


A Telepresence Robot in Residential Care: Family Increasingly Present, Personnel Worried About Privacy

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Abstract. Elderly people moving into assisted living facilities often face profound changes in their daily routines and social relationships, which may lead to feelings of social isolation and even to depression. Telepresence robots can alleviate this by enabling easily accessible virtual presence of family members and other close ones at the ward. Telepresence robots have been tested in different care environments with often positive responses, but there are still challenges, both technical and non-technical, that hinder the wider adoption of the robots in residential care settings. We seek for more understanding of the non-technical challenges by studying the use of a telepresence robot Double in a residential care facility. In a 12-week field trial, we installed a telepresence robot in a room of a long-term care home resident for communicating with her family members. The qualitative interview data included the perspectives of the resident, her family members and care workers at the ward. The results confirm the potential of telepresence robots in assisted living in order to increase the presence of family members to the resident and vice versa; the study also provides insight about how the increased presence of family members may affect the care work.

Keywords: Elderly · Residential care · Telepresence robot · Social relationships

1 Introduction

There is an increasing demand for good quality of life for older people living in residential care (e.g. in sheltered housing care facilities). Loneliness and depression are serious concerns for people living in the care facilities [1, 2], and what is needed is person-centered care [3]: possibilities for participation, social activities and maintaining social relations. Communication and contacts with family and friends are among the most important aspects in supporting the well-being of people in residential care.

Telepresence robots like Beam, VGo, Giraff and Double, which is used in this study, are also known as virtual presence robots or remote presence robots. They are remote-controlled robots which enable a person to be virtually present, interact and socially participate from a remote location. Telepresence robots can be used for the purposes of business, education or medicine, for example, but also as a means of interaction between older people, their care givers and other close ones [4].

According to Coradeschi et al. [5], robotic telepresence could be particularly suited to elderly persons: a telepresence robot is remotely controlled, and the elderly user can interact with the robot in a natural manner with little additional learning. The remote user of the robot has the control (up to the complete control of the device) and so can more flexibly adapt to the physical requirements of the elderly person (e.g., moving closer to the elderly user). The telepresence robot is adjustable for many kind of uses, for both mobile and less mobile elderly users, who may also want to drive the robot themselves. The robot can also increase the feelings of safety and connection as the elderly user knows that others can easily “stop by” virtually.

In this article we present a study about the potential of telepresence robots in residential care in particular in increasing the social activity of the elderly resident; i.e. the presence of family members and other socially important people in a residential care facility. Empirical studies have been carried out earlier as well [e.g. 4, 5]. Based on that we summarize what kind of social benefits and concerns the robot is expected to cause from the perspectives of the resident, family members and caregiver staff. We then present a field trial, in which a telepresence robot was 12 weeks in a resident’s room in a residential care facility. The results of the trial confirm earlier findings and gives also new insight about how telepresence might affect the care work.

2 Background

2.1 Assisted Living for Elderly People: In Between Home and Institutional Care

“Residential care” belongs to services of “assisted living” that entail provision of housing combined with basic nursing care [6]. The idea of assisted living is to offer the residents a home-like environment which fosters autonomy, privacy and freedom of choice [7, p. 216]. Assisted living holds a promise of ageing in place as the facility services adapt according to the residents’ changing needs.

In an assisted living residence in Finland, a person lives in his or her own home, most often a room with a kitchenette and a bathroom. The residences often have different units, for example separate wards of intensive care with determined daily routines. Unlike long-term care institutions, assisted living provides more choices regarding services and lifestyles [8] to support the individual well-being of the residents.

However, quality of life may suffer in residential care: although the residents in assisted living facilities live in their own homes by definition, many think that a room in a ward is not private enough, and the common areas like dining rooms or living rooms are not felt as home-like [9]. Moving into a care facility is a significant change in the lives of older people. The routines and habits that a person had in the old home and neighborhood break, and the previous social surrounding completely change [10]. In a ward of intensive assisted living, the doors may be locked and residents are only allowed to leave with an escort. People may lose contacts that previously were present in everyday life, and feel socially isolated [3, p. 64]. Furthermore, in Finland the municipal authorities decide on a person’s entitlement to a place in residential care and often refer people to the care units according to the specific care needs and available places [11].

