

Acceptance of Telemedical Consultations in Nursing Homes: First Insights & Outlook

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Abstract: Rising numbers of older people and people in need of care pose tremendous challenges for care institutions. Due to a lack of medical personnel, residents of nursing homes (geriatric patients) are frequently hospitalized although it is not medically necessary and causes a deterioration of health in many cases. Telemedical consultations in nursing homes represent one approach to relief and support care personnel in emergency and medically uncertain situations aiming at a reduction of unnecessary hospitalizations of geriatric patients. For a successful implementation of these consultations and related innovative processes, the patients' and as well as other stakeholders' (caregivers, doctors, relatives) perspectives and acceptance are important. Thus, a systematic investigation and adjustment of the requirements is of immense importance. This paper introduces the Optimal@NRW approach for a cross-sectoral care structure that aims at an avoidance of unnecessary hospital admissions by implementing telemedical infrastructure in nursing homes. A first scenario-based acceptance evaluation of telemedical consultations provides insights into the people's attitudes and allows to outline an acceptance research agenda as well as next steps within the project.

1 INTRODUCTION

In Europe and worldwide, national health systems are under pressure. Even before Covid-19 many countries were confronted with shortages of medical personnel and limited financial resources as well as an increasing number of old people entering the care system as a result of demographic change (Schmidt et al., 2013; Abbing et al., 2016). The increasing number of people with need for professional care burdens the health system and calls for new innovative solutions.

One critical aspect that is of particular importance refers to acute medical emergency situations of people in nursing homes. These situations often cause hospitalization as a result of a rescue service, especially during the weekend and outside the consulting hours of physicians (Ouslander & Berenson, 2011). In this context, it is important to point out that hospitalization of older people supports

an increase of a delirium or secondary diseases (Marcantonio, 2017). This fact has a double negative impact: On the one hand, unnecessary hospital stays are an immense financial burden for the health system. On the other hand, immobilization and a high mortality rate come along with the necessity to discuss social implications and questions about a dignified end of life. In sum, the necessity for innovative approaches including all relevant stakeholders to foster resilient, sustainable, and accepted approaches is without controversy. Digital measure such as telemedicine could offer relief. However, a success of telemedicine is no self-starter at all. How telemedicine can be implemented in nursing homes, how old structures can be reorganized, and how acceptance of all stakeholders involved can be fostered need special attention, research, and implementation work.

This paper steams from the research project "Optimal@NRW" that proposes an approach for a

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systematic implementation of a telemedical infrastructure in German nursing homes that is accompanied by a fundamental reorganization of intersectoral emergency care.

The focus of this paper is put on the acceptance of telemedical consultations in nursing homes with special attention to nursing home residents and their relatives. In this respect, the paper is structured as follows: Section 1 starts with a short state of the art of telemedical applications (section 1.1) in general and leads over to a presentation of technology acceptance research (section 1.2) with focus on health-related technologies and telemedical applications (section 1.3). Following that, section 2 presents the research project and its aim to illustrate the research context of the presented study. Afterwards, section 3 presents first insights from a scenario-based questionnaire study with focus on future users' and their relatives' attitude towards telemedical consultations in nursing homes. Section 4 contains the discussion and presents a roadmap for future research on the acceptance of telemedical consultations in nursing homes. The paper closes with a short conclusion (see section 5).

1.1 Telemedicine and eHealth

Digital measures offer possible solutions to address the main challenges in the healthcare sector, such as shortages of medical personnel and lack of financial resources. The ubiquitous presence of the Internet in combination with modern sensor technology, for example, open up innovative monitoring concepts for the private space or nursing facilities. Since 2005 eHealth is a central element within the work of the World Health Organization (WHO) (Al-Shorbaji, 2013). From that moment on, there was a clear endorsement to the value of information and communication technologies (ICT) for health and their socioeconomic benefits in healthcare. Moreover, since that time there has been immense progress and innovation in the field of eHealth (and thus also telemedicine). For the professional medical sector, we can see two different levels of telemedical advantages: One the one hand, within the field of doctor-patient communication and, on the other hand, in the context of communication between medical professionals, e.g., in the field of tele-intensive care (Amkreutz, et al. 2020) or tele-emergency care (Felzen et al., 2019; Czaplik, et al 2014).

