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ORIGINAL RESEARCH

Receptiveness Of GPs In The South Of Saxony-Anhalt, Germany To Obtaining Training On Technical Assistance Systems For Caregiving: A Cross-Sectional Study

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Background: Challenges to general practitioners (GPs) as family doctors in Germany are growing because of the demographic situation. Technical assistance systems can improve the care for patients provided by GPs and care personnel to preserve autonomy. GPs are key persons in the health care team to recommend and facilitate access to technical solutions to influence their implementation into their patients' homes.

Aim: Explore the general receptiveness of GPs in Germany regarding state-of-the-art and modern assistive technology, as well as their experiences, attitudes and expectations and their training demands.

Methods: A cross-sectional survey was conducted among GPs in Germany with a self-developed questionnaire sent by mail.

Results: Response rate was 34% (n=194). As expected computers and smartphones are widely used. Data glasses, digital pens and virtual reality and others are often "unknown". Experience with assistive technology was gained with emergency call systems, smart calendars and tablet dispensers. Self-reported receptiveness to use innovative technology is high but knowledge is low. The majority reported lack of access to training and support. The receptiveness for advanced education about technical solutions is high. In free-text response, some communicated their worries about the replacement of human interaction with technology.

Conclusion: The survey showed an overall high receptiveness about assistance technology to GPs and strong demands for education and support. Education for GPs need greater efforts to master the process transforming the digital health care provision.

Keywords: general practitioners, physicians, family physicians, self-help devices, technology, outpatients

Introduction

One of the challenges in terms of health care is the growing demand for consultants and family doctors due to the increase in the numbers of elderly people and the simultaneous increase in the age of doctors themselves.[1] Home automation and emergency call systems, etc., may be regarded as reasonable ways of supplementing the care provided by doctors and care personnel with a view to preserving patient autonomy.[2] This also applies to technical assistance systems such as robots or telepresence systems (advanced video telephony systems enhance the impression of the communication partners' presence).[3–5] It is not currently possible to make

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clear distinctions between the different categories of assistance systems.[6] There is hope, however, particularly in the field of health care, that new technologies will help improve patient care.[7] This largely depends on how closely reasonable applications (from a specialist perspective) are able to keep pace with developments.[8]

General practitioners (GPs) as family doctors are the core of the primary health care team and are therefore the main point of contact, in terms of technical assistance systems, for both care personnel and relatives who might act as caregivers. Therefore, GPs expertise in relation to potential technical solutions may provide the basis for targeted advice and prescriptions. As far as we are aware, there has been no study of the role of family doctors in terms of technical solutions for the delivery of care in the home yet. In the area of nursing, one study examined eHealth education and training on all 19 Australian university medical schools.[9] There is consensus about the importance of eHealth, but there are other priorities and systemic problems inhibiting the inclusion of this topic in medical education. Research into robotics systems in the home is mostly based on prototype systems in the context of feasibility studies and acceptance surveys, with no attempt so far to provide evidence of benefits or effectiveness.[5] The evidence relating to studies of telepresence systems is similarly scarce.[10]

The aim of our investigation was to ascertain if GPs in Germany know about state-of-the-art and modern assistive technology, as well as their experiences, attitudes and expectations. We wanted to understand about their adoption of these kinds of technology, desire for training about them and whether they recommended the devices to their clients.

Methods

Sampling And Design

Between February and April 2018, we performed a cross-sectional questionnaire-based survey among GPs in Germany (South of Saxony-Anhalt). From the Association of Statutory Health Insurance Physicians, we had a publicly available list of 823 postal addresses with a ZIP code beginning with 06 specific for the targeted region. This list was randomized for two research projects via Microsoft Excel. One part was used by the other project and for this current study, we used the rest with 571 of the addresses to contact the GPs. We sent to potential participants the information sheet, the questionnaire and a stamped addressed envelope. The sheet contained information about the researchers, the study aims and about pseudonymised data handling. Because the participants are informed and choose to complete the survey, it was taken as demonstration of their willingness to participate and a formal prospective written informed consent process was not be required.[11] The option for participants to send the filled questionnaire back by fax was also offered. After one month, a reminder with the same materials was sent to all non-responders. In case of returned mail because of an incorrect address, investigations into the new address were done. If successful, the mail was sent to the new address.