Thus the people moving to wards of intensive assisted living are most often not able to make choices regarding the social surrounding of their new home.

Depression is common among older people and those who live in long-term care facilities are also at risk [12]. Social engagement in the sense of making social and emotional connections with people and the community [13] has a positive effect on both physical health and social well-being of older people [14]. Seeking ways to support the continuity of social contacts is a question of importance in assisted living.

2.2 Telepresence Robots for Elderly in Home and in Residential Care

Telepresence robots have been tested in different settings for their potential to support social relationships for the elderly people. For instance, twelve community-dwelling older adults experimented short-term remote visits with a Mobile Remote Presence System [15]. When interviewed, 66% of the participants' comments were positive, and 28% mixed. The participants preferred controlling the system themselves, and wanted to contact their family, children and grandchildren. The benefits mentioned were the image (and seeing the visitor's face), reduced travel time, and socialization. The concerns were the call etiquette (how to end/refuse call), the control over accepting/refusing calls, privacy i.e. how to manage visitors when in a care facility and who has access to call, the lack of face to face contact, and mis/overuse of the system.

In two-day field trials at the homes of eight seniors with a VGo telepresence robot [16], the overall experiences of the seniors and the visiting family members and friends were quite consistently positive. The technology was appreciated for its capability to support the health and well-being of seniors as well as their social connectedness and the ability to live independently at home. In a third study, a Giraff robot was placed for a year in the home of a couple of older adults [4]. The robot helped them to keep in connection with their son, and alleviated their sense of loneliness. Seeing the calling person was positive, and the remote user's ability to move freely in his parents' home through Giraff was seen useful. The elderly couple (the local users) expressed a need for greater control: they would have liked to move the robot themselves and call with it. Their interest in using the robot did not decrease in time.

In a residential care setting, a socially assistive robot called Tangy was demonstrated for groups of residents, their family members and care professionals in two care homes [17]. Tangy had a smart telepresence functionality: on scheduled times, the robot would locate the primary user and go to her/him to notify about the upcoming call. In focus groups, altogether 81 residents, family members and healthcare professionals gave positive feedback about the functionality. Telepresence enabled the residents to converse with their close ones at their leisure. The family members anticipated using telepresence frequently as it required little assistance from the staff and would help to overcome long distances and busy schedules.

In another study, a multifunctional assistive telepresence robot was placed in the nursing home for one month [18]. Altogether 30 elderly residents with no severe disabilities used it periodically. Both the elderly users and professional caregivers found the robot useful. Especially the video was found useful for the elderly to reduce loneliness and increase contact with family and friends.

In another nursing home [19], a Giraff robot was used 6–8 weeks by five elderly participants, who suffered from mild to moderate dementia, and their family members. The participants were generally positive and engaged with the robot, and families perceived the robot to help in reducing social isolation of the residents. Video connection was seen of importance: seeing the face of family members was commented to maintain the resident’s connection with them, and the relatives felt enjoyment and reassurance for seeing the resident is doing well. The ability to move around was beneficial for the family members, as they could observe places and follow the resident in the facility, although the privacy issue was in concern. (The calls were always prearranged with the participants to protect privacy.) The family could also get more involved in the life in the facility by being able to talk to staff, and they liked the reduced travel time. The telepresence robot was preferred to existing video call applications because of the greater level of control the family has in terms of connecting, moving, and positioning the camera. The staff found positive to see that the residents enjoyed the communication with the family. Several non-technical challenges were identified: the participants expressed concerns about whether the residents would react by confusion or fear to the robot, or would the family members witness residents’ disruptive behavior. These were not observed after all. The staff however felt unskilled and that they had no time to learn to use the robot.

Based on the literature above, we collected the main benefits and concerns related to telepresence robots in residential care in the Table 1.

Table 1. Benefits and concerns when using a telepresence robot in residential care.

