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DESIGNING DIGITAL TOOLS FOR QUALITY ASSURANCE IN 24-HOUR HOME-CARE IN AUSTRIA

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Abstract: The cost-effectiveness of 24-hour care makes it a major source of support for elderly people in need of home-based care in Austria. Language barriers, feelings of isolation when living with chronically ill people and a lack of adequate training and quality control create stressful working conditions for 24-hour caregivers in Austria, who mainly come from Slovakia, Hungary and Romania. The challenges not only affect the 24-hour caregivers themselves but also their clients, relatives and registered care agency nurses in care settings. The aim of the qualitative study was to assess user needs in order to develop an app to improve working conditions and quality assurance in 24-hour home-care. The study consisted of guided interviews, focus group and cultural probes and 45 interviewees (24-hour caregivers, persons in need of care, relatives and registered nurses). The collected data were analyzed using Kuckartz's method of content structuring qualitative content analysis. The main results show that 24-hour caregivers predominantly require information about common geriatric diseases and the law on 24-hour care. Additionally, medical emergencies can cause insecurities, which creates high interest in professional emergency management skills. Clients and relatives are especially interested in 24-hour caregivers having better German language skills. Care agencies and registered nurses would particularly welcome electronic care documentation to ensure traceability of the activities and measures taken.

The study points to the need for a digital tool that would meet demand for an appropriate assistance system for 24-hour home-care that complies with the AAL (active and assisted living) requirements of the aligned project. Therefore, the intended software solution meets challenges in 24-hour home-care for 24-hour caregivers, persons in need of care, their relatives and professionals involved in the 24-hour care setting.

Keywords: 24-hour home-care; user needs; software solution; Austria.

Introduction

Demographic change and the associated ageing society mean that care will become ever more important in Austria in the coming years. The increasingly popular model of 24-hour care offers a comprehensive support service at home. The main reason for the current increase in demand is the inability of existing local mobile care providers to offer a comparable extended care service for the many affected persons at an affordable price (Bauer & Österle, 2013). Thus, 24-hour care represents an inexpensive care service round the clock that is a valuable alternative to family care and mobile care.

The typical recipients of 24-hour care are persons in need of care in their own homes who desire or require the permanent presence of a caregiver. Since 2007, 24-hour care has been covered by the Austrian Home-Care Act (Hausbetreuungsgesetz: HBeG). This law regulates the care provided to the person being cared for, including assistance with housekeeping and everyday life as well as the caregiver in attendance. Moreover, 24-hour care may be provided by a self-employed person or under an employment contract (HBeG, 2007).

The Austrian Ministry of Social Affairs (BMASGK) has created a funding model for the provision of financial support to persons with 24-hour care needs. Funding is based on entitlement to a level 3 care allowance, the need for care for up to 24-hours per day and a monthly net income limit of 2,500. The caregiver must offer a care relationship in accordance with the provisions of the Austrian Home-Care Act, hold mandatory insurance, have the prerequisite theoretical training and experience and be an authorized caregiver (BMASGK, 2019).

The 24-hour care model includes caring for elderly people in need of round-the-clock care. The individual need for care varies greatly depending on the person's health and ranges from housekeeping duties to nursing care. Given the broad spectrum of care, since 2008 physicians or registered nurses may delegate simple nursing and medical duties to a 24-hour caregiver. (Haslinger-Baumann et al., 2019) As reported by the professional association for 24-hour care of the Austrian Economic Chamber (Wirtschaftskammer Österreich: WKO) there are approximately 59,734 self-employed and active 24-hour caregivers registered in Austria. Most of them are female (94.8%); only 5.2% are male. (WKO reporting date 30.09.2016)

24-hour caregivers working in Austria are mostly migrants from Eastern Europe, usually from Slovakia, Hungary and Romania, and commute between Austria and their home country every two or more weeks. A total of 82,646 24-hour caregivers are registered at the WKO. 47.1% of the registered 24-hour caregivers come from Slovakia, 37% from Romania and 5.6% from Hungary (Famira-Mühlberger, 2017). For this reason, language barriers are common among 24-hour caregivers and care families. Furthermore, commuting between Austria and the respective home country makes it hard for the carer to balance privacy and recovery periods (Haslinger-Baumann et al., 2019). Caregivers receive only initial professional training before starting work in 24-hour care settings that often require an in-depth knowledge of geriatric diseases and nursing. Although the intention is not for 24-hour caregivers to routinely take on professional health care tasks, such as food intake support or bathroom assistance, in reality they have to undertake these tasks on a regular basis. In practice such nursing duties are not delegated after the appropriate training in accordance with the legal requirement; however, administrative penalties may be issued. (ebd.)