Telemedicine and eHealth concepts are currently being developed and tested in numerous national and international research projects. National and international research funding systematically supports the development and research of eHealth and networked. A few of them are mentioned here to illustrate the broad range of approaches and research activities: The PAAL project, an EU project, for

example aims at a development of different video-sensor-, and speech-based systems supporting older and frail people in their everyday life (Flórez-Revuelta et al., 2018). Other projects, such as the BMBF project AIDA, focus on the medical care of residents in nursing homes. In this context, the aim is to use telemedicine to ensure adequate care for elderly people in nursing homes, despite the increasing lack of resources. At the same time, it is to be examined whether telemedical measures are suitable for reducing unnecessary hospital admissions (Ohligs et al 2020). However, even though research projects such as the ones described here are promising it is still difficult to make the move from the project phase into the standard care of the national health insurance funds. In addition to these financial aspects, the acceptance of the involved stakeholders (nurses, patients, physicians) is an important aspect, which, just like ethical and legal aspects, is necessary for the successful and sustainable introduction of concepts (see section 1.3).

1.2 Technology Acceptance

Due to the fundamental digitalization technology acceptance and use is a crucial topic in these days. Since the 1980ies technology acceptance is part the research agenda in different disciplines (e.g., business economics, psychology, social sciences).

With focus on different acceptance subjects, objects and contexts technology acceptance research is focused on the willingness to use technology as well as using conditions and human factors as a potential influencing factor on acceptance. The most successful acceptance models like TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003) steam from the late 1980ies and are focused on the adoption ICT in the working context. In the context of these models, factors like the *perceived ease of use* or *perceived usefulness* were identified to be good predictors for *the behavioral intention to use* a special technology. Up to today these models emboss acceptance research and were transferred to other technical domains (e.g., medical technology, or energy) and innovative approaches from the field of ICT. Acceptance research is often challenged to research the status quo at the beginning of these phases, when no interaction with technical artefacts has yet happened and only theoretical deliberations were made. In these cases, adequate methodological approaches are needed to gain resilient information. Scenario-based approaches (see section 3) are one suitable measure. Derived from the computer sciences, which uses scenario-based methods to integrate the perspective of future users into the

software design process, scenario-based surveys are today also used in other fields of research, such as technology acceptance research. The next section focuses on the acceptance of (tele)medical applications as one sensitive area in acceptance research.

1.3 Acceptance of eHealth and Telemedical Technologies

Within the field of technology acceptance research medical or health-related technology (such as telemedical technologies) are playing a special role. The sensitive circumstances of their application require a review of existing models and acceptance factors. Most studies on the acceptance of telemedicine or other eHealth applications focus on the acceptance of medical professionals. In this context, it could be revealed that the classical technology acceptance models like TAM and UTAUT (see section 1.2) also have a prediction for the medical use context (Holden & Karsh, 2010). Nevertheless, there is a lack of adequate standardization of acceptance factors and testing of their robustness. According to Holden and Kars (2010), it must be assumed that factors such as social influence have other reference points (e.g., patients or relatives) than in the area of ICT in the work context. From several research projects and studies, we know different factors that have been proven to be relevant for the acceptance of medical technologies (human factors, system related factors, and context factors):

Human factors: Age (e.g., Ziefle & Wilkowska, 2010), gender, expertise with (medical) technologies (Ziefle & Wilkowska, 2010), perceived locus of control over technology (Burde & Blankerts, 2002), but also health status (Calero Valdez & Ziefle, 2015) and care experience (Offermann-van Heek & Ziefle, 2018) were revealed to be relevant factors in the field of human factors.

System related factors: As relevant system factors, the perceived ease of use and usefulness (e.g., Brauner, 2016) as well as perceived costs as classical technology acceptance factors are of importance. In addition to that, perceived system security as well as privacy and data security (Wilkowska, 2015) were revealed to play an important role in the context of the acceptance of medical technologies. In the case of telemedical technologies, teleconsultation presentations types (e.g., display size) can also have an important influence on the evaluation by patients (Beul et al., 2011). When examining such technologies, it is therefore of particular importance to make mutually influencing aspects measurable in a

differentiated manner in order to examine which factors are ultimately decisive for acceptance.