Questionnaire

The study questionnaire in German language was self-developed by an interprofessional team (the authors are nursing scientists, GPs and computer scientists) in an intensive process with eleven iterations. To ensure comprehensibility, usability and face validity, the questionnaire was pre-tested with three GPs resulting in minor changes to improve the feasibility.[12] The original questionnaire can be requested from the corresponding author. Survey participants were questioned about socio-demographic information, current occupation and characteristics of their medical office. Furthermore, they were asked about their knowledge, current use, planned use, willingness and training needs for specific technical solutions. The technical terms used in the questionnaire were given without further definition or explanation. The translation from German to English of the technical terms used can be found in the Supplementary Data: (Table S1). There were also some free-text fields to give the participants the opportunity to give us their own thoughts. One question was about the imaginability about autonomous robots in the care context. There were two versions of the questionnaire. One presenting an example picture with a humanoid robot (Pepper) and one with a non-humanoid (Care-o-Bot 3). The idea was to obtain some initial indications regarding the potential impact of the uncanny valley effect in the context of health care.[13] According to that theory, it is assumed that the acceptance and affinity of a robotic system increase with its human likeness appearance. But at the peak (nearly human like), the acceptance and affinity fall into the negative, called the "uncanny valley". For these two pictures also we did not offer descriptions about the robots and their features. The selection of the survey items related to different technologies was based on other research overviews.[5,14] For the purposes of assessing and classifying care needs, a distinction is made in Germany between the following six areas: mobility, communication, safety, self-sufficiency, management of requirements

relating to illness and/or therapy, and organization of day-to-day life. These six areas of the new care dependency definition in the German Social Code Book XI were used to categorize the technological solutions in some of the questions.

Semi-automatic data entry was done via FormPro questionnaire scanning software.[15] The process was validated manually by eye-examination and automatically by scripts written in Python.[16] Descriptive statistics were done using R with package openxlsx.[17,18] The responses in the free-text fields were examined content-analytically based on the fundamental paradigms of qualitative research by following Kuckartz.[19–21] This manuscript follows the STROBE reporting statement.[22]

Results

The survey was sent to 565 GPs. Returned mails by GPs that are retired or deceased are the reason for the difference to the 571 first mentioned. The initial response rate was 19% and after sending the reminder four weeks later it was finally 34.34% (n=194). More basic socio-demographic data is presented in Table 1.

Table 1 General Description Of The Sample

Total participants	194
Questionnaire type ratio (Care-o-bot to Pepper)	106 to 88
Sex (%)	
Women	55.67
Men	39.18
NA	5.15
Age (%)	
Under 30	0.0
30 to 39	8.76
40 to 49	22.16
50 to 59	38.14
60 and older	30.41
NA	0.52
Organization of GP surgery (%)	
Single handed	67.01
Group practice	24.23
Help center	4.64
NA	4.12
Catchment area (%)	
Urban (more than 20 000 population)	50.0
Rural (20 000 and less population)	48.45
NA	1.55

Note: Values rounded to second decimal place.
Abbreviation: NA, no answer.

All the doctors surveyed use a computer at work and most also use a smartphone (Supplementary Data: Table S2). Tablets are used much less widely. Other forms of technology barely feature at all in terms of professional use. These include telepresence systems, which got many "unknown" responses but are only regarded as pointless by a small percentage of those surveyed. Other items that got a lot of "unknown" responses were data glasses, digital pens and virtual reality technology. Smartwatches and activity trackers were also often regarded as pointless.

More than half of those surveyed have recommended the emergency call system (area: safety) to their patients (Supplementary Data: Table S3). This was followed, with some distance, by the calendar with memory function (area: organization of day-to-day life) and the tablet dispenser (area: therapy-related requirements). In the free-text field for this question, 7 out of the total of 194 GPs surveyed referred mainly to functional technical solutions (e.g., bath lifts, stair lifts, electric wheelchairs) as additional options.