Despite the fact that 24-hour care is associated with many challenges and difficulties, it is an attractive model for many people in need of care who wish to remain in their own homes. Consequently, persons requiring care (clients), relatives and 24-hour caregivers face a difficult task in ensuring a successful care arrangement in a family-like system. Therefore, any successful 24-hour care arrangement requires a joint negotiation process based on the professional and social competences of the 24-hour caregiver. Furthermore, the provision of professional support and guidance throughout the care process is indispensable if an

accepted standard of quality of care is to be maintained (Petry et al., 2016). In some cases, 24-hour care agencies take on these tasks. Hence, they are called upon to provide expert support to 24-hour caregivers and families in order to ensure quality 24-hour care.

AAL - Active and assisted living

AAL (active and assisted living) stands for age-appropriate assistance systems for healthy and independent living. It includes concepts, products and services that bring together new technologies and social environments with the aim of improving quality of life in people in all stages of life, especially older people (AAL Austria, 2021).

The AAL Austria platform of the Federal Ministry of Transport, Innovation and Technology promotes stakeholder networking and the establishment and expansion of the Austrian AAL community. Among the stakeholders of the Austrian AAL community are older people as its primary users as well as any organizations in direct contact with older people. Public and private organizations, such as research institutions and lobbies, can also become members (AAL Austria, 2021). AAL information and communication technologies can contribute to improving quality of life through technical solutions for the independent control of health problems in all dimensions of the older population (Siegel & Dorner, 2017).

Aims

The objective of the research is to identify the user needs for a target group specific software solution and to integrate the survey results into the software development using AAL information and communication technology, focusing on quality assurance in 24-hour home-care. Consequently, another aim is to involve 24-hour caregivers as the main users, persons requiring care, their relatives and 24-hour care professionals so as to obtain a wide range of views and needs.

Methods

Research design

Qualitative research was used to collect comprehensive data on the heterogeneous needs of the four user groups: clients, 24-hour caregivers, relatives and registered nurses of 24-hour care agencies. Various qualitative methods, such as focus groups, guided interviews employing the stimulus situation method by Merton and Kendall (1993) and the cultural probes method (Gaver et al., 1999), were used in order to address the different target groups and wide range of user needs.

Guided interviews allow for a relatively open design of the interview situation and let the perspective of the interviewees come to the fore (Flick, 2012, p.194). In the interviews, the researchers used a predetermined list of questions based on predefined topics. The wording and order of the questions was adapted to the interview setting and the progression of the interview (Gläser & Grit, 2010, p. 42). The use of focus group discussions for data collection facilitated the exploration of the opinions and attitudes of the individual group

members as well as the opinions, attitudes and behaviors of the entire group, i.e. "public" opinion (Lamnek, 2005, p. 416). Guided interviews and guided focus groups tailored to the different needs of the aforementioned target groups were used to illustrate a broad spectrum of perspectives. Thus, the researchers created appropriate semi-structured interview guidelines for each target group on the challenges in 24-hour care and in relation to the planned software solution. The guidelines contain the interviewees' sociodemographic data, questions about 24-hour care and about technical support options and their design and conditions of use. To capture specific opinions on technical design, Merton and Kendall's (1993) stimulus situation method of focused interview was used. Accordingly, the interviewer showed the respondents a tablet with pre-installed exemplary training videos and a paper version of the care documentation. These inputs served as stimuli and led to associations regarding the planned software solution.

In addition to the interviews and focus group, the cultural probes method (Gaver et al., 1999; Gaver et al., 2004) was used to actively involve future users of the software solution in the research and development. Moreover, users presented their views regarding the future use of the software solution. Cultural probes consist of a set of inspiring materials that participants use over a defined period and provide designers with insights into the users' world (Lorenz et al., 2015).

Research sample

The data collection and the data analyses took place between the end of February 2019 and June 2019. To assess the user needs of the clients, 24-hour caregivers, relatives and registered nurses of 24-hour care agencies, a total of 45 persons were interviewed. Forty interviews were conducted as individual interviews with clients, 24-hour caregivers, relatives and registered nurses of 24-hour care agencies. Furthermore, a focus group discussion was held with five caregivers. Overall, 18 24-hour caregivers, 14 relatives, 10 clients and 3 registered nurses participated in the interviews.[1] Two of the 24-hour caregivers interviewed also took part in the cultural probes. The recruitment criteria of the participating persons included a wide range in terms of age, size of place, gender, German language skills, care qualification and years of work experience as a 24-hour caregiver. The survey participants were recruited using the gatekeeping strategy (Kruse, 2015). The project partners of the care agencies initially informed potential participants in various organizations about the opportunity to participate, and the interviewers subsequently established initial contact.

Procedure

Before the interviews and cultural probes took place, the interviewers assured the participants of data anonymity and confidentiality. In addition, comprehensive information about the study was provided in German, Slovak, Hungarian and Romanian and there was an opportunity to ask questions. Subsequently, the participants gave their written consent

[1] In the presentation of results, anchor examples of the 24-hour caregivers are marked "B", statements from registered nurses "D" and statements from relatives "A".