Context factors: The relevant contextual factors arise directly from the framework conditions of technology use. In the case of medical technology or telemedicine, this can be the living environment, the clinical context, or further social conditions, for example acceptance or rejection of family or doctors (e.g., Brauner, 2016).

2 RESEARCH AIM & PROJECT

As described above, a specific challenge of demographic change is the provision of adequate geriatric care in nursing homes or home environments of geriatric patients. Telemedicine is a promising approach to tackle the existing challenges, but so far there are no solutions that have been rolled out on a large scale. A widespread use would require the implementation and standardization of technical means, the proof of medical evidence, cost coverage by the health insurance companies as well as the acceptance of the involved stakeholders. This is precisely where the Innovation Fund project Optimal@NRW comes in. The Optimal@NRW project represents a new intersectoral approach to provide acute care and support for geriatric persons in need of care by means of an implementation of an early warning system and the integration of telemedical consultation systems in 25 nursing homes and outpatient care within the region of Aachen in Germany. To realize this goal the project is focused on restructuring the emergency care infrastructure for nursing homes as well as improving the collaboration between the involved stakeholders (emergency service, emergency department, general practitioners, care personnel, etc.). According to this goal, a central emergency number provided by the Association of Statutory Health Insurance should act as a virtual hub for the care of geriatric patients. The concrete approach of the project involves that the participating nursing homes first contact the doctor's call center (116 117) when a medical problem arises. Then, the call center is responsible for an initial medical assessment and decides whether the respective general practitioner can be involved or if a teleconsultation with the "virtual digital desk" (which means the medical experts from the emergency department at the University Hospital RWTH Aachen) should be conducted. In addition, mobile care assistants are introduced within the project, who can also support the care personnel and provide services that can be delegated by doctors – especially

if the general practitioner is not available at that time. Applying these processes, the central project goals refer to the avoidance of inadequate hospital admissions in outpatient-sensitive hospital cases and improved medical care at the nursing homes and in outpatient care.

During the project, an evaluation of the efficacy of the implemented structure and processes will be carried out in a cluster-randomized study. Besides this health economic evaluation and concrete medical questions, one central focus of the project relates to user-related acceptance, perceptions, requirements, and wishes. Thereby, all relevant stakeholders (i.e., residents of nursing homes, relatives of residents, care personnel, general practitioners, emergency department, emergency services etc.) have to be considered in order to identify and evaluate the user requirements and acceptance with regard to the usage of telemedical consultations in nursing homes holistically. The study (see section 3) in this paper represents the first (scenario-based) step of the user-related acceptance evaluation.

3 FIRST STUDY INSIGHTS

Within this paper, we like to present first insights from the previously described project. For this purpose, the applied online survey, the acquired sample as well as exemplary results are presented in the following.

3.1 Online Survey

In the initial phase of the project – in which the technology is still being configured, requirements must be identified, and processes coordinated, a first scenario-based study was conducted to initially evaluate the use of telemedical technology in nursing homes from the perspective of younger and older adults being predominantly not affected by care themselves. For this purpose, an online survey was conceptualized focusing on two different self-developed scenarios: the participants were asked to put themselves in situations that 1) the telemedical consultations are used for a family member who lives in a nursing home, and 2) that they will live themselves in a nursing home in a few years and the telemedical technology is used for them.

In the first part of the online survey, the participants indicated demographic information (i.e., age, gender, educational level, living situation). Afterwards, the participants stated if they suffer from a chronic disease and if they are in need of support

and care. In addition, the participants were also asked if they had previous professional or private experience in care (each as yes/no answer options).

Subsequently, the participants were informed in detail about the projects' idea, concept, and functionality of integrating telemedical consultations in nursing homes. Thereby, an exemplary situation was described. In this context, it was explained in which way telemedical technology can be used and be beneficial for both, residents and personnel in nursing homes, by preventing unnecessary hospital admissions and the associated, frequently occurring deterioration in the health status of geriatric patients (e.g., delirium).

Following this explanation, the participants were asked to empathize with the first scenario – imaging that telemedical consultations are integrated in a nursing home a family member is living in. Thus, the participants should evaluate the usage of telemedical consultations from a perspective of a *relative of a nursing home resident*. Overall, 13 items were used for the evaluation of the telemedical consultations (see Figure 1). In more detail, the general attitude towards the technology (3 items), the behavioral intention to use the technology (3 items), and the perception of potential advantages (4 items) as well as potential barriers (3 items) of using telemedical consultations in nursing homes were assessed.

