Needs, Requirements, and Technology Acceptance using Telemedical Consultations in Acute Medical Situations in Nursing Homes

Julia Offermann[1,*][a], Wiktoria Wilkowska[1][b], Anne Kathrin Schaar[1][c],
Jörg Christian Brokmann[2][d] and Martina Ziefle[1][e]
(on behalf of the Optimal@NRW-Research Group)
¹Human-Computer Interaction Center, RWTH Aachen University, Campus-Boulevard 57, 52074 Aachen, Germany
²Emergency Department, University Hospital RWTH Aachen, Pauwelsstraße 30, 52074 Aachen, Germany

Abstract: A lack of (medical) personnel and high proportions of older people in need of care pose enormous challenges for care institutions, often resulting in hospitalizations of nursing home residents (geriatric patients). Frequently, these hospitalizations are not medically necessary and cause a deterioration of health. The usage of telemedical consultations in nursing homes represents one approach that aims at the reduction of unnecessary hospitalizations of geriatric patients and at supporting care personnel in acute and medically uncertain situations. For a successful implementation of these telemedical consultations, especially the patients' as well as the care personnel's perspectives and acceptance are essential. This paper presents first qualitative results from a social communication science perspective within the Optimal@NRW project. Based on an interview study with residents and care personnel of different nursing homes (N=28) first attitudes, perceived advantages, and concerns as well as requirements regarding the usage of telemedical consultations are identified. These results provide the basis for further quantifications and comparisons of acceptance parameters of using telemedical consultations in nursing homes in general and across the entire duration of the project in specific.

1 INTRODUCTION

Studies have shown that 20% of nursing home residents are hospitalised once a year. 40% of these hospitalisations turn out to be unnecessary or premature (Jakobs et al., 2018; Sundmacher et al., 2015). Apart from the stressful emotional component, hospital admissions can even cause harm to this vulnerable group of patients. When a resident of a nursing facility is taken to an emergency room for an acute medical situation that could have been treated by the general practitioner (GP), he or she joins the ranks of other patients whose reasons for visiting the emergency room are often more urgent and critical.

Long waiting times in an unfamiliar environment are the consequences, which often trigger delirium, especially in patients with dementia. It is not uncommon for nursing home residents to spend weeks recovering from the strain after a short stay in an emergency room. In cases with e.g., occurring delirium it is even likely that a higher level of dependency persists due to the underlying condition of frailty (Theou et al., 2018).

The main causes of these so called "ambulatory-care sensitive conditions" (ACSC) are not finally elucidated, but in many cases suboptimal outpatient medical care of nursing home residents seems to be responsible. This effect can be observed especially

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* Corresponding Author
[a] https://orcid.org/0000-0003-1870-2775
[b] https://orcid.org/0000-0002-7163-3492
[c] https://orcid.org/0000-0002-8643-6213
[d] https://orcid.org/0000-0002-1745-6130
[e] https://orcid.org/0000-0002-6105-4729

outside the regular consultation hours of the GPs combined with an increasing workload of the nursing staff in the facilities (e.g., low number of care providers during night shifts).

Optimal@NRW project offers a low-threshold opportunity by implementing telemedical acute care for nursing home residents around the clock. For this purpose, 25 participating senior care facilities are equipped with the technology for telemedical consultations as well as an early warning system. The aim is to prevent nursing home residents from unnecessary hospital admissions. The early warning system is intended to preventively counteract a potential deterioration of a health condition by regular non-invasive measurement of vital parameters. Likewise, the faster establishment of a doctor's contact provides support for the nursing staff in acute medical situations in the care facility.

In addition to the technical implementation of telemedical infrastructure itself, the aim is to link the components with the nursing home documentation system via interfaces. With that approach, every physician who is not familiar with the patient can also access relevant preliminary medical information and in turn document on the acute setting and therapy in a way that is visible to co-therapists.

Further, the physicians in private practice and the emergency service of the Association of Statutory Health Insurance Physicians can optionally participate in the beneficial telemedical infrastructure to improve intersectoral medical care for nursing home residents. It needs to be emphasized that telemedicine is not intended to be a substitute for personal doctor-patient interaction, but rather a supplement to standard medical care - especially in situations in which hospital admissions are the only option left. Additionally, positive economic side effects can be assumed by a reduction in ambulance transports and hospitalizations.

2 BACKGROUND

In this section, the theoretical and empirical background is presented, starting with a current state on telemedical applications as well as insights regarding empirical technology acceptance research. Based on that, the underlying research project is introduced, followed by the specific research aims and research questions of the present study, focusing on a social communication science perspective.