(Mayer, 2019). Two 24-hour caregivers (39 years, Romania; 58 years, Bulgaria) working in Austria were asked to test the cultural probe set (tablet, application software) for one week and to complete the included task sheet with diary function on a daily basis. Furthermore, the interviewers wrote a postscript each time the cultural probe set was returned.

The interviews took place in the respective household and, where possible, in the family setting (client, 24-hour caregiver and relatives). The interviews with the registered nurses were conducted in individual settings. The focus group took place in rooms provided by a project partner. All interviews were digitally recorded using a recording device or a smartphone. After each interview, the interviewer added a postscript documenting the atmospheric aspects, e.g. a particular conversation dynamic or specific aspects of the first personal contact (Kruse, 2015, p.278). Subsequently, the interviewers transcribed the interviews in a computer-aided manner using Microsoft Word.

Data analysis

The data analysis of the interviews and the focus group as well as the postscripts and cultural probe diaries was based on the structuring qualitative content analysis by Kuckartz (2016). The objective was to filter out and summarize specific themes, content and aspects. The categories were formed both inductively and deductively and super-topics and subtopics were created in MAXQDA 18.0.0. Deductive super-topics were those used in the interview guidelines: challenges of everyday care, e-learning, e-documentation, emergency management, networking platform and technology competence. The subtopics (e.g. language barriers, teaching content, documentation content) were coded inductively and deductively. To ensure the reliability of the analysis and provide quality assurance of the qualitative content analysis, MAXQDA software was used to improve the transparency of the qualitative data analysis by documenting and tracing the formulated codes. In addition, the two researchers who conducted the interviews coded the text-material following the inter-coder compliance principle (Kuckartz, 2016). In particular, the coders jointly determined the coding criteria for the analysis of the text-material. Then they coded some parts of the material together and then the remaining parts separately. Discrepancies in coding were rare. Those that did exist were discussed verbally and reconciled by the four members of the core research team.

Results

24-hour caregivers are the main target group and future users of the proposed software solution. Consequently, the socio-demographic data of this target group are described in detail. The average age of the 18 interviewed 24-hour caregivers is 51.56 years. They had been working in 24-hour care for an average of 6.24 years. Table 1 shows in absolute numbers the distribution of gender as well as country of origin, mother tongue, German language skills and education of the participating 24-hour caregivers, who represent the future target group who will use the software solution.

The results of the data collection revealed various topics and reference points relevant to the development of the software solution.

Table 1. Characteristics of the 24-hour caregivers

Gender	Female (17)	Male (1)		
Origin	Romania (8)	Slovakia (5)	Bulgaria (3)	Others (2)
Mother tongue	Romanian (6)	Slovakian (3)	Hungarian (5)	Others (4)
German language skills (self-perception)	Moderate (13)	Fluent (5)		
Education (multiple choice)	A-levels (16)	Academic degree (3)	Nursing education (6)	Trained caregivers (12)

Below, the results are presented in detail alongside the associated user requirements for the software solution. The identified user needs of the different target groups were all taken into account and do not contradict each other; they were treated equally for the purposes of developing the software solution. Tables 2 to 6 give an overview of the results, with abbreviations in brackets indicating the origin of the finding, such as caregivers (CG), registered nurses (RN), relatives (R) and clients (C).

E-learning platform to fill in knowledge gaps

One component designed to ensure the quality of 24-hour care is the e-learning platform. According to all the target groups, caregivers face unfamiliar bureaucratic obstacles and administrative tasks, especially when beginning work in 24-hour care. Moreover, caregivers and registered nurses but particularly clients and their relatives point out that language barriers often exacerbate these problems and lead to difficulties communicating with clients and their relatives: "The caregiver does not speak with her (the client) because her knowledge of German is poor. And as a result, both of them are somehow lonely because they have no one to talk to"[2] (A7, 49). In addition, 24-hour caregivers often lack awareness of legal and other aspects of the job (e.g. professional rights and duties, employment law, social insurance, tax laws). The registered nurses interviewed pointed out that 24-hour caregivers are often not authorized to perform certain care tasks. Therefore, a registered nurse had to provide the caregiver with the appropriate training and subsequent written authorization (delegation) enabling them to perform the task. Furthermore, 24-hour caregivers frequently lack the appropriate specialist knowledge to perform certain nursing duties. They stated that they tried to compensate for that by 'learning by doing', which requires a high level of self-initiative. To fill in knowledge gaps, they used various information sources ranging from informal sources, such as other 24-hour caregivers and relevant websites or videos, to formal sources via the 24-hour care agencies or the family physician.