In a second step, the participants were asked to imagine that some years have passed and they themselves live in a nursing home. Hence, they should therefore evaluate the use of telemedical consultations for themselves. Here, the participants evaluated the same statements again from their "own" perspective (being a *resident in a nursing home*). Aiming for a comparison of both scenarios, all participants evaluated both scenarios, while participants who evaluated only one scenario and filled out the online survey incompletely were excluded from statistical analyses.

At the end of the online survey, the participants were asked to evaluate (yes/no answer options) two final statements ("Telemedicine enriches care in nursing homes" and "Telemedicine replaces human attention in nursing homes") from both introduced perspectives (i.e., *relative* vs. *resident*),

3.2 Participants

Overall, N = 118 participants filled out the online survey in November and December 2020 in Germany. The mean age of the participants was 36.58 years (SD = 15.12; min = 21; max = 79) and the sample consisted of a higher proportion of female

(70.3%, $n = 83$) compared to male participants (29.7%; $n = 35$). Overall, the sample's educational level was comparably high as the majority (60.2%, $n = 71$) indicated to hold a university degree, 22.9% ($n = 27$) a university entrance certificate, and 8.5% ($n = 10$) a PhD. In contrast, only 8.5% ($n = 10$) of the participants indicated lower education levels, i.e. diverse secondary school certificates.

Asked about their current living situation, the majorities of the participants reported to live together with another person (49.2%, $n = 53$) or together with several people (32.2%, $n = 38$), while only a small proportion (18.6%, $n = 22$) lived alone.

Referring to health-related characteristics, the participants assessed their health status as very good (26.3%, $n = 31$), good (47.5%, $n = 56$), and rather good (22.3%, $n = 24$), while only (5.9%, $n = 7$) indicated lower assessments. In addition, 25.4% ($n = 30$) of the participants reported to suffer from a chronic disease (e.g., hypertension), and only 1.7% ($n = 2$) indicated to be in need of care.

As last person-related characteristics, the participants were asked for their previous experience in care. Thereby, 15.3% ($n = 18$) reported to be professionally experienced in care, whereas 27.1% of the participants indicated private passive experience in the sense that a person in their close environment is in need of care. Beyond that, 21.2% ($n = 25$) of the participants reported to have active experience in care, as they have already been the caregiver for a person needing care in their close environment.

3.3 Results

In a first step and apart from descriptive statistics, repeated measure ANOVAs were calculated in order to investigate the influence of the different perspectives (a *relative of a resident in a nursing home* vs. a *resident in a nursing home*) – on the evaluations of telemedical consultations in nursing homes. In a second step, (multivariate) analyses of variance were applied to examine whether the evaluations were influenced by individual characteristics of the sample. Finally, it was investigated to what extent the evaluations of telemedical consultations relate with each other. For this purpose, bivariate correlation analyses were calculated. In the following, means (M) and standard deviations (SD) are reported for descriptive analyses. For the omnibus significance of analyses of variance, the F-Tests were taken from the Pillai values, Pearson's coefficient are reported for correlations, and the level of statistical significance (p) was set at a conventional level of 5% ($* = p < .05$; $** = p < .01$).

3.3.1 Two Perspectives on the Evaluation of Telemedical Consultations in Nursing Homes?

The results regarding the evaluations of telemedical consultations in nursing home differing both described perspectives are presented in Figure 1. Thereby, means above the mean of the scale (3.5) indicate the agreement, while means below 3.5 rejection of an item.

Starting with the overall acceptance, telemedical consultations in nursing homes were evaluated to be equally useful (n.s.), and the usage of innovative technologies in nursing homes was desired independent from both investigated perspectives (n.s.). Compared to that, the item “I find the system meaningful” was confirmed significantly more from the perspective of a *relative* ($M = 4.74$, $SD = 0.92$) compared to the perspective of a *resident* ($M = 4.54$, $SD = 1.05$; $F(1,115)=6.211$, $p < .05$).