2.1 Telemedical Applications

Applying innovative digital applications has the potential to address the main challenges in the healthcare sector due to demographic change, i.e., high percentages of highly aged people with long-term care needs at the same time shortages of medical personnel and lack of financial resources (Wootton, Craig & Patterson, 2017; Cook, Augusto & Jakkula, 2009). In more detail, the ubiquitous presence of the Internet in combination with modern sensor-based and ambient technologies enable the development and design of innovative monitoring concepts for the private environments, nursing facilities and hospitals.

With eHealth as a central element within the work of the World Health Organization (WHO), the value of information and communication technologies (ICT) for healthcare applications and their socioeconomic benefits in healthcare are highly acknowledged in the last years (Al-Shorbaji, 2013). In line with this, the design and development of eHealth and telemedical applications has been immensely expedited. Regarding telemedicine, applications addressing doctor-patient communication and also applications for communication between medical professionals – such as tele-intensive care (Amkreutz, et al. 2020) or tele-emergency care (Felzen et al., 2019; Czaplik et al., 2014) – are focused. Supporting development and research, diverse telemedicine and eHealth approaches are funded as national and international research projects. One international example is the EU-project PAAL (Privacy-Aware and Acceptable Lifelogging services for older and frail people) aiming for a development of diverse video-, sensor-, and speech-based systems that support older and frail people in their everyday lives (Flórez-Revuelta et al., 2018). Another example is the project AIDA, which focuses on medical care of residents in nursing homes, aiming for preparing nursing homes for the usage of telemedicine to ensure adequate care for elderly people (Ohligs et al., 2020).

Although the purposes of such research projects are promising, it is still difficult to transfer the project phases into the standard care of the national health insurance funds. Beyond the primarily financial difficulties, the acceptance of all involved stakeholders (i.e., caregivers, patients, physicians) poses an important prerequisite for the successful and sustainable rollout of usable concepts.

2.2 Acceptance and Technology Perception

In line with the increasing development of innovative digital applications, the efforts in technology acceptance research have rapidly grown in the last decades. Initially – focusing on a differentiation between acceptance subjects, objects, and contexts (Kollmann, 1998) – technology acceptance research based on successful and established acceptance models like TAM (Davis, 1989) and further model developments such as UTAUT (Venkatesh et al., 2003). These models focused on the adoption of ICT in working contexts and identified in particular two factors, the perceived ease of use and perceived usefulness, as good predictors for the behavioral intention to use a specific technology or application. To date, these models have been applied numerous times and are frequently adapted to different contexts (for an overview see Rahimi et al., 2018).

Beyond these models, acceptance research in early project or technology development phases is often challenged by the fact that it relates to areas that have not been researched before, requiring that the status quo must first be identified. In such phases – when interaction with technical applications has not yet started and only theoretical deliberations were made – adequate explorative methodological approaches are needed (especially in sensitive contexts, such as nursing home environments). Qualitative and scenario-based approaches are one suitable measure to gain insights into the respective stakeholders' associations, mental models, perceived (dis)advantages, needs, wishes, and the requirements of using a specific application in a specific context.

2.3 The Context of the Study: Optimal@NRW

Although telemedicine is a promising approach to tackle the described challenges in the healthcare sector, there are no solutions so far that have been rolled out large-scale.

Continuing the efforts of the AIDA project (Ohligs et al., 2020), the implementation and standardization of telemedical processes, the proof of medical evidence, cost coverage by the health insurance companies as well as the acceptance of the involved stakeholders are needed to enable a sustainable and widespread use of telemedical care in nursing homes. This is exactly the aim of the project Optimal@NRW, representing a new intersectoral approach that focuses on a provision of acute care and support for geriatric patients based on the integration of telemedical consultation systems in 25 nursing homes and outpatient care within the region of Aachen in Germany. In particular, the project aims for the avoidance and reduction of inadequate hospital admissions in ambulatory care-sensitive hospital cases (Sundmacher et al., 2015) and improved medical care in nursing homes. For this purpose, a central emergency number acts as a virtual hub for the care of geriatric patients and the idea is that – in case of medical problems or acute situations – the participating nursing homes firstly contact the doctor's call center (116 117). The call center then executes an initial medical assessment and decides about urgency and following treatment. If the GP is not available or if the call from the nursing home is received outside the GP's opening hours, the physicians of the resident health service are contacted in order to provide a visit. If timely contact cannot be guaranteed neither by the GP nor the resident health service, teleconsultation by the tele-physicians can be carried out at any time.

Besides medical research and evaluation of the efficacy of the implemented structure and processes, the project investigates user-related acceptance, perceptions, requirements, and wishes of the relevant stakeholders – in particular, the residents of nursing homes and care personnel. Since in nursing homes especially the actions of the care personnel determine whether new structures and process are used in the everyday life, it is precisely the perspective of this group that must be considered, analyzed, and understood throughout the entire project. Only this way, central barriers, concerns, and requirements can be timely identified enabling technical or medical adaptions of the telemedical infrastructure and processes.