[2] All anchor examples were transcribed word by word. To aid understanding among international readers, they were translated literally into English.

This lack of knowledge adds to the heavy workload of 24-hour caregivers performing nursing duties. There is a particular need for further training in geriatric disease (e.g. dementia), emergency management, nursing techniques (e.g. mobilization, transfer), coping strategies and work ergonomics. The 24-hour caregivers would like to see further training being provided at a suitable time and location compatible with their regular care tasks. 24-hour caregivers rate issues as particularly relevant when directly confronted with them in their daily care routine. Therefore, the software solution provides an e-learning platform supplying relevant content in a supportive manner. According to the 24-hour caregivers, the structured training course should be available in video format in German with subtitles in their language of origin. The 24-hour caregivers and the registered nurses see this as an opportunity to learn German alongside the professional content: "Because I think that would have a double learning effect. That one could simply improve oneself from the language point of view as well." (D1, 81). Registered nurses complained about the lack of obligatory further training for 24-hour caregivers who have received only basic training. The registered nurses and the families would like the 24-hour caregivers to have appropriate communication skills (e.g. appreciative language, expressiveness).

In order to address these language barriers, the e-learning platform provides professional content on everyday care via German training videos with subtitles in German, Slovak, Hungarian and Romanian. In addition, written information in these languages is provided on workplace topics, the legal aspects of 24-hour care (e.g. delegated tasks), German language training, emergency skills, geriatric diseases and nursing care as well as daily care (e.g. personal care) and household. The interviewed 24-hour caregivers were willing to attend training, subject to time availability. Furthermore, they mentioned the complexity of the regular shift changes that made it hard to attend an educational program. The interviewees

Table 2. E-learning platform requirements based on the user survey findings

Criteria	**Findings user survey**	**Requirements e-learning platform**
Sources of information for 24-hour caregiver	Peers, physicians, agencies, internet (CG)	Digital training platform including standardized, evidence-based teaching content (CG)
Teaching content	Poor nursing education, lack of further training opportunity of the 24-hour caregiver (RN)	Provide teaching content in modules on topics relevant to 24-hour care (RN)
Willingness to learn	Depending on time resources available to the 24-hour caregiver (e.g. care effort) (CG)	Use of the digital training platform is independent of time and location (CG)
Language barriers	Huge variation in German language skills among the 24-hour caregivers (CG, RN, C, R)	Subtitles in the languages of origin, i.e. Slovakian, Hungarian and Romanian, in addition to (CG, RN, C, R)

thought being able to choose the time and place to use the digital training platform was a positive aspect, as the following statement shows: "(...) It's quite easy because you don't need to go anywhere and you can do it there in those hours, of yours, that you have free, do it at home and that's easier" (B7, 196). Thus, the e-learning platform accommodates the time restraints on the 24-hour caregivers.

Unitary simple digital care documentation

An important aspect of 24-hour care is the care documentation, which is typically done on paper. However, it differs in structure and use among the 24-hour caregivers and ranges from daily documentation to once per shift. The 24-hour caregivers see the care documentation as a part of their work, but often do it reluctantly and struggle to complete it. In particular, they find complex and extensive documentation problematic in terms of the time required and their lack of language skills. Furthermore, it is hard to adapt the existing care documentation to the actual care given and the diseases of the clients. With the e-documentation the caregiving tasks needed for the particular client can be selected so the scope of the documentation can be adapted to reflect the actual care situation.

In addition, the 24-hour caregivers consider it important to have data sheets with the contact details of the family and physician. Caregivers and registered nurses would like to see a checkbox system for the digital documentation, as they avoid free text fields because of the difficulties they have expressing themselves in the language and for fear of making mistakes. The e-documentation meets this requirement by providing checkboxes in the

Table 3. E-documentation requirements based on the user survey findings

Criteria	**Findings user survey**	**Requirements e-documentation**
Complexity of care documentation	Complex care situations with varying care requirements depending on the age and disease patterns of the clients (CG)	E-documentation can be individually adjusted according to the disease patterns of the clients (CG)
Exceeding competence	Lack of knowledge about care measures requiring delegation (RN)	Note for activities requiring delegation and the opportunity of depositing written delegations in e-documentation (RN)
Lack of written expression in German language	Difficulties filling in free text fields due to the low level of German skills and the required effort regarded (RN, CG)	Preferred checkboxes supplemented by free-text fields (RN, CG)
E-documentation content	Client data sheet incl. pre-existing illnesses and contact details of relatives and family doctor (CG)	Opportunity to store client's master data (incl. pre-existing illnesses) and important contact details of relatives and doctors (CG)
Language barriers in documentation	Huge variation in the German language skills among the 24-hour caregivers (RN, CG)	In addition to German, provide e-documentation in Slovakian, Hungarian and Romanian with a translation function (RN, CG)

main, accompanied by free text fields for some parts of the documentation. In addition, the integrated translation feature helps reduce the burden of completing free text fields. The younger caregivers tended to see the ease of use of the digital care documentation as an advantage, as the following statement shows: "But that's quite good, I only have to tip, tip, tip and don't have to write" (B14, 392).

