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Research
Attitudes towards health-care robots in a retirement village

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Aim: *This study investigated the attitudes and preferences of staff, residents and relatives of residents in a retirement village towards a health-care robot.*
Methods: *Focus groups were conducted with residents, managers and caregivers, and questionnaires were collected from 32 residents, 30 staff and 27 relatives of residents.*
Results: *The most popular robot tasks were detection of falls and calling for help, lifting, and monitoring location. Robot functionality was more important than appearance. Concerns included the loss of jobs and personal care, while perceived benefits included allowing staff to spend quality time with residents, and helping residents with self-care. Residents showed a more positive attitude towards robots than both staff and relatives.*
Conclusions: *These results provide an initial guide for the tasks and appearance appropriate for a robot to provide assistance in aged care facilities and highlight concerns.*

Key words: *aged care, attitude, robot, technology.*

Introduction

Many countries are facing the challenges of an ageing population, including providing care for people with deteriorating health, and declining physical and mental capabilities. This is coupled with the challenge of a shrinking workforce and shortages of health-care professionals [1]. Advances in technology are able to offer increased remote monitoring and management of patients with chronic illnesses [2]. The use of robotics in this area is receiving increased attention in research. Applications for robotic technologies include surgery, medication dispensing, and rehabilitation for stroke sufferers [3–7]. Small pet-like robots can provide companionship where people can no longer provide care for a real animal [8]. However, uptake of robots has not met initial projections for the provision of care [9]. Some robots introduced to aged care facilities have not been used by residents and have dropped out of commercial production [10,11].

One reason for the lack of robot uptake may be that robotic designers have not adequately researched the needs and desires of staff and residents in aged care facilities. Studies have shown that older people are particularly willing to accept technology when it addresses a perceived need and they see that it can offer increased independence [12,13]. Designers may also have failed to recognise that older people have a different attitude towards technology than young people. Older people have a higher level of mistrust of technology and find it more complicated to use [14]. Older people are also more likely to give up when faced with difficulties rather than look for assistance [15].

There is a paucity of studies investigating the acceptance of assistive technologies with older people and their caregivers [16]. Past research has shown that barriers to the use of assistive technologies include feelings of embarrassment and lack of knowledge, while facilitating factors include ease and comfort of use, a positive attitude, a feeling of increased personal safety, and the satisfaction when goals are achieved [17]. Attitudes and abilities are important factors in the use of information technologies by older people [18].

Ethnographic studies examining how older people use existing assistive products have reinforced the importance of the product's ability to assist independence and retain the dignity of the user [19]. This work has resulted in recommendations that designers of robotic assistive technologies should consider how the robot will fit within the accommodation of the user, work to make the interface easy for an older person, and ensure that the robot is able to interact with people with a range of abilities. Research into robotic forms of assistance stresses the importance of matching the robot's abilities to the user's needs [20].

Robots can take a range of forms, depending on their tasks. The extent to which a robot appears human is thought to influence acceptance, with a drop in acceptance if the robot looks uncannily human-like [21]. Studies have suggested that people prefer less human-looking robots [22–25]. Other work suggests that older people would like robots to look

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serious and see them as being there to perform a task, while younger people prefer more humanlike and lively robots [14].

This study aims to investigate the attitudes and preferences of residents, their relatives and staff at a retirement village towards the use of robots in the village.

Method

This research applied a mixed methods approach, using both focus groups and questionnaires. The study was conducted at Selwyn Village retirement centre, in Point Chevalier, Auckland, New Zealand, operated by a not-for-profit foundation. The facility has over 600 beds in accommodation ranging from self-care residential apartments and cottages, rest homes, a specialised dementia unit, respite accommodation and hospitals. Ethics approval was obtained from the University of Auckland Human Participants Ethics Committee and written informed consent obtained. The research was conducted from October 2008 to April 2009. The focus group and questionnaire studies are presented separately. A notice about the study was placed in the staff and resident village newsletters asking for volunteers.

Focus groups

Three focus groups were conducted. The first comprised six managers (including clinical care coordinators), the second included eight caregivers, and the third included seven residents. Individual staff rostered on the day of the focus group were contacted by village management and asked whether they would participate. They were given time off their duties to come to the focus groups. One caregiver worked in the dementia unit, two in the hospital and five in the rest-home. All participants were female, except one male manager. All participating residents lived in self-care units or cottages and age ranged from 73 to 89 years (mean 78.5).

Each group lasted between one and a half and two hours, was facilitated by a trained moderator and was audiotaped and transcribed. The questions were: What needs do you have (in your job/daily life) that you think robots might be able to help with? What other kinds of things do you think a robot could assist with around the village? How do you feel about having a robot assisting around the village? What factors do you think are important in the design of the robot to make it acceptable in the village? What do you see as the advantages and disadvantages of having a health-care robot in the village? Do you have any final thoughts about having a health-care robot in the village?

Transcripts from focus groups were analysed using the common techniques used in qualitative analysis with an emphasis on understanding and interpreting the perspectives of the individuals and exploring their relative meanings [26]. Each transcript was read several times and analysed for recurring patterns.