The current study presents first results from an initial qualitative interview study, identifying the wishes, needs, concerns, and requirements of the two most relevant user groups – geriatric patients and care personnel – prior to the real usage of the telemedical consultations.

2.4 Research Aim and Questions

From the perspective of social communication science, the first aims of the project and, in particular, of the present study refer to the understanding and identification of acceptance-relevant parameters of the telemedical consultations in nursing homes. In more detail, the specific underlying research questions were the following:

- RQ1: How do geriatric patients and care personnel perceive telemedical consultations in emergency situations in nursing homes in general?
- RQ2: Which benefits do geriatric patients and care personnel perceive related to telemedical consultations in emergency situations in nursing homes?
- RQ3: Which barriers and concerns do geriatric patients and care personnel perceive related to telemedical consultations in emergency situations in nursing homes?
- RQ4: Which requirements are relevant for geriatric patients and care personnel related to telemedical consultations in emergency situations in nursing homes?

The qualitative approach as a first step was necessary to enable subsequent quantifications and weightings of the identified acceptance parameters. Beyond that, the investigation in the initial phase of the project provides a baseline for the comparisons of acceptance and the identification of impacting parameters in later project phases.

3 EMPIRICAL APPROACH

This section presents the methodological approach of the conducted study, starting with a description of the empirical concept as well as the procedure and specific contents of the interview study, followed by an overview of the participants' characteristics.

3.1 Empirical Concept

The entire project including the individual studies of the different project partners was reviewed and approved by the Ethics Committee at the RWTH Aachen Faculty of Medicine.

Overall, the project can be divided in three different phases: pre-implementation, implementation, and post-implementation. During the implementation phase of the project, an evaluation of the medical and economic efficacy of the implemented structure and processes will be carried out in a cluster-randomized study, which means that the telemedical infrastructure will be implemented stepwise in four different clusters containing each 6-7 nursing homes.

The pre- and post-implementation phases enable the identification of relevant parameters, processes, and structures directly at the beginning of the project, and offer the opportunity to compare perceptions and

acceptance of the telemedical infrastructure regarding the whole project period.

In each of the three phases, technology acceptance and perception are investigated, using multi-faceted empirical approaches consisting of qualitative interview and quantitative survey studies. In addition, the implementation phase enables to evaluate interactions with the telemedical infrastructure in the participating nursing homes, thus in real and not in scenario-based or laboratory settings.

This study presents the results of an interview study with geriatric patients and care personnel from different nursing homes within the pre-implementation phase. Hence, the identification of opinions, attitudes, requirements, and wishes is focused prior to first interactions with the telemedical infrastructure. These results represent the basis for subsequent quantitative investigations.

3.2 Interview Study

At the beginning of the interviews, participants were shortly informed about the overall project and the content of the study. Further, they gave their informed consent to participate in the interview and to agree with audio recordings of the interview.

In a first step, the participants were asked to share some personal information, such as their age and gender. Beyond that, the participating geriatric patients were questioned about their health situation as well as for their experiences and feelings connected to the living in the nursing home. In parallel, the care personnel answered questions related to their professional experience in caring for geriatric patients in general and specifically related to the current professional everyday life in their nursing homes.

As a thematic transition, both groups of participants were then asked for their experiences with emergency situations in nursing homes, focusing on real past situations, existing processes, and potential difficulties.

Afterwards, the concept of telemedical consultations in nursing homes was introduced to the participants using a short descriptive scenario (translated version):