Furthermore, the registered nurses mentioned that the care documentation represents an important source of information about the client's state of health, especially during their nursing rounds. They find it hard to read illegible documentation filled out in the 24-hour caregiver's language of origin: "(…) my handwriting is really scratchy and someone else can hardly read it, so I'm glad that I have a tablet for writing, because then I can also read it (...) after a few months. That's already a big advantage. Not for nothing that we're all getting into electronic documentation – the doctors, healthcare professionals and in the future the caregivers should do it too" (D2, 156). In addition, colleagues read the care documentation to find out about the client's state of health and the care tasks taken. The e-documentation comes in German, Slovak, Hungarian and Romanian and has a translation feature, eliminating the problem of poor legibility.

Relatives and clients are rarely integrated into the documentation process. Their interviews therefore provided no relevant information on the 24-hour-care documentation.

Emergency management

Emergencies may occur at any time with elderly clients. According to the interviewees from all the target groups, the prearrangements for such situations are handled individually in the families and depend on the client's medical status. At the beginning of 24-hour care, the family and caregiver usually decide how to proceed in an emergency. In addition, clients sometimes use an emergency button, as important patient data and the address are already stored in this emergency management system. According to the interviewees, it is important recognize that it is an emergency so the agreed communication chain can be initiated. Some

Table 4. Emergency management requirements based on the user survey findings

Criteria	**Findings user survey**	**Requirements emergency management**
Emergency management	Emergency button is a simple tool for initiating the rescue chain (C,R)	Integration of an emergency call application into the e-documentation with background information relevant to emergencies (C,R)
Not knowing emergency numbers	Local emergency number for ambulance mainly unknown (CG)	Place emergency number(s) prominently in the emergency management (CG)
Required contents for emergency management	24-hour caregivers show little knowledge of client's data (CG)	Quick accessibility to client data (e.g. address, social insurance number) (CG)

24-hour care organizations also set criteria for when to call the emergency services (e.g. a fall). The 24-hour caregivers interviewed thought they were generally good at assessing an emergency and asked relatives in cases of doubt. However, the 24-hour caregivers often do not know the client's address or medical history. In addition, the interviews with the caregivers showed that in some cases they did not know the local emergency number by heart. The software solution has a digital emergency management system in which the most important data, such as the caregiver's address and social insurance number, can be stored. In this way, the caregiver can easily make the emergency call and quickly pass on all important information to the emergency service.

Relatives and clients had no special requirements regarding the emergency system apart but thought it should be quick and accurate.

Networking for professional and personal exchanges

The interviews with all the target groups revealed that 24-hour caregivers often feel isolated from their social environment in their everyday work. Therefore, opportunities to network with others are of great importance. Good networking between 24-hour caregivers and their care family, colleagues, registered nurses and families of origin can support them when caring for clients and enable them to exchange and acquire knowledge and to obtain advice on the care situation.

For peer group exchanges, the 24-hour caregivers like to use social media channels such as Facebook, Instagram or WhatsApp groups. Furthermore, the results show that the caregivers frequently communicate by phone and messenger services. Families indicated that they spoke on the phone or exchanged text messages with the 24-hour caregiver. Registered nurses also maintained telephone contact with the 24-hour caregivers and visited the family when problems arose. They stressed that data protection had to be taken into account when exchanging information about client data. Signal messaging service is a high quality, secure way of exchanging information through encrypted chat and so is ideal for this purpose. In

Table 5. Networking platform requirements based on the user survey findings

Criteria	**Findings user survey**	**Requirements networking platform**
Networking through Social-Media-Platforms	Networking between people involved in 24-hour care via social media platforms and messenger services (CG, RN, C, R)	Moderated Facebook-group in German with usage guidelines for 24-hour caregivers in order to support the exchange of information and experiences (CG, RN, C, R)
Source of information	Formal sources (family physician, registered nurse) and informal sources (colleagues in 24-hour care, family, internet) are used (RN, CG)	Moderated Facebook-group and secure messenger Signal to ask questions about 24-hour care and for professional exchange (RN, CG)

addition, a moderated Facebook-group is an important means of communication for the 24-hour caregivers.

Technological competence

Although all the 24-hour caregivers owned a smartphone, they had various skill levels. Operating a smartphone was not a major hurdle for the 24-hour caregivers, but using apps was more of a problem. The caregivers were therefore dependent on people they knew or family members in their country of origin, as the following statement shows: "Messenger and WhatsApp and Viber, that's all new, I have to learn everything. (...) my grandchildren do this." (B15, 91). In order to support the 24-hour caregivers' initial use of the tablet, the software solution comes with additional materials such as user manual and explanatory videos on how to use the apps.