Beyond the general acceptance, the participants also evaluated a more concrete facet of acceptance in terms of an intention to use telemedical consultations in nursing homes. Thereby, both perspectives equally rejected to “do not want to use the system” (n.s.) and agreed with the statement that they “can imagine using the system in the future” (n.s.). Instead, the most concrete statement “I would like to use it” was evaluated more affirmative from the perspective of a *relative* ($M = 4.46$, $SD = 1.06$) compared to the perspective of a *resident* ($M = 4.23$, $SD = 1.20$; $F(1,116)=4.993$, $p < .05$).

Among potential barriers of using telemedical consultations, the item “I would prefer personal contact” was confirmed most from both perspectives (n.s.) and, thus, revealed the most relevant aspect. Further, both perspectives (n.s.) confirmed to “would not have any concerns that data is transmitted securely”. As a last barrier, both perspectives (n.s.) showed rejections with regard to the statement “I feel that the technology is not mature”.

Moving to perceived benefits and motives to use telemedical consultations, the results show the descriptive tendency that all four items were evaluated more affirmatively from the *resident's* than from the *relative's* perspective. In particular, the item “[My relative / I] would feel safe” was even evaluated significantly more positive from the perspective of a *resident* ($M = 4.26$, $SD = 0.90$) compared to the perspective of a *relative* ($M = 3.99$, $SD = 0.98$; $F(1,114)=6.972$, $p < .01$).

In addition to the evaluations, the participants assessed two final statements also from both perspectives. In accordance with the non-varying evaluations of the barriers, the statement



Figure 1: Evaluation of telemedical consultations in nursing homes from two different perspectives.

“Telemedicine replaces human attention in nursing homes” was evaluated almost the same ($F(1,115)=.498$; n.s.) from both perspectives – *relative*: yes 12.8% ($n = 15$), no 87.2% ($n = 102$); *resident*: yes 13.0% ($n = 12$), no 87.0% ($n = 104$). In line with the tendency of a higher evaluations from the *relative* perspective (e.g., meaningfulness), the statement “Telemedicine enriches care in nursing homes” was also evaluated more confirmatively ($F(1,114)=7.799$; $p < .01$) from the *relative's* (yes 94.8% ($n = 109$), no 5.2% ($n = 6$)) compared to the *resident's* perspective (yes 86.2% ($n = 100$), no 13.8% ($n = 16$)).

3.3.2 Influence of Individual Factors on the Evaluation of Telemedical Consultations

For both scenario perspectives, MANOVA analyses did not reveal significant omnibus effects for the included demographic characteristics, i.e., age, gender, and educational level. Further, also the living situation and health-related characteristics of the participants did not influence the evaluations of telemedical consultations in nursing homes in general. The same appeared for both facets of private experience in care.

In contrast, professional experience in care influenced the evaluations of telemedical consultations in nursing homes significantly within the *relative's* scenario perspective ($F(13,98)=2.218$; $p<.05$): in particular, professionally experienced participants ($M = 4.41$, $SD = 1.18$) showed higher agreements to the statement “My relative would feel safe” ($F(1,111)=4.114$; $p < .05$) compared to inexperienced participants ($M = 3.89$, $SD = 0.93$). Further, they ($M = 3.71$, $SD = 1.61$) showed lower confirmations of the statement “I would prefer personal contact for my relative” ($F(1,111)=4.228$) compared to inexperienced participants ($M = 4.33$, $SD = 1.05$). Interestingly, these effects were not apparent for the own perspective of a *resident* in a nursing home.

3.3.3 Relevant Relationships

In order to analyze the extent of relationships within the evaluations of telemedical consultations, correlation analyses were conducted. Therefore, overall scores for the participants' general acceptance, their intention to use telemedical consultations as well as their evaluations of perceived benefits and barriers were created for the *relative's* and the *resident's* perspectives. The results are presented in Figure 2.