"In the Optimal@NRW project, telemedical technology is being introduced and tested in various nursing homes in the region of Aachen. Once introduced, it will be possible for the on-site care personnel to request support in emergency situations via the central emergency number (116117) of the Association of Statutory Health Insurance Physicians. The trained staff at the center will decide whether the specific case is
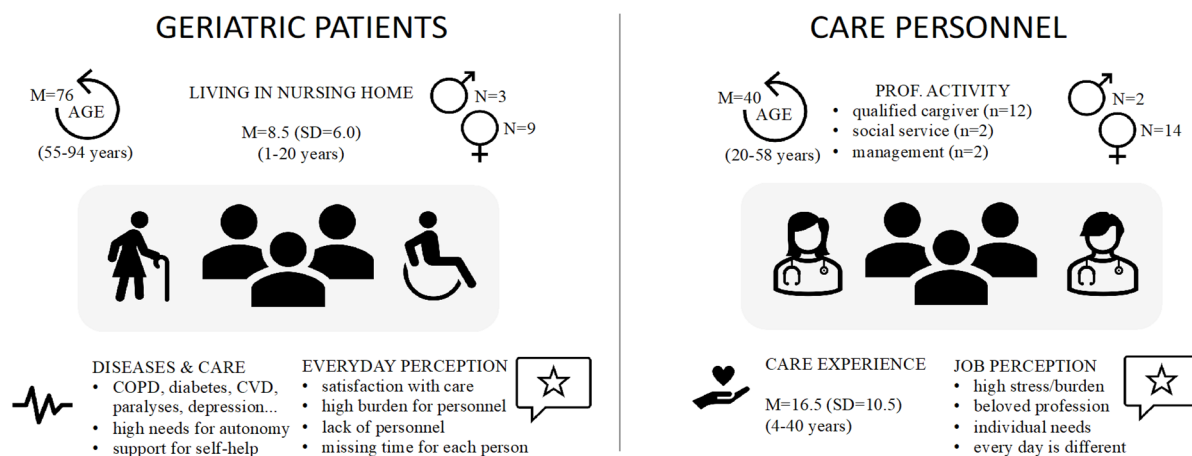
GERIATRIC PATIENTS

M=76 AGE
(55-94 years)

LIVING IN NURSING HOME
M=8.5 (SD=6.0)
(1-20 years)

N=3
N=9

DISEASES & CARE
- COPD, diabetes, CVD, paralyses, depression...
- high needs for autonomy
- support for self-help

EVERYDAY PERCEPTION
- satisfaction with care
- high burden for personnel
- lack of personnel
- missing time for each person

CARE PERSONNEL

M=40 AGE
(20-58 years)

PROF. ACTIVITY
- qualified caregiver (n=12)
- social service (n=2)
- management (n=2)

N=2
N=14

CARE EXPERIENCE
M=16.5 (SD=10.5)
(4-40 years)

JOB PERCEPTION
- high stress/burden
- beloved profession
- individual needs
- every day is different

Figure 1: Characteristics of the participants.

suitable for teleconsultation or whether another step must be taken. If the requirements for a teleconsultation are met, a wheeled stand equipped with a camera, monitor, microphone and specific medical technology equipment (for measuring blood pressure, oxygen saturation, pulse, and temperature), is pushed into the patient's room. Then, a specialist is available in a time period of maximum 10 minutes. The physician can communicate live with the patient and the care personnel and view the electronic patient file. Once the patient's medical history has been taken, the telemedicine specialist decides on the next course of action. If necessary, he or she can, for example, order the deployment of a specially trained mobile nurse to the nursing home, who can then carry out interventions on site, such as changing a catheter. Actions such as these can prevent a resident from being rushed to hospital, instead of being able to remain in their familiar environment. At the same time, long waiting times for the difficult-to-reach general practitioners or specialists should be avoided."

Subsequent to this information, the participants were asked to describe their first impressions focusing on the question if they can imagine using (or agree with) telemedical consultations in emergency situations.

In a next step, the participants were asked to think about and describe potential advantages they associate with the usage of telemedical consultations in nursing homes. In line with this, the participants should also anticipate potential concerns or barriers regarding the usage of telemedical consultations in emergency situations.

In a last step, the participating patients and care personnel were asked which specific wishes, needs, and requirements are considered important and should be addressed when the telemedical consultations are implemented in their nursing home.

At the end of the interview, the participants had the opportunity to comment and give feedback on the topic or the interview itself, or to ask specific questions about the project.

Following the interviews, the recorded audio files were transcribed literally, and were analyzed by means of qualitative content analysis (Mayring, 2014). For data analysis, a deductive system of categories was derived based on the literature-driven interview guide, and iteratively supplemented with inductive categories after analyzing the data material. The authors coded the quotations independently and only indisputable quotations were included in the categories.

3.3 Participants

Overall, N = 28 participants took part in the interview study (for details, see Figure 1). Among the participants, 16 persons belonged to the care personnel and 11 persons were the residents of nursing homes, whereas one interviewed person was an accompanying family member. The participants belonging to the care personnel were on average 40.4 years old, while most of them were female (n=14). Most of the care personnel reported a long-term professional experience in care (> 10 years), while only five participants indicated 4-5 years of professional care experience. The caregivers expressed satisfaction with their profession and doing their job with conviction. However, they also described high burdens in their everyday professional activities due to time restrictions and a lack of personnel. Further, they pronounced the individual

needs of their patients/residents and that no two days are alike within their professional everyday life.