Table 6. Software solution requirements based on the user survey findings

Criteria	Findings user survey	Requirements software solution
Acceptance of the software solution	Differences in technology skills and/or affinity for technology among 24-hour caregivers (CG)	Simple applications that appeal to a broad target group (CG)
Support for use	Family members help with utilization (CG)	Providing manuals and explanatory videos to support the handling of the software solution (CG)

Discussion

The aim of the present study is to identify problems in 24-hour care to enable the development of a functional prototype of a software solution focusing on quality assurance in 24-hour care.

The qualifications held by 24-hour caregivers broadly range from a university degree or health and nursing diploma acquired abroad to primary education – with or without any care training background (Bauer & Österle, 2013). The registered nurses point out that caregivers often lacked knowledge about care duties. The 24-hour caregivers reported that they tried to fill in knowledge gaps using informal information sources (e.g. the internet). Moreover, they wanted to be able to study without having to commit to a specific time and location. All the target groups thought language barriers were the main issue needing to be addressed in 24-hour care. In supporting skill growth in low-qualified 24-hour caregivers, an e-learning platform can compensate for the lack of professional knowledge in 24-hour care. This form of learning is not tied to a particular time and location and is therefore highly compatible with 24-hour care arrangements. The learning content is adapted to the requirements of the 24-hour care setting. Consequently, the content includes work-related topics, the legislation relating to 24-hour care and professional information about the clients' daily care,

housekeeping and professional care regarding various geriatric diseases and how to handle emergencies. Furthermore, the low-threshold access to knowledge via short learning videos in German with subtitles in the languages most commonly spoken by the 24-hour caregivers fosters German language acquisition.

Adequate care documentation is an essential part of internal quality management and external quality control. The main purpose of the documentation is to show that the care duties were carried out correctly. The written record should be as simple and succinct as possible. In addition, caregivers should document their actions in a timely manner (Rappold & Aistleithner, 2017). Indeed, the caregivers themselves requested simple documentation. Usually the documentation used in both health care and 24-hour care is handwritten on paper. Often it is incomplete and not up to date. Furthermore, the existing forms are not always used as specified. Moreover, handwritten documentation can lead to problems regarding legibility and is location-bound. In the interviews the registered nurses mentioned the sometimes poor legibility of handwritten documentation. Poor writing skills (in particular the foreign language skills of the 24-hour caregivers) can lead to content gaps in the care documentation. (Fischer, 2013). The e-documentation eliminates the potential for illegibility and incompleteness. Support is provided for 24-hour caregivers with little knowledge of German using checkboxes and just a few free text fields so they can complete the documentation in full. Besides German, the digital care documentation is also available in Slovak, Hungarian and Romanian.

The rescue chain is triggered by the person recognizing that the situation is an emergency and making the emergency call. In this way, the first aider fulfills their duty to provide first aid. (Perkins et al., 2015).

According to a survey commissioned by Johanniter, the Austrian emergency service and conducted by the media research company INTEGRAL Markt – und Medienforschung, 60% of respondents stated that they were capable or very capable of providing first aid. People with higher secondary and tertiary education are more likely to be able to provide first aid than those educated to lower secondary level education. (Integral Markt-und Meinsungsforschung, 2016). The 24-hour caregivers stated that they were able to recognize life-threatening symptoms and emergencies. Nonetheless, their poor German language skills and lack of knowledge about local emergency numbers could seriously hamper their ability to make an emergency call. In addition, some 24-hour caregivers lack information about their clients. Thus, the software solution developed has a simple emergency-call button and integrates important information such as the caregiver's address, previous illnesses and social insurance number.

Mishra, Rani and Bhardwaj (2017) found that younger individuals (under 26 years old) had better social media skills than older individuals. The 24-hour caregivers interviewed in the study, with an average age of approximately 52 years, used digital applications such as WhatsApp and Facebook on their smartphones for personal networking. This shows that networking with other 24-hour caregivers, relatives and registered nurses is an essential part of everyday care. With the messenger service Signal, the newly developed software solution provides a secure alternative to WhatsApp and offers a moderated Facebook-group as a further communication channel for the 24-hour caregivers.

According to Endsley & Jones (2016), when developing a technology, it is important to ensure that it meets the needs of the user groups. The technology should match and adapt to

the abilities of the users. Once achieved, improved human-machine interaction is expected, along with greater satisfaction with the new product (Endsley & Jones, 2016). The software solution was developed to incorporate the findings of the present study and the variety of technical skills among 24-hour caregivers. This ensures a low-threshold qualitative support for 24-hour care.