Table 2 contains an overview of the extent to which respondents can imagine humanoid and non-humanoid robots or a telepresence system in five different settings. The imaginability of those surveyed strongly varies between these three device categories and the five usage contexts (humanoid: 27.3–53.4%; non-humanoid: 11.3–44.3%; telepresence: 29.9–45.4%). The least imaginability setting for all three devices was in the context of the care family doctors providing at home (humanoid: 27.3%; non-humanoid: 11.3%; telepresence: 29.9%). The next least was outpatient care for the two robots (humanoid: 30.7%; non-humanoid: 23.6%) and usage in hospital for telepresence (35.6%).

For all five usage contexts, a Chi-square test of independence was calculated comparing imaginability of humanoid and non-humanoid robots (Table 3). A significant interaction between the two robot groups was found only for the usage context "GPs care at home" ($\chi^2(1, N=191)=7.98$, $p=0.005$). In that context, the humanoid robot Pepper was statistically significantly more imaginable (27.3%) than the non-humanoid Care-o-Bot 3 (11.3%).

Over half of those surveyed would rate their receptiveness to using innovative technology as high, although few would rate their level of knowledge as high too (Figure 1).

A notable proportion of the family doctors surveyed said they found it difficult to assess the need for and benefits of technical solutions and also felt their own knowledge was inadequate (Table 4). The majority of

Table 2 Imaginability Of The Usage Of (Non-)Humanoid Robots And Telepresence Systems

	Humanoid Robot "Pepper" (n=88)			Non-Humanoid Robot "Care-o-Bot 3" (n=106)			Telepresence (n=194)		
	Imaginable (%)			Imaginable (%)			Imaginable (%)		
	No	Yes	NA	No	Yes	NA	No	Yes	NA
I can imagine using this in hospital	46.6	52.3	1.1	53.8	43.4	2.8	61.9	35.6	2.6
I can imagine using this for inpatient care	45.5	53.4	1.1	55.7	41.5	2.8	57.7	39.7	2.6
I can imagine using this for outpatient care	67.0	30.7	2.3	73.6	23.6	2.8	59.8	38.1	2.1
I can imagine family doctors using this to care for people at home	71.6	27.3	1.1	86.8	11.3	1.9	68.0	29.9	2.1
I can imagine using this to help patients preserve their independence at home	47.7	51.1	1.1	52.8	44.3	2.8	51.0	45.4	3.6

Note: Values rounded to first decimal place.
Abbreviation: NA, no answer.

those surveyed feel they lack access to training and points of contact or the support they require in order to use technical solutions in a way that would meet the relevant needs.

Overall, the receptiveness to training and information events relating to technical solutions is high (Table 5). This particularly applies to the areas associated with the therapy and diagnostics provided by family doctors. With 19 responses from the 194 people surveyed, the free-text field relating to this issue was not used that much. Interesting topics addressed by those who responded to this free-text where that there is no need for training opportunities, no capacity, missing opportunities and bad training experience within the area of digitalization or technical assistance systems.

The GPs were asked which technical solutions they would like for the problems they encounter in their everyday work, and this generated 64 free-text responses. Reference was made to the areas of digital networking and communication and also digital documentation. There were complaints about the lack of infrastructure for telematics and video consultation applications and of points of contact and support.

When asked what technical solutions should be available for patients and their relatives, 62 family doctors provided free-text responses. Telemonitoring is regarded as potential solutions for care purposes – including for images of wounds, vital signs and scheduling and monitoring medication. Assistance systems designed to help preserve individual mobility, enable patients to stay in their own homes and facilitate social participation are cited – e.g., via smart home networking. Mention is also often made in this context to the dangers involved, namely that human interaction cannot be compensated for with technical elements.

The worry that technology might be used to try and replace human interaction was again communicated in the free-text fields to the subsequent question, where a total of 41 of the 194 GPs surveyed took the opportunity to share their thoughts on this general issue. In addition, the debate is seen as rather unrealistic given the host of other problems facing health care and the options – often yet to be clarified – for funding the systems described. As was the case with previous questions, the need for training and support is raised here too.