	Benefits	Concerns
Resident(s)	<ul style="list-style-type: none"> ● Reduced social isolation, increased connection between the resident and family members [4, 16, 18, 19] ● Especially being able to see the family member’s face is important to the resident [4, 15, 18, 19] 	<ul style="list-style-type: none"> ● The resident may react negatively (be confused, frightened) [19] ● Lack of physical face to face contacts due to reduced visits of the family [19] ● Mis/overuse of the robot [15] ● The resident does not have enough control (to end/refuse a call and to manage who has access) [15] ● Invasions of privacy [19]
Family	<ul style="list-style-type: none"> ● Enjoyment when connecting to the resident; reassurance when seeing that the resident is doing well [19] ● Reduced travel time and related convenience [15, 19] ● Family and staff discuss about care; the family feels more involved and connected with the facility [19] 	<ul style="list-style-type: none"> ● Family members may witness residents’ disruptive behavior [19]
Staff	<ul style="list-style-type: none"> ● Feeling good when seeing the resident experiencing enjoyment [19] 	<ul style="list-style-type: none"> ● Staff may feel unskilled and too busy to learn [19]

Considering the elderly people in residential care, telepresence robots appear to be a beneficial technology as far as the concerns especially about privacy and control are

taken into account. Telepresence robotics also holds significant promises for family members. The benefit for care workers is less clear; for instance they can find the robot as an extra workload. For telepresence robots to become common, their perspective and acceptance is however critical.

In this paper, we further elaborate what kind of social benefits and concerns are related to the use of a telepresence robot in residential care, from the perspectives of (1) a resident in a facility and her family and (2) the care workers involved in taking care of the resident. The data has been collected in a field trial of a telepresence robot in a residential care facility as a case study.

3 Study Setting

3.1 Method and Participants

The empirical study was carried out as a 12-week field trial, in which a telepresence robot Double (<https://www.doublerobotics.com>) was placed in the room of a long-term resident in a private residential care home. The facility consists of four wards of intensive care which provide around-the-clock care for a maximum of 16 residents each. The primary (local) user of the telepresence robot was an 83-year old female resident who had no diagnosed memory illness. She mostly moved in a wheelchair.

The resident's two daughters, who both lived within 30 km, participated in the study as remote users. The first daughter normally visited the resident 2–3 times a week, the second about once a week. They chatted with their mother on the phone several times a week. The first daughter was involved in the study from the very beginning and the second daughter joined in the half-way of the trial.

In the trial, the telepresence robot was placed in the resident's room (Fig. 1). The system included “call request buttons”, one for each daughter: by pressing a separate big button the resident could send an SMS request to the mobile phone of a daughter to ask her to open the telepresence connection. The daughters used laptops to open the video connection to the robot.

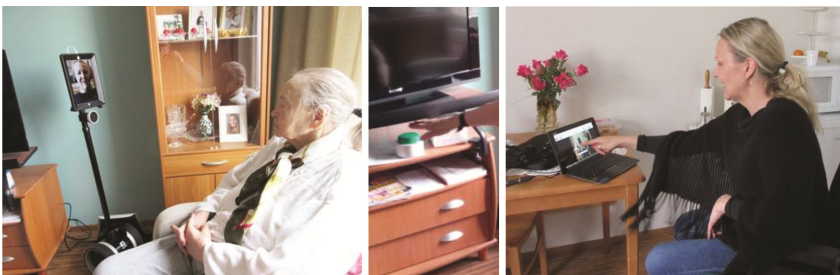


Fig. 1. The telepresence robot was placed in the room of the primary user in the care home (on the left). The resident could press a separate button to send an SMS request to her daughter to connect (in the middle). Her daughter used a laptop to connect with the resident (on the right).

The data was collected in pre- and post-interviews (of the resident, the daughters, and altogether three nurses), user observations, keeping a log of the use of the robot, and videotaping call sessions of one daughter through the robot. The involved researchers discussed also with the resident but no formal interview was held due to her health condition. The data collection and the call sessions are presented in the timeline below (Fig. 2). (The zero calls during weeks 8–10 were due to the family’s private issues that had no relation to the trial as such.) The interview data was handled with descriptive and qualitative way.