Limitation

In the present study, three institutions recruited the interview partners. In order to guarantee efficient data collection, people who were easy to interview were contacted (purposive sampling). That led to contacts with 24-hour caregivers, who tended to be rather well qualified and fluent in German. The literature (Bauer, 2010) and interviewees pointed out that it is rare for 24-hour caregivers in Austria to be highly professionally qualified and have good language skills. On the positive side, one should note that the respondents commented on 24-hour care generally and on the various different requirements and situations of 24-hour caregivers. The findings regarding the 24-hour caregivers can only be interpreted in relation to the sample and are not transferable to the wider population (Koller, 2014, p.77). As the legal and organizational aspects of care are specific to Austria, studies from other countries were not considered. This must therefore be taken into account when interpreting the results.

Conclusion

The results of the study indicate opportunities to improve the quality of 24-hour care by providing a digital software solution. The analyzed data contain topics around daily business and professional practice, the competences required to provide 24-hour care and the care documentation. In addition, the communication channels between the actors in the 24-hour care setting and the frequently used platforms and channels of organization and coordination were identified as means of handling emergencies.

Based on the user survey findings, a comprehensive software solution for 24-hour care was developed that consists of an e-learning platform, electronic care documentation with integrated emergency management and simple networking options. The e-learning courses meet the requirements on accessibility to relevant information and learning conditions. The e-documentation constitutes a unified digital documentation system that relies mainly on checkboxes and selected free text fields with an integrated translation function. In addition, the e-documentation provides a comprehensive and traceable record of tasks taken. A Facebook-group has been set up to meet the need for communication and networking among the 24-hour caregivers. The software solution includes Signal messenger as a secure means of exchanging information with family members and those involved in the care situation.

The present research results concern the 24-hour care situation in Austria. Therefore, the software solution meets the specific user needs in this region. As the legal and organizational aspects differ, the results may prove exemplary for technical developments in other countries. Further research is needed in order to identify any differences (e.g. in languages of origin of 24-hour caregivers) and similarities in the requirements the software solution would have to fulfil in relation to 24-hour home-care in other countries.

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References

AAL Austria (2021). Retrieved May 19, 2021 from https://www.aal.at/

Bauer, G. (2010). *Die 24-Stunden-Betreuung in Österreich: Motive und Beschäftigungsverhältnisse von osteuropäischen Pflege- und Betreuungspersonen* [24-hour home-care in Austria: Motives and employment relationships of Eastern European care and support workers]. Vienna University of Economics and Business, Vienna.

Bauer, G., & Österle, A. (2013). 24-Stunden-Betreuung für ältere Menschen. Entwicklungen und Wirkungen der Regularisierung der Betreuung in privaten Haushalten in Österreich [24-hour home-care for older people. Developments and effects of the regularisation of care in private households in Austria]. *Sozialer Fortschritt*, *62* (3), 71–77. https://doi.org/10.3790/sfo.62.3.71

Bundesministerium für Arbeit, Soziales und Konsumentenschutz (BMASGK) (2019). Österreichischer Pflegevorsorgebericht 2018, Sozialministerium, Wien. Retrieved April 21, 2021 from https://broschuerenservice.sozialministerium.at/Home/Download?publicationId=719

Bundesministerium für Soziales, Gesundheit, Pflege und Konsumentenschutz (BMASGK) (2020). Österreichisches Gesundheitsportal. Retrieved April 21, 2021 from https://www.gesundheit.gv.at/leben/altern/wohnen-im-alter/ambient-assisted-living

Endsley, M. R., & Jones, D. G. (2016). *Designing for situation awareness: An approach to user-centered design.* (2nd ed.) Boca Raton, London, New York: CRC Press. https://doi.org/10.1201/b11371

Famira-Mühlberger, U. (2017). *Die Bedeutung der 24-Stunden-Betreuung für die Altenbetreuung in Österreich [The importance of 24-hour care for elderly care in Austria]*. Retrieved April 21, 2021 from www.wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=60718&mime_type=application/pdf

Fischer, F. (2013). *Herausforderung Pflegedokumentation: Möglichkeiten und Nachteile EDV-gestützter Dokumentationssysteme in der stationären Altenhilfe [The challenge of care documentation: Possibilities and disadvantages of computer-supported documentation systems in care for elderly]*. München: GRIN Verlag.

Flick, U. (2012). *Qualitative Sozialforschung: Eine Einführung [Qualitative Social Research: An Introduction]*. (5th ed.). Rororo Rowohlts Enzyklopädie: Vol. 55694. Reinbek bei Hamburg: Rowohlt-Taschenbuch-Verlag.