Since all residents of the participating nursing homes suffered of at least one chronic disease (see Figure 1), we call this group of participants "geriatric patients" in this study. The geriatric patients were on average 76.2 years old, whereas the youngest person was 55 and the oldest 94 years old. Nine participants were female (75%). On average, the participants lived comparably long in the nursing homes (M=8.5 years; SD = 6.0), while only one person lived there only for one year. All participants suffered from chronic diseases, such as diabetes, paralyses, chronic obstructive pulmonary disease (COPD), or cardiovascular diseases (CVD).

All of them described that they were supported in their everyday life aiming at a support for self-help and assistance in being as independent and autonomous as possible. Regarding living in their nursing home, the participants were on average satisfied with care and the respective care personnel. However, they described the high workload of the caregivers, the lack of personnel, and resulting missing times for the individual person (in particular, for social contact, conversations, etc.).

Focusing on experiences with emergency situations, both groups described that such situations occur on a regular basis and that waiting times for physicians on call are mostly too long. Circumstances like that frequently lead to hospital admissions and result in burdens and frequent health deteriorations for the patients. Participants in both groups emphasized that something must fundamentally change in terms of healthcare supply and processes.

4 RESULTS

In the following, the key insights of the interview study are presented guided by the previously introduced research questions.

4.1 General Insights (RQ1)

The general perception of the concept of telemedical consultations in emergency situations was well-reviewed in both groups.

Among the care personnel, all participants expressed and expected the telemedical consultations to be a useful and beneficial approach. All of them indicated a willingness to use telemedical consultations and confirmed the implementation of the telemedical care infrastructure within their nursing home to be highly appreciated. One

participant added a sceptical comment regarding the accessibility and the interaction with telemedical physicians (see RQ3).

Considering the perspectives of the geriatric patients, all of them showed a positive attitude towards using telemedical consultations in emergency or medically uncertain situations. Despite the positive attitude, two of the respondents were also sceptical about the implementation in everyday life and possible technical problems (see RQ3).

Nonetheless, all participants could easily imagine the usage of telemedicine in their nursing home, and immediately began weighing possible benefits against potential concerns.

4.2 Perceived Benefits (RQ2)

Overall, the participants mentioned 21 aspects referring to potential benefits and motives to use telemedical consultations in nursing homes. From these, 13 benefits were mentioned and discussed by at least two of the participants. These perceived benefits were divided into three categories and are shown in Table 1: general benefits, patient-related benefits, and personnel-related benefits.

Table 1: Identified perceived benefits and their categories.

Patient	Faster help in an emergency
	Shorter waiting times for medical treatment
	Avoidance of hospital admission or stay
	Avoidance of transport to the hospital
	Avoidance of stress and deterioration of health
Personnel	Reducing the workload of caregivers
	Quick decisions at the nursing homes
	Increase of safety for caregivers through medical decisions
	Flexibility in time and place
General	Higher sense of security
	Improved sense of care
	Improved doctor-patient communication
	Use of innovative technologies in care

Within the category **general benefits,** the participants (in particular, the care personnel) mentioned that using telemedical consultations would give them a *higher sense of security* as fast advice of medical experts is enabled.

> *"It simply gives you more safety and a better feeling."* (Personnel, female, 24)

Further, they expected an *improved sense of care* as well as an *improved doctor-patient-communication*.

> *"Maybe it will make residents feel better about the care they receive – here in the nursing home, but also in conversations with physicians."* (Personnel, female, 34)

Finally, it was also expressed that *the use of innovative technologies in care* is beneficial in order

"*to move away from old and conventional conditions more and more*" (Personnel, female, 50 years).

The second category included perceived **personnel-related benefits**. Here, the geriatric patients expressed the expectation that the usage of telemedical consultations would contribute to *reducing the workload of caregivers* and enable *flexibility in time and place*.

"*It would be easier and reduce efforts for the care personnel because it would be faster and they would be more flexible.*" (Patient, female, 84)

From the perspective of care personnel, the benefit of *quick decisions at the nursing homes* was of major importance and connected with the expectation that a fast contact to medical experts would lead to an *increase of safety for caregivers though medical decisions*.

"*In the future, it may bring relief in care because responsibility can be handed over; when a doctor deals with it directly (without waiting time), the doctor takes responsibility and the decision.*" (Personnel, female, 50)

"*And I think it's also a good thing for the professionals who are at the bedside in this case, because they are of course often confronted with uncertainties, they have to make decisions, and not having to stand there all alone helps, I think, a lot to overcome these uncertainties.*" (Personnel, female, 25)

The third category referred to **patient-related benefits.** Here, both groups of the participants expected that the use of telemedical consultations enables *faster help in emergencies* and *shorter waiting times for medical treatment*.

