines**. However, such a dehumanisation of care normally does not reflect the thrust of current developments. The applications rather are intended to systematically support social interaction – be it by reducing the burden on care personnel or by empowering people in need of care with regard to social participation.

Controversial is the question whether and to what extent these objectives can be realised in practice. There are fears that, on the one hand, the use of robots will increase **focusing on functional aspects of care work** (e.g. personal hygiene, nutrition) and that, on the other hand, it might lead to an economically motivated **reduction of care personnel**. Reliable findings regarding the implications of robotic systems in the care sector are still lacking which is primarily due to the **scarcely available practical experience**. Moreover, there are no guidelines on how to deal with the individual systems in an ethically appropriate way. In this respect, an important field of research opens up which yet has not been tapped at all. This is why currently a **prospective ethical evaluation within the framework of technology development** is the most reasonable way to face the unclear effects of technology in a constructive manner.

Nevertheless, some **normative indications** can be derived from the ethical debate. Thus, ethical problems are getting worse **the closer robotic systems come into contact with people in need of care and the higher the devices' level of autonomy**. In contrast, automation of logistical and organisational tasks beyond person-related care, particularly in the field of

inpatient care, seems to be ethically more acceptable. Ethical evaluations are getting more complicated if people concerned can express their will regarding the use of robots only in a very limited way or not at all. For this reason, **dealing with patients suffering from dementia** requires a **particular ethical sensitivity** and a very careful and responsible use of technology.

Responsible research and development

For many years already, developers have been reminded to no longer make the technically feasible the yardstick of technology development, but rather the required assistance demands which need to be determined as early as possible and with the users being involved. A more **demand-oriented technology development** now is also **increasingly being implemented**. Altogether, this is expected to offer technology solutions that are **precisely tailored to the needs of the users** and thus are socially more acceptable and economically more successful.

The development of demand-oriented care technologies is a **long-term, open-ended task** (see box) that depends considerably on public funding, particularly in the early stages of product development. In recent years, both at the national and European level, there have been significant research policy efforts to consequently **deal with ethical, social and legal issues** in publicly funded projects. For this, the German Federal Ministry of Education and Research (»BMBF«) has developed the approach of integrated research which is applied to all care-related calls for tender. It is a **key task of research funding** to make sure that these strategic objectives are effectively implemented at the project level.

Fig. 2: Robot seal PARO



Currently, however, **German research funding does not place special emphasis** on the issue of **robotics in the care sector**. In particular, there is no comprehensive strategy for the development of service robotics as a whole like it has been developed in other high-tech countries like Japan or the USA. In view of cost-intensive and time-consuming R&D processes, a **stronger strategic orientation of funding activities** would be desirable in order to ensure a higher planning security for the stakeholders involved.

So-called lighthouses would be helpful to ensure that promising robotic care innovations finally will be adopted in practice. Those lighthouses are institutions or companies **playing a pioneering role with regard to a transfer into practice** by testing promising innovations at an early stage. There is a dilemma that there are only few mature products which could be used for this. However, this dilemma can be avoided by focusing on pilot applications which already generate an added value, even without offering their full functionality yet. Moreover, the lighthouses could serve as **learning spaces** to improve the **evidence base with regard to the following aspects**:

- › the **specific demands and life situations** of the potential technology users that should be broadly examined,
- › the **manifold implications** of the systems regarding arrangements of care and the stakeholders involved,
- › their **efficiency and effectiveness**, especially with regard to the support potential for the core processes of care work,

Requirements with regard to a demand-oriented technology development

The demand-oriented development of robots for the care sector has to be seen in the context of a holistic approach comprising not only the product itself, but also broader contexts of use. This not only requires a **deep understanding of the users and their needs**, but also **good knowledge of the sector environment** which can only be achieved by means of an **interdisciplinary research approach**. A demand-oriented approach includes the following key elements:

- › **demand analyses** identifying reasonable possibilities for assistance in complex care arrangements,
- › evaluations uncovering **the ethically relevant aspects** of the resulting artefacts,
- › **practical tests** serving to examine the technical reliability of the applications, but also their impacts on the core processes as well as the environment of care under conditions that are as realistic as possible.

- **adequate socio-economic, legal and ethical framework conditions** supporting a successful implementation.

Social and legal framework conditions

Currently, it is still unknown whether at all or when a widespread use of robots in the care sector is to be expected. Nevertheless, it is important to keep an eye on the challenges involved in order to be well prepared for new developments:

Setting the course regarding professional and social welfare law: Systems that have proven to be useful should preferably be included in the **catalogue of care aids of Book XI of the German Social Code (»SGB XI«)** in order to not restrict the group of potential users. At the same time, it is a significant political task to make sure that technical assistance will not be systematically prioritised to personnel assistance with regard to social welfare law. An obvious option would be to establish a **veto right for beneficiaries** to be able to provide for their needs and wishes. Finally, it is of crucial significance that the future users have the **necessary technical skills**. Here, a broad field of action opens up – not only for politics, but also for professional associations and trade unions – to ensure an adequate **qualification of care personnel**.

Issues of security and liability: It is important to have legally binding regulations **protecting the physical integrity and privacy of every individual** and providing an adequate compensation in case of damages. In this context, some regulatory uncertainties are emerging: For example, the **security and maintenance obligations of the operators** are not defined in a transparent way which last but not least also has consequences with regard to liability law. This is due to the fact that – according to the current **civil liability regulations** – a damaged party normally can only hope for receiving compensation for damages if a tangible breach of duty of the operator or a manufacturing-related product defect can be proven. Given the technical complexity of the robots as well as their increasing degree of autonomy, those aspects pose almost insurmountable barriers. One way of overcoming this dilemma could be the **introduction of strict liability for the operators**, perhaps combined with corresponding insurance obligations.

The Office of Technology Assessment at the German Bundestag (TAB) advises the German Bundestag and its committees on questions of scientific and technological change. TAB has been operated by the Institute for Technology Assessment and Systems Analysis (ITAS) of the Karlsruhe Institute of Technology (KIT) since 1990. It has been cooperating with the IZT – Institute for Futures Studies and Technology Assessment and VDI/VDE Innovation + Technik GmbH since September 2013. The Committee for Education, Research and Technology Assessment decides on TAB's work programme, which also includes subjects proposed by other parliamentary committees. The standing »TA Rapporteur Group« consists of the Chairman of the Committee, Dr. Ernst Dieter Rossmann (SPD), and one member from each of the parliamentary parties: Stephan Albani (CDU/CSU), René Röspel (SPD), Dr. Michael Espendiller (AFD), Mario Brandenburg (FDP), Ralph Lenkert (Die Linke), Dr. Anna Christmann (Bündnis 90/Die Grünen).

TAB report no. 177

Robotics in the care sector – challenges for society

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Website of the project

www.tab-beim-bundestag.de/en/research/u106002.html

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Public debate: Finally, designing good care is a **task of society as a whole**. It seems to be urgently necessary to hold a public debate on which developments are desirable and which role automation solutions shall play in the overall context of care – all the more so since there are **essential questions** hidden behind, such as the question of **how we would like to live and grow older in the future**. However, it is to be stated that the topic is raising public awareness only slowly and rather in speculative contexts. This is why it seems to be important to initiate processes of public discourse already today which include a **systematic exchange regarding the future of care**. This debate should also take into consideration a realistic assessment of the opportunities and limitations of using robots in the care sector as well as a reflection of alternative options for action to deal with the demographic change in a constructive way.