Discussion

Our investigation reveals considerable receptiveness among the family doctors surveyed in relation to these issues. The

Table 3 Chi-Square Test Of Independence Of Imaginability Of Humanoid And Non-Humanoid Robots

	Imaginability Of Humanoid (Pepper) And Non-Humanoid (Care-o-Bot 3) Robots
I can imagine using this in hospital	χ^2 (1, N=190)=1.27, p=0.308
I can imagine using this for inpatient care	χ^2 (1, N=190)=2.42, p=0.145
I can imagine using this for outpatient care	χ^2 (1, N=189)=1.19, p=0.327
I can imagine family doctors using this to care for people at home	χ^2 (1, N=191)=7.98, p=0.005
I can imagine using this to help patients preserve their independence at home	χ^2 (1, N=190)=0.70, p=0.467

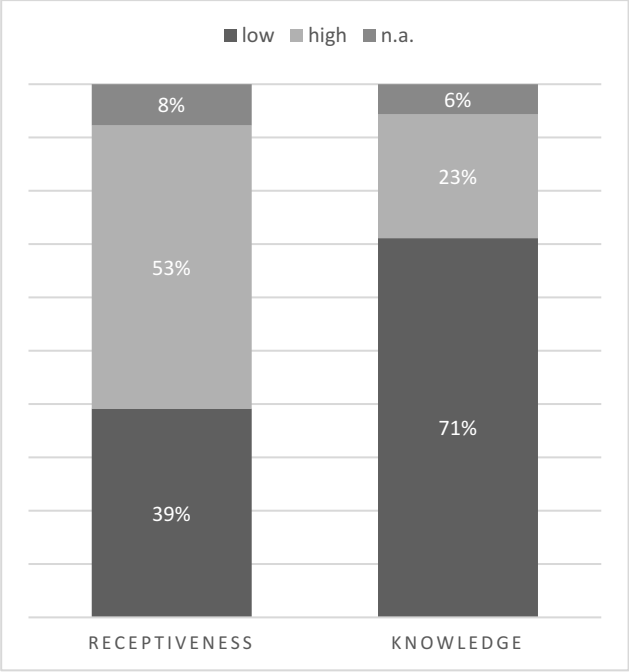

Figure 1 Receptiveness and knowledge.

majority would rate their own expertise in this area as limited and also complain about a lack of support, time and financial resources. It became clear that while there is great receptiveness to the idea of attending training in the area of technical assistance systems, no comparable studies could be found regarding receptiveness or expertise in relation to technologies for a sample of GPs.

The results in terms of how respondents classify and rate the more recent technologies show how very acute the situation is, in terms of coverage, in keeping with similar surveys for other target groups within a health care context.[23–25]

The results indicate that family doctors find that the various categories of devices are used by patients in more cases than they had actually recommended by themselves, which would suggest that other parties (besides family doctors) are also providing advice and making recommendations regarding technologies used in a care context.

Our own research group has conducted a survey of a much younger sample of 415 health care apprentices in the area of Eastern Germany.[25] The survey results in question were similar to the present survey regarding how people rate their own expertise (66% "low") and receptiveness (68% "high"). In terms of how people rate robotic systems, it did not really matter in our study whether the example picture showed a humanoid robot or one that was less so or even non-humanoid. Although they may seem very different at first sight, the two devices presented are less far apart – along a continuum of (dis)similarity to humans – than might be suspected. The results do not really support any conclusions about the impact of the uncanny valley effect within health care or whether the extent to which a robot is similar to humans has any impact on how likely the user is to accept it.[13]

Table 4 Self-Appraisal About Integration Of Technical Solutions

	Yes (%)	No (%)	NA (%)
I have trouble identifying where patients might need technical solutions	45	53	3
I am not aware of the benefits of technical solutions	41	55	5
I do not know how technical solutions can be funded	74	23	3
I have no expertise in relation to technical solutions	69	27	4
There is a lack of training on how to match technical solutions to actual needs	76	20	4
There is a lack of contacts or support in terms of how to match technical solutions to actual needs	79	16	5

Note: Values rounded to integer.
Abbreviation: NA, no answer.