"*Decisions are made here on site and, above all, help can be provided quickly.*" (Patient, male, 84)

"*If a telemedical consultation would be guaranteed within 10 minutes, this would be so great and so much faster than calling a doctor and he had to come here first. Usually, we have been waiting many times longer.*" (Personnel, male, 33)

"*It would be great to have no, or little, waiting time here on site.*" (Personnel, female, 40)

In addition, more than half of the participants mentioned the reduction and *avoidance of hospital admissions or stays* as well as *avoidance of transport to the hospital* as relevant motives to use telemedicine in nursing homes.

"*Sometimes they lie in the emergency room for 6 hours and then come back again – this could be avoided, and the residents could be spared the whole procedure (i.e., transport, stay). Especially for residents with dementia, or other cognitive impairments, staying in the facility is certainly always best.*" (Personnel, female, 26)

In line with this, also the *avoidance of stress and deterioration of health* was mentioned by both care personnel and geriatric patients, expecting that reduced or avoided hospitalizations contribute to the wellbeing of residents in nursing homes.

"*Of course, I think that would save a lot of stress and health deterioration for our residents.*" (Personnel, female, 58)

4.3 Perceived Barriers (RQ3)

Concerning perceived barriers of using telemedical consultations in nursing homes, the participants mentioned 15 different aspects, while 14 of them were discussed by at least two participants. Table 2 presents these 14 potential barriers and concerns, which were classified into four categories: communicative concerns, technological concerns, handling concerns, as well as data management and privacy concerns.

Table 2: Identified perceived barriers and their categories.

Communicative concerns	Impersonal/Indirect Contact
	Distance to physicians providing treatment
	Inconvenient communication of complaints
	Lack of understanding of physicians due to the distance
Technological concerns	Immature, possibly deterrent technology
	Physicians not easy to understand
	Physicians not easy to recognize
	Technical failures (e.g., WLAN)
	Technical errors (e.g., pixelated display)
Handling concerns	Errors in operation (e.g., physicians, care personnel)
	Lack of availability of trained personnel
	Overstraining of care personnel
Data & Privacy Concerns	Insecure data transmission
	Invasion of privacy

Starting with **communicative concerns,** the concern of *impersonal or indirect contact* and thereby a feared *distance to the physicians providing treatment* was mentioned by participants of both groups.

"The physician has no or only a difficult personal insight due to the distance." (Personnel, male, 33)

"It is just not face-to-face communication. Due to the distance, there is already the danger that the personality of the patient is not perceived in its entirety." (Personnel, female, 50)

"I am concerned that the doctor may not understand me as well (as usual), because he is less close." (Patient, female, 82)

Further, some of the participating geriatric patients were afraid that due to the distance *health complaints could be communicated inconveniently* by using telemedical consultations.

"I doubt whether I can describe it exactly how I feel, what I have and that it doesn't come across right if I say, for example, 'it's pressing there'." (Patient, female, 82)

In line with this, both groups of participants expressed the concern of *a lack of understanding of the physicians due to the distance* to the patients.

The second barrier category referred to **technological concerns**. Here, some participants of the care personnel feared that the *technology may have an immature, deterrent effect* on the patients – especially regarding patients suffering from dementia or other comparable cognitive impairments.

"For cognitively impaired residents in particular, the new equipment and also the conversation with the doctor via a monitor could have an initially deterrent effect." (Personnel, female, 20)

Furthermore, some of the geriatric patients (and the accompanying relative) expressed concerns that *the physicians are not easy to understand* and *not easy to recognize* within the telemedical consultations.

In line with this, the greatest concerns related to specific technical problems were expressed especially by the participating care personnel, but also occasionally by the geriatric patients. In more detail, *technical failures (e.g., WLAN interruptions)* based on the infrastructure in the nursing homes and *technical errors (e.g., pixelated display)* related to data transmission and the Internet connection were discussed.

"But if you have got a data connection that doesn't work before, which is pixelated, that you don't see the person properly like on TV, if it's raining, you've got the pixels. It could happen. And then you think, you're lying there, you want to tell him something, you can't see him properly and you think, does this have to be now? Why is that not

possible and he should help me?" (Relative of a patient, female, 57)

A third category contained perceived barriers related to **handling concerns**. Both groups thought about *errors in the operation* of the telemedical consultations – both on the side of the *physicians* and on the side of the responsible *care personnel.*

"I'm concerned that it won't work properly or much more that there won't be a person around to operate it properly." (Patient, female, 82)

A majority of the participating care personnel expressed concerns about a *lack of availability of trained personnel,* because they have previously experienced that new systems can often only be operated by one or a few trained colleagues, who are not always available on site.

In line with this, some participants also feared – especially at the beginning – an *overstraining of the care personnel* regarding the processes in interaction with the new technologies.