Questionnaires

Inclusion criteria were being a staff member, resident, or a relative of a resident. Researchers approached individual staff members and residents in lounges. Selwyn Village staff posted questionnaires to 91 relatives of residents. The questionnaires included demographic information, a list of robot tasks for participants to rate on a 5-point scale from not at all useful (1) to extremely useful (5), and the Robot Attitudes Scale (RAS) on which people rate how they see robots on 11 items rated from 1 to 8 (safe–dangerous, reliable–unreliable, friendly–unfriendly, simple–complicated, useful–useless, strong–fragile, interesting–boring, trustworthy–untrustworthy, advanced–basic, easy to use–hard to use, and helpful–unhelpful). The scores of all the items of the RAS are summed to create a total score; the scale has high internal consistency (Cronbach's alpha 0.92), and a low score indicates a more positive attitude [27]. Staff and residents were asked about preferences for robot design as reported elsewhere [27]. Relatives were asked open-ended questions about perceived benefits and concerns.

Results

Focus groups

Five major themes emerged from the discussions:

Lack of knowledge

Across all three groups it was apparent that people were not familiar with robots. Manager: 'I really have had nothing to do with robots'. Caregiver: 'I've never actually given them a thought'. Resident: 'I really haven't any idea about robots'.

Tasks

Participants identified a wide range of practical tasks. Lifting objects and people was discussed in all groups. Manager: 'it would be able to stand a person up because a lot of people can't get from sitting to standing'. Other tasks included filling and distributing water jugs and meals, cleaning, helping dress residents, picking things up, setting tables, making beds, and escorting residents. A robot could free staff from these duties, allowing them more time with residents. Caregiver: 'The caregivers could spend a lot more time with the residents as well instead of doing these (basic tasks). . . . That's the place we miss out on'.

Robots could help residents maintain independence by providing reassurance, monitoring, alerting staff if help is required, assisting with medical assessments and promoting exercise. Robots were viewed as better suited to some of these tasks than humans: 'I would see the robots also doing a bit of the observation, taking blood pressures, taking

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pulses; they could probably listen to chests and make better diagnoses that the humans can'.

A robot could provide assurance to people who have Alzheimer's disease who require constant assurance about time and place. Manager: 'it would be quite nice to have people that are putting it on a recorder to say "today is, and the year is" '.

Residents spoke about the large numbers of pills they had to take and problems forgetting: 'I think reminding people to take their pills, and saying that you've taken them is excellent'. The robot could indicate when prescription repeats are due, and alert the medical centre. Counting and dispensing the right pills at the right time on the right day was seen as useful, and being able to communicate with the robot about side-effects. Another suggestion was reminding residents about daily routines and appointments.

Participants discussed the usefulness of monitoring when residents needed help; 'If it learns "help" and something's going wrong and we ask "help" or "fire", it comes up with the appropriate response', said a resident. The robot could have a help button, or a function that detects when the user is struggling and needs assistance. It was mentioned that alarm buttons can be hard to reach and it would be helpful for a robot to respond to voice commands.

Constant video surveillance was not acceptable to residents, and seen as an invasion of privacy. It was acceptable if video purely monitored and assessed movement without sending the images elsewhere. Caregivers suggested the robot could check rooms when residents did not report for meals, answer call bells, alert staff when residents fell or during other emergencies and ensure that residents were in their beds at night: 'Well to sort of monitor him, keep an eye on him because he shouldn't be wandering around at night like that'.

One manager suggested monitoring emotions, specifically sadness. Others mentioned helping with exercise and games, facilitating social support and encouraging interaction between residents. Manager: 'You could almost see the robot doing some of the group activities'. Caregiver: 'Just to have a chat or to sing them a song, or you know, for the ones that can't speak, just let them know that there's somebody there'.

Appearance

Functionality was a key subtheme; the robot should have large buttons, clearly visible screens, and a clear voice. Small robots were unacceptable as residents could trip over them; about five feet tall was suggested and preferably adjustable. The robot should be robust enough to withstand a human falling or leaning on it, be hygienic and easy to clean.

No clear preference emerged for sex, and it was suggested sex could be a personal choice. Some residents felt a male voice might be easier to hear, while caregivers suggested a quiet soft voice for reassurance. Human-likeness was discussed as related to function. A telemedicine robot should look human-like, while a lifting robot need not. Residents preferred to have a blank screen – activated only when needed. The residents emphasised they would prefer a machine-like robot that was functional. The robot was seen as a tool and not a person substitute. Resident: 'It's the function of the thing that we want, a life saving function. Personally I'm not interested in having a face or arms'.

Concerns

Concerns included possible harm to residents, particularly in the hospital, such as muscle deterioration, choking, skin tears and causing fear. Other fears regarded reliability: 'Are they reasonably reliable, or is it likely to have a hissy fit and bounce off the walls at some stage?'

A concern among caregivers was that the robot would take jobs away: 'And then you have to be very careful how [many] robots you need otherwise you're just taking, you know your job away from here'.

Residents were concerned that information be accurately relayed to the appropriate person and wanted feedback that something was being done: 'Yes, I'd like to have a response, definitely, not instantaneously, but over a certain period, to have assurance that it had been in fact picked up'.

Some suggested the robot may have difficulty getting into rooms if doors were shut, and would not have the ability to interact like a human. In particular, during games such as Bingo, a robot would remove the enjoyment that is gained from sharing knowing glances and laughter between carers and residents. One resident stated, 'You'll never replace the human contact – never'.

Prospects

The groups showed different prospects towards the presence of a robot in the village. Managers were positive: 'yeah, they [residents] will be interested'. Caregivers showed mixed perspectives: 'I can't see robots helping what we do at hospital . . . tasks are too personal'; 'Once residents see it's working, they'll like it'. The resident group showed a readiness of having a robot around to help them in everyday life, 'It's going to be a facility . . . happy to have one if we see it's working'.

Questionnaire

Thirty-two residents, 31 staff (one questionnaire was incomplete) and 