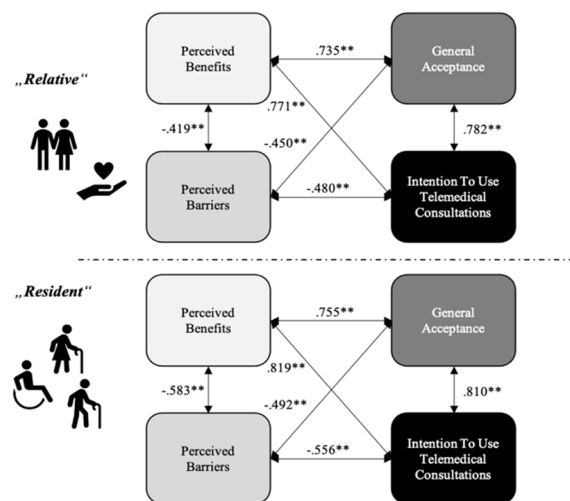


Figure 2: Relationships regarding the evaluation of telemedical consultations from two perspectives.

Starting with the *relative's* perspective on using telemedical consultations in nursing homes, strong relationships showed up between the participant's general acceptance and intention to use ($r = .782$; $p < .01$). Further, also the perceived benefits correlated strongly with the general acceptance ($r = .735$; $p < .01$) and the intention to use telemedical consultations ($r = .771$; $p < .01$).

Considering the perceived barriers, comparably lower, moderate (negative) relationships appeared with regard to perceived benefits ($r = -.419$; $p < .01$), general acceptance ($r = -.450$; $p < .01$), and the intention to use ($r = -.490$; $p < .01$).

Moving to the *resident's* perspective, even stronger relationships were apparent. General acceptance and the intention to use correlated strongly ($r = .810$; $p < .01$) and also the perceived benefits showed strong relationships with general acceptance ($r = .755$; $p < .01$) and the intention to use telemedical consultations in nursing homes ($r = .819$; $p < .01$). However, the differences are most noticeable in terms of perceived barriers: in comparison, the perceived barriers correlated (more) strongly negatively with the perceived benefits ($r = -.583$; $p < .01$), general acceptance ($r = -.492$; $p < .01$), and the participants' intention to use ($r = -.556$; $p < .01$).

4 DISCUSSION

Overall, this paper aimed at an introduction of a current research project focusing on the integration of telemedicine in nursing homes in order to relief caregivers, and to reduce the probability of inadequate hospital admissions. Focusing on the

communication science perspective the results of a first scenario-based study were presented. In the following, the findings of this study are discussed, allowing to outline a research roadmap which indicates relevant further steps within the project for the technology acceptance part.

4.1 Key Insights & Limitations of a First Study

Inquiry of the Involved Stakeholders: In general, the study revealed rather similar evaluations with regard to using telemedicine in nursing homes from both perspectives – the perspective of a relative of a nursing home resident and being the nursing home resident him- or herself. These similar evaluations could be caused by the scenario-based approach. In this regard, the gap between (reported) attitudes and the actual behavior of people is well known (Ajzen & Fishbein, 1980). Therefore, affected *stakeholders* (i.e., in particular nursing home residents, their relatives and caregivers) should be directly addressed in future studies.

Considering Diverse Stakeholders: Despite the overall rather similar evaluations, single significant differences with regard to the different perspectives were apparent: on the one hand, perceived meaningfulness and a concrete intention to use telemedicine in nursing homes were higher from a relative's perspective than from a nursing home resident's perspective; on the other hand, the perceived benefit in terms of higher felt safety was more acknowledged from the nursing home resident's than the relative's perspective. These (within a scenario-based study gained) differences indicate the importance of considering diverse stakeholders in future research on the acceptance of integrating telemedicine in nursing homes. This procedure addresses different aspects: On the one hand, the results obtained here are to be tested for their resilience. On the other hand, other perspectives (e.g., those of the nursing staff) and any interactions between the stakeholders are to be brought into focus.

Contrasting Professional and Non-professional Stakeholders: With regard to the impact of individual factors on the evaluations of telemedicine in nursing homes the study did not reveal any effects of demographic characteristics, such as age, gender, or educational level. Here, it should be considered that the study's sample was comparably small, reached rather young participants, contained a higher proportion of female than male participants, and reached predominantly participants being less experienced in care. Changes in the evaluation patterns can be expected when the opinions of older

participants (e.g., Wilkowska, 2015; Brauner, 2016) and also care-experienced participants are investigated. Therefore, future studies should aim at reaching broader and more balanced samples in order to integrate all relevant stakeholders equally and adequately. In line with previous research on the acceptance of assisting technologies in care (e.g., Offermann-van Heek & Ziefle, 2018), effects of professional experience on the evaluations of using telemedicine in nursing homes were identified in the present study. Here, professionally experienced participants saw a greater advantage in increased safety by using telemedicine in nursing homes and showed lower concerns of a loss of personal contact. These effects were only apparent within the scenario including the perspective of a relative of a nursing home resident, which makes sense as this perspective is close to a professional caregiver's perspective. These insights confirm the relevance of integrating all affected stakeholders within research on the acceptance of using telemedicine in nursing homes since perceived (dis)advantages may differ depending on the respective stakeholders' perspectives.