"And I think, depending on which caregiver colleague you have, it could be an overload. Because they're not used to it, it has to settle in [...]. They're nervous then thinking 'am I doing something wrong'?" (Personnel, female, 58)

"Okay, so where do I start this, where do I stop? Which button do I press now? But all beginnings are hard and you just don't know. I think you're in an excited situation anyway, is now the right moment for me to use telemedicine? That's another thing, that's new and then putting everything on and communicating with the doctor." (Personnel, female, 34)

The last barrier category related to **data and privacy concerns**. Here, a potential *insecure data transmission* and an *invasion of privacy* was mentioned. However, it was striking that these well-known barriers in the context of other health-related technologies (e.g., Peek et al., 2014) were only sporadically mentioned by our study participants.

4.4 Needs and Requirements (RQ4)

Considering the results regarding specific needs and requirements, the participants mentioned overall 25 different aspects: 11 of them were discussed by single participants, while the remaining 14 aspects were discussed by several participants and were subsequently classified in four categories: introduction and training, trust-related conditions, technology-related conditions, as well as interaction with physicians (see Table 3).

The first category contained requirements related to the **introduction and training** regarding the telemedical infrastructure and processes. Here, almost all care personnel participants desired a *detailed technical introduction* as well as *regular technical trainings* on how to use the telemedical consultations and how to behave in such situations correctly. Further, some of these participants also desired a *refreshment of specific medical trainings* in this context.

"So in any case, a good introduction to the equipment must take place and not only once, but also repeatedly. That you are first of all well accompanied. That would be important." (Personnel, female, 34)

A second category referred to **trust-related requirements**. Here, participants of both groups mentioned that the *availability of trained staff* is a prerequisite for trust. In line with this, *trust in the technology* as well as *trust in the respective tele-physicians* were also discussed to be relevant conditions. Beyond that, the requirement of ensuring *data privacy and system security* were also occasionally mentioned.

"There must be trained personnel and the technology must be operated 100%, of course everything must also fit technically." (Relative of a patient, female, 57)

Concerning **technology-related requirements** it was mentioned that in particular the *technical infrastructure has to be created* and ensured. The majority of these comments referred to the often poor WLAN connection in the nursing homes. Further, *technical support and maintenance* were mentioned to be essential parameters not only in the beginning but also continuously during the use of the telemedical consultations. As a last technology-related aspect, care personnel but also some of the geriatric patients mentioned the *appearance and design* of the wheeled stand to be an important factor: As new technologies can have a deterrent effect, in particular to patients suffering from dementia, unobtrusive and well-known designs should be focused.

Finally, the category **interaction with physicians** included aspects referring to the indirect contact. Based on previous experiences with physicians on call, the geriatric patients mentioned the necessity that the *tele-physicians must have enough time for the consultations* and *empathy for the residents' situations.* Some care personnel participants specified this requirement and added that the tele-physicians should bring along *patience for the residents and*

their needs. Beyond that, the care personnel participants highlighted that *an understanding of the tele-physicians for age-typical clinical pictures* is essential.

"Above all, it needs empathetic physicians who have time and act in the will and support of the residents." (Patient, female, 87)

"The physicians must have time for residents within the consultations, they must be skilled with geriatric-psychiatric residents and they have to take both, residents and their needs as well as the caregivers, seriously." (Personnel, female, 55)

Table 3: Identified need/requirements and their categories.

Introduction and training	Detailed technical introduction for staff
	Regular technical training for staff
	Refreshment of specific medical trainings for staff (e.g., medical parameters)
Trust	Availability of trained staff
	Trust in tele-physicians
	Ensure data privacy/system security
	Trust in the technology
Technology	Creation of technical requirements/ infrastructure (e.g., reliable WLAN).
	Appearance/design of technology
	Technical support and maintenance
Interaction with physicians	Tele-physicians must have enough time for consultations
	Understanding of tele-physicians for age-typical clinical pictures
	Empathy of the tele-physicians for the situation of the residents
	Patience of tele-physicians for residents and needs

5 DISCUSSION

In this qualitative study, we aimed at the uncovering of acceptance-relevant aspects for the use of telemedical consultations in acute medical situations in nursing homes, thoroughly studying two essential user groups: the residents of nursing homes and the care personnel. The results enable us to better understand the perceived benefits and barriers of such complex, yet highly useful, technology which has the potential to significantly relieve the processes and ease consultations with specialized medical professionals in the long run. This approach can therefore positively complement the healthcare system and significantly support the situation in Germany's currently troubled institutional care.

5.1 Key Insights of the Study

Results reveal that the important stakeholders are open-minded and have generally positive attitudes towards using telemedical infrastructure. Confirming previous research (e.g., Peek et al., 2014; Offermann-van Heek et al., 2019), these attitudes are associated with the perception of technology-related perceived benefits and barriers of using the telemedical infrastructure. In line with previous research (e.g., Jaschinski & Allouch, 2015; Offermann-van Heek & Ziefle, 2018) the perceptions of benefits and barriers or concerns possessed different priorities and differed in their depth of detail depending on the two relevant user groups under study.