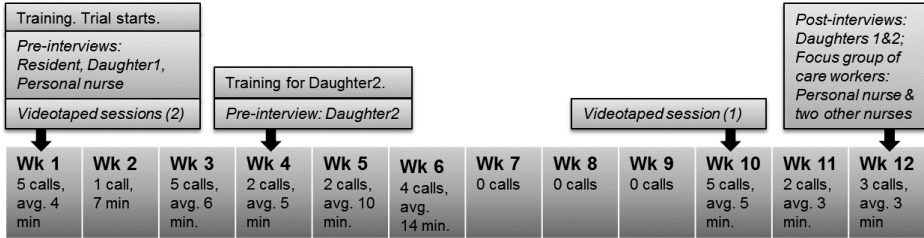


Fig. 2. The timeline of the data collection and call sessions during the trial.

The study setting was accepted by the facility management and the Ethical Committee of the author’s affiliation. All participants signed an informed consent form for taking part in the study. In particular, the participants were told that videotaping the calls was voluntary and they could easily reject the recording before each call.

4 Results

During the trial, the daughters called successfully to their mother for 29 times (see Fig. 2). The length of the calls varied from 1 to 34 min; typically they lasted 5–10 min. Usually there were 2–5 calls during a week (excluding weeks 7–9).

The call request button for the first daughter was pressed 11 times on 7 different days and the other button 7 times on 4 different days. Of all successfully transmitted text messages, the daughters missed calling back once. Altogether 3 videos were recorded. One of them was 10 min long; the other two 1–2 min. In other cases, the recording was rejected before the call.

There were some technical difficulties and practical challenges that have been acknowledged in the literature as well, e.g. in [19], such as connectivity failures due to the poor internet connection or speed. The connection broke up during four calls and a new connection was established 1–2 times. Setting the robot’s speaker on a suitable level was not easy. For example, when the daughters called the resident, the resident did not always notice that a connection had been opened, especially if the television was on and the volume set high.

4.1 Family Members' Perspective

The connection through the telepresence robot created a feeling of presence of the resident for the family members; the presence was stronger than on the phone. Seeing their mother and taking eye contact was of importance for both daughters: *“If you see that she is feeling good about something, and she laughs and talks to you about something, then it’s different with the phone because you can’t see”*, as put by the first daughter. She believed the mother felt the same about their presence: *“She seemed, somehow, so happy every time she realized that aha, there’s somebody there now.”*

The contents of communication did not change compared to phone or visits, according to the daughters. However, the occasional poor audibility made it difficult to talk properly about important issues. The resident had lowered hearing and she often had her television on even during the calls. One of the daughters said that if the issue was really important she preferred to use a cell phone. The video image brought also challenges: the daughters found that sometimes the resident was not able to concentrate on the image as well as to mere voice on the phone.

The main concerns were related to privacy. On some occasions, when a daughter called, the resident did not understand the video connection was open. That made the daughter feel like spying, although this kind of situations were discussed beforehand and did not seem to bother the resident. The daughters wished that the resident would have more control over the call, especially as the telepresence robot was used only for daily social interaction. Using the robot in a “surveillance mode” would be acceptable only if the resident was suffering from dementia or similar illness, the resident had fallen or been in an accident, or the robot was genuinely only in personal family use. Also in these conditions, the resident would need to pre-accept the possibility of surveillance. Furthermore, the daughters commented that the primary user should be able to choose who she wants to talk with and who is allowed to connect without a specific permission. The device should signal in a salient way that the connection is open.

The remote driving was experienced challenging due to the limited field of view to the surrounding space (through the robot’s camera). Therefore, the ability to remotely drive the robot closer to the resident in her room was not used in practice even it would have been basically useful. Being able to turning the camera/display of the robot was enough. The daughters did not find driving in the residential care ward useful either. However, they commented that driving would have been important when their mother still stayed in her own home and did not sometimes answer phone calls. Then again, the problem might have been rugs on the floor.

4.2 Care Workers' Perspective

Care workers’ experience of the trial was positive. They found that the telepresence robot increased the family members’ presence to the resident. Again, especially seeing the face and expressions of the relatives was crucial. They commented that increasing the presence of family members could increase the wellbeing of residents; however, they did not find that the wellbeing of the participating resident would had been improved

during the trials due to the increased (tele) presence. (Naturally, a number of issues affected the wellbeing of the resident during the trial).