Table 5 Willingness About Advanced Education And Information Sessions About Technical Solutions For Care Support

Issues	Yes (%)	No (%)	NA (%)
Organization of work for family doctors	67	31	2
Therapy for family doctors	86	13	2
Diagnostics for family doctors	86	12	3
Techn. solutions to support patients at home	76	23	1
Techn. solutions to support relatives caring for patients at home	69	30	2
Techn. solutions to support care personnel	54	44	2
Communication with fellow doctors	78	21	1
Communication with patients	60	39	1
Communication with relatives	50	48	2
Communication with those delivering outpatient or inpatient care	73	26	1
Other forms of networking between professionals	46	42	12

Note: Values rounded to integer.
Abbreviation: NA, no answer.

Strengths And Limitations

To the best of the authors' knowledge, this is the first study in this field with a sample of GPs. The data is up to date as it was gathered in 2018. The sample surveyed is largely representative, in terms of age and gender, of the cohort of family doctors actually providing outpatient services in Saxony-Anhalt.[26] Although comparability may be assumed based on socio-demographic characteristics, it would be impossible to rule out any bias within the sample.

Despite the length of the questionnaire, the response rate should be regarded as good given the difficulty in getting access to family doctors, who often receive surveys from researchers and tend not to have much spare time.[27] The good response rate is partly due to the reminder letter and also presumably to the prepaid envelope enclosed for replies. By contrast, it must also be assumed that some of those asked to participate felt a four-page questionnaire was far too long and that this had a negative impact on the response rate. Similarly, the questionnaire covered a wide area (in terms of the issues at hand), which left little scope to deal with individual aspects in any real depth.

Looking at how some questions were answered, there have to be doubts about how conscientiously parts of the questionnaire were completed. For example, a considerable number of those surveyed indicate they are already using telepresence systems in a personal (8.2%) or professional (6.7%) capacity, although this seems very unrealistic based on the sample. It can only be assumed that some questions were, despite all efforts to make them easily understandable to technical laypersons, too hard to understand or there were too many questions to answer. Some problems understanding questions may be due to those surveyed encountering individual technical terms without the benefit of definitions or explanations that are more detailed. In view of all this, the results must be interpreted with a degree of caution.

Implications For Further Research

Given the tremendous consequences that go with digitalization and the use of technical assistance systems within health care, our results demonstrate that there is tremendous gap to fill. Particularly in terms of the training and development of the key stakeholder, such as GPs, who would facilitate access to these facilities for those concerned.[28,29] In particular, further research, conceptualization, and the availability of training and development options relating to technical assistance systems are core aspects of the additional efforts that need to be made to facilitate sensible and sustainable integration with the provision of day-to-day care.[30]

Conclusion

The present study highlights the need to offer family doctors training in relation to assistance technology. GPs are also very receptive to this idea. Taking into account the care situation in Germany and with due regard for family doctors and their patients, it is a case of conceiving and establishing specific training options. It is also essential to investigate innovative training methods (of the e-learning variety) with a view to saving time spent traveling and other resources. It is important to note that greater efforts need to be made in terms of training for GPs – with a view to shaping the processes that will drive the transformation toward digital health care provision – and that this calls for a sustainable and participatory approach.[23] Besides the conception of advanced education opportunities for GPs that cover the area of digitalization, the

integration into the curricula from an interprofessional perspective, e.g., on how to conduct televisits, should also be established.[30]

Ethical Considerations

No ethical approval was obtained because this study did neither involve a prospective evaluation nor involve animals or patients. The research does not impose risks, harm or disadvantage on the participants. Ethical approval was, according to the guidelines of local ethics committee and the procedures in comparable cases and in accordance with §15/1 of the German professional codex of physicians in its current version not necessary (https://www.bundesaerztekammer.de/fileadmin/user_upload/downloads/pdf-Ordner/MBO/MBO-AE_EN_2018.pdf).

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Disclosure

The authors report no conflicts of interest in this work.

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