In more detail, this study identified concrete perceived benefits (divided in general, personnel- and patient-related aspects) of using telemedical consultation in acute situations in nursing homes. For instance, the participating residents of nursing homes expressed rather generic benefits regarding a potential reduction of the workload and thus a relief for the everyday life of the care personnel. In contrast, the participating care personnel described the perceived benefits of using telemedical consultations very precisely in terms of quick decisions at the nursing homes and an increase of safety for them as caregivers through medical decisions enabled by the fast contact to medical experts.

On the other hand, the study also identified that both investigated user groups were concerned about possible drawbacks that the technology could bring along. Concrete barriers and concerns were determined referring to communicative, technology-, handling- as well as privacy- and data security-related issues. Among these issues, a major hurdle is posed to technical requirements and competence in handling the technology. Not only is the widest possible expansion of Internet access perceived as vital, but also an uninterrupted support from technically competent and well-trained personnel is highly required. Other concerns refer to possible communication issues due to the distance to physicians providing treatment.

Along with the anticipated benefits and barriers of using telemedical tools, we also gained insights into the requirements for, and conditions of, the use from the involved study groups. These requirements referred to the main topics introduction and training, technology, interaction with physicians, and trust. With regard to the latter and in line with previous research on trust in medical technologies (Montague et al., 2009; Wilkowska & Ziefle, 2018), needs and requirements had different priorities depending on both investigated user groups. To build trust in the completely novel ways of communication concerning the sensible topics of health and assistance of frail persons in nursing home environments, participants especially required a proper technical training for, and an accessible technical support from a technically competent staff; correspondingly, an appropriate technological infrastructure is necessary in such facilities. Empathy, patience, and particular sensitivity for the situation of the nursing home residents on the part of treating physicians is all the more vital here – compared to direct interactions in a doctor-patient situation – and an important requirement for a successful usage of telemedical consultations.

5.2 Future Research Agenda

As far as potential stakeholders solely envision the use of the technology, instead of the real interaction with the telemedical tools/infrastructure, we have to expect that the attitudes greatly differ from the actual use (Ajzen & Fishbein, 1980). A purposeful and trouble-free use of the telemedical consultations also requires the perspective of the attending physicians and can uncover additional issues, which need to be appropriately addressed. Based on the insights identified from the first scenario-based qualitative study that focused on the essential user groups, i.e., residents and care personnel, and their attitudes towards using telemedicine in acute medical situations in nursing homes, concrete strategies for further steps of the user-centered investigations within the Optimal@NRW project can be derived:

1) Fulfilling a holistic user-centered consideration and in addition to already applied scenario-based analyses, a major focus must be put on investigations of acceptance and evaluations of "real" interactions with telemedical systems. The analysis and evaluation of direct interactions within telemedical consultations enables to identify appearing problems, the users' unaltered reactions, and relevant process flows. Up to now, the initially applied scenario-based approaches of the present study supported the understanding and enabled an identification of mental models, opinions, and perceptions regarding care in nursing homes, existing process flows, and general attitudes before telemedicine was integrated in the nursing homes.

2) As the results of this study revealed differences between the respective user groups, the opinions and evaluations of all relevant stakeholders (in particular residents and care personnel) have to be investigated

and considered in all phases of the project (before/during/after implementation).

3) For a successful realization of acceptance research within the project, qualitative and quantitative methodological approaches have to be combined. Thereby, interviews have been conducted in particular at the beginning of the project to identify wishes, attitudes, and needs of the involved stakeholders. Further, qualitative approaches will be applied to enable the involvement of older and frail participants who are not able to take part in quantitative surveys. Only on the basis of, and in addition to, these qualitative analyses a holistic quantification of the results using (online) surveys is usefully realizable. Thereby, a combined usage of qualitative and quantitative approaches enables the inclusion of different stakeholders and their specific characteristics.

4) As a last aspect, combining comparative and summative acceptance analyses along the project enables to identify changing acceptance parameters over time (pre- / during / post-implementation). Further, the empirical approach enables to identify influencing characteristics of the stakeholders (e.g., age, gender, experience), which may also vary over the different project phases.

Following this research agenda and considering a social communication science perspective, the user-centered investigations will contribute to a better understanding of needs, requirements, and technology acceptance patterns of partly vulnerable stakeholders (in particular residents of nursing homes and their caregivers). Only this way, an appropriate medical, technical, or organizational adaption of telemedical processes and infrastructure to the needs of the respective user groups can be realized.

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