The care workers brought up many general concerns related to telepresence, of which privacy was the most often mentioned. They were worried about risking the privacy of the resident (in general) due to uncontrollable monitoring by family members. This concerns also visitors, care workers and other residents at the ward who may visit in the room of the primary user. They envisioned that telepresence might also disturb the care work itself: relatives may want to monitor or take part in care operations, even if the resident disagrees. The care workers were doubtful of their role in that kind of situations. Would they have the right to end the call for the resident, as opposing to the will of the family member? What if the resident was not able to say out loud her/his wish about ending the call? And, if the calls were rejected or ended by a worker, would family members doubt that there is something suspicious going on? Nevertheless, the caregivers were confident that their work is professional and causes no reason for hiding anything.

Furthermore, the care workers wondered whether the increased telepresence of the family members would cause that the resident talks more about her health with them, ignoring care workers. This would affect the planning of the daily care. The care workers suggested that family members could be involved in tri-partial care discussions with the resident.

The care workers thought that remotely driving the robot at the ward's common areas poses a threat to other residents' privacy as well. The facility had strict rules about taking photos at the wards: taking photos of relatives only was allowed. The workers wanted to apply this to the telepresence robot, even if it was not recording anything.

The care workers were of the opinion that the resident should have control over the calls (accept/end/reject) and also over who is able to call through the robot in the resident's room in the first place. There should be also an "Off-button" to (temporarily) let no calls come through. Considering shared use of the robot in the facility, common rules and routines for the use as well as scheduling would be needed. The robot appeared to be a very non-effortful device for the care workers, and they saw such robots to be common within ten years.

4.3 Resident Perspective

The resident could be only shortly interviewed due to her health condition. In the beginning of the trial, she looked forward to be in contact with her family members and, in particular, see her grandchildren through the robot. In the end, she commented the telepresence robot as "nice" but preferred her mobile phone because of the better audibility. The video analysis showed that the occasionally poor audibility indeed made the communication challenging. When the communication worked the resident visibly enjoyed, for instance, seeing her grandchild play piano, and visiting in different rooms at a daughter's home as the family members carried the laptop around.

5 Discussion

Compared to the earlier empirical research on using telepresence robots to enhance the social communication of elderly persons (Table 1), the results of this study both confirm many earlier findings and provide some new insight especially with regard to the social impact that the adoption of telepresence robots in care homes might have.

All in all, telepresence robots appear to be quite a mature technology to be taken into use in care facilities, to alleviate the breaking of earlier social routines and networks and to reduce the related feelings of isolation that the residents in assisted living often confront [3]. For the wider adoption, such technical issues such as good quality sound, displays big enough and with good quality video image, and a driving interface that makes the remote user to feel confident about driving are naturally required. Also, care facilities themselves need to consider is their Wi-Fi capability enough for such devices. Apart from technical fixes, privacy and control issues are at special stake in care facilities. We were little surprised that the care workers were so strict about remote driving through the robot at the ward – even in common spaces, which are open to any visitor at the ward, the remote user should see and hear only his or her relative. (Capturing the signal by a third party was found to be a concern.) Although there might be technical/software solutions for that (so that all other voices and sightings would be blurred) limiting the remote user’s “remote sensing” in such a way would ruin the original idea of involving the family members remotely more in the life of the facility [19]. Further questions thus are whether other care facilities perceive privacy and remote driving in a similar way, to what extent this is due to existing regulation (e.g., concerning patient rights) and whether perceptions of privacy in care facilities will change when younger people who are used to social media and constantly sharing their personal information in public get older.

Furthermore, telepresence robots would cause social reflections also in the resident’s room. If family members were able to freely open the connection to the room (e.g., in the case of a dementia patient), the care worker entering the room would need to control her/his words in a new way, not speaking about work issues unless checked that the connection is not open. The increased (tele) presence of family members in a resident’s room could even lead to a situation, in which the care workers need to protect the resident’s privacy *against* family members. The care workers’ rights should be clear in this kind of situations.

In assisted living, the care staff gets easily involved, even if the new technology was meant to be used by the resident and family members only. Their acceptance for the technology is thus essential. Adopting telepresence robots should thus be co-designed with care workers so that common rules for privacy and control can be established already in the early phase.

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