Investigating Interrelations between Acceptance, Requirements, and Perceived (dis)Advantages: In line with previous research on the acceptance of assisting technologies in older age (e.g., Peek et al., 2014, Offermann-van Heek et al., 2019) the results showed that the acceptance and intention to use telemedicine in nursing homes are connected with the perception of potential technology-related advantages and disadvantages. Beyond that, the relationships were even stronger for the perspective of a nursing home resident compared to the perspective of a relative of a nursing home resident. Hence, future research should also investigate the interrelations between acceptance, requirements, and perceived (dis)advantages depending on the perspective of all affected stakeholders.

Holistic Evaluation of User Requirements: Another aspect refers to the fact that only few aspects were part of this first study, and, therefore, this study has certainly not included all relevant aspects holistically. As mentioned above, future studies should address all relevant stakeholders in order to identify relevant requirements as well as perceived (dis)advantages of using telemedicine in nursing homes. Only this way, it can be ensured that all "user"-relevant requirements and wishes are considered within the adaption and integration of telemedicine in nursing homes.

4.2 Investigating Acceptance of Telemedicine in Nursing Homes in the Future

Based on the identified insights of a first scenario-based study focused on potential users' attitude towards telemedicine in nursing homes within the Optimal@NRW project, concrete strategies for further steps of the user-centered investigations can be derived:

From the user-centered communication science perspective, a major focus must be put on **acceptance research and respective assessments of "real" interactions with telemedical systems** in addition to a usage of scenario-based analyses. Analyzing direct interactions within telemedical consultations enables to identify appearing problems, (initial) reactions, and relevant process flows between the different involved stakeholders (i.e., care personnel, doctors, emergency services, patients) and also in the field of human-technology interaction. In addition, scenario-based approaches support the understanding and identify existing opinions and mental models regarding care in nursing homes, process flows, or general attitudes before telemedicine is integrated in the involved nursing homes.

A further major, user-centered task refers to the **integration of all relevant stakeholders** in all phases of the project (before telemedicine is implemented, during the different interaction phases, and at the end of the project). As the results of the present study suggest significant differences in the acceptance of telemedicine depending on different user perspectives, it is necessary to talk to the "real" stakeholders and to systematically survey the real perspectives within all steps of the project. This way, all relevant user requirements can be identified and validated for the diverse stakeholders.

To realize acceptance research within the project successfully, a **combination of qualitative and quantitative methodological approaches** is necessary. Thereby, interviews will be conducted in particular at the beginning of the project to identify the status quo regarding relevant process flows, communication requirements as well as wishes, attitudes, and needs of all involved stakeholders. Only on the basis of these qualitative studies and analyses a holistic quantification of the results using (online) surveys is usefully realizable considering the different stakeholders and their specific characteristics.

Finally, the mix of **summative and comparative acceptance analyses** enables to identify changing

acceptance parameters over time as well as to determine influencing characteristics of the stakeholders (e.g., age, gender, experience), which may also vary over the different project phases.

5 CONCLUSIONS

This paper presented a first scenario-based acceptance study with focus on future users' attitude towards the use of telemedicine in nursing homes. on the attitude of potential users. Focusing on a user-centered and technology acceptance related perspective is one focus addressed within research project "Optimal@NRW". Overall, the project aims at a sustainable implementation of telemedicine in nursing homes and outpatient care in order to avoid inadequate hospital admissions of geriatric patients. The results of this particular presented study highlight the importance of integrating all involved stakeholders into all further project phases in order to do justice to user-specific requirements. Beyond that, the study's insights enable to outline research tasks within a research roadmap, that will be pursued in the acceptance research part of the project.

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