Gaver, W., Boucher, A., Pennington, S., & Walker, B. (2004). Cultural probes and the value of uncertainty. *Interactions, 11*(5), 53–56. https://doi.org/10.1145/1015530.1015555

Gaver, B., Dunne, T., & Pacenti, E. (1999). Design: Cultural probes. *Interactions*, *6*(1), 21–29. https://doi.org/10.1145/291224.291235

Gläser, J., Grit, L. (2010). *Experteninterviews und qualitative Inhaltsanalyse [Expert interviews and qualitative content analysis]*. (4th ed.), Wiesbaden: VS Verlag für Sozialwissenschaften.

Haslinger-Baumann, E., Lilgenau, A., Binder, C., & Gugenberger, K. (2019). Qualitätsmerkmale in der 24 h-Betreuung aus der Perspektive der Betroffenen - Ergebnisse einer Pilotbefragungsstudie in Österreich [Quality characteristics in 24-hour care from the perspective of those affected - Results of a pilot study in Austria]. *Pflege, 32*(4), 189–200.

HBeG Hausbetreuungsgesetz BGBl. I Nr. 33/2007.

Integral Markt-und Meinungsforschung (2016). *Pressetext Erste Hilfe [First aid press release]*. Retrieved May 12, 2021 from https://www.integral.co.at/downloads/Pressetext/2016/09/Pressetext_ErsteHilfe_2016.pdf

Koller, M. (2014). *Statistik für Pflege- und Gesundheitsberufe [Statistics for nursing and health care professions]*. Vienna: Facultas.

Kruse, J. (2015). *Qualitative Interviewforschung: Ein integrativer Ansatz [Qualitative interview research: An integrative approach]*. (2nd ed.), Weinheim, Basel, München: Beltz Juventa; Ciando.

Kuckartz, U. (2016). *Qualitative Inhaltsanalyse. Methoden, Praxis, Computerunterstützung. Grundlagentexte Methoden. [Qualitative content analysis. methods, practice, computer support. Basic texts on methods]*. (3rd ed.), Weinheim/Basel: Beltz Juventa.

Lamnek, S. (2005). *Qualitative Sozialforschung [Qualitative Social Research]*. Basel: Beltz Verlag.

Lorenz, K., Zach, J., & Joost, G. (2015). Beispiele aus der Praxis: Anwendung partizipativer Methoden im Gesundheitskontext [Examples from practice: Application of participatory methods in the health context]. In: A. Weisbecker, M., Burmester & A. Schmidt (Eds.), *Mensch und Computer 2015 Workshopband*. 101-107. Stuttgart: Oldenbourg Wissenschaftsverlag. Retrieved May 27, 2021 from https://www.degruyter.com/downloadpdf/books/9783110443905/9783110443905-014/9783110443905-014.pdf

Mayer, H. (2019). *Pflegeforschung anwenden: Elemente und Basiswissen für Studium [Applying nursing research: Elements and basic knowledge for study]*. (4th ed.), Wien: Facultas.

Merton, R. K., & Kendall, P. L. (1993). Das fokussierte Interview [The focused interview]. In: C. Hopf, & E. Weingarten (Eds.), *Qualitative Sozialforschung*. 169–204. (3rd ed.), Stuttgart: Klett-Cotta.

Mishra, A., Rani, S., & Bhardwaj, U. D. (2017). Effectiveness of e-learning module on first aid: A study on student nurses. *International Journal of Nursing Education*, *9*(3), 6–10. https://doi.org/10.5958/0974-9357.2017.00060.5

Perkins, G. D., Handley, A. J., Koster, R. W., Castrén, M., Smyth, M. A., Olasveengen, T., & Soar, J. (2015). European Resuscitation Council Guidelines for Resuscitation 2015: Section 2. Adult basic life support and automated external defibrillation. *Resuscitation,* 95, 81–99. https://doi.org/10.1016/j.resuscitation.2015.07.015

Petry, H., Naef, R., Rüesch, P., Mahrer-Imhof, R., & Dreizler, J. (2016). Erfahrungen von älteren Menschen und deren Familien mit einer Rund-um-die-Uhr Betreuung durch Care MigrantInnen. Eine Grounded Theory Studie [Older persons' and their families' experience with live-in foreign home care workers. A grounded theory study]. *Pflege, 29*(6), 301–314. Online publication. https://doi.org/10.1024/1012-5302/a000515

Rappold, E., & Aistleithner, R. (2017). *Arbeitshilfe Pflegedokumentation 2017 [Care Documentation Guideline 2017]*. Im Auftrag des Bundesministeriums für Gesundheit und Frauen. (3rd ed.) Gesundheit Österreich GmbH/ Geschäftsbereich ÖBIG, Vienna.

Siegel, C., & Dorner, T. E. (2017). Information technologies for active and assisted living. Influences to the quality of life of an ageing society. *International Journal of Medical Informatics*, 100, 32–45. https://doi.org/10.1016/j.ijmedinf.2017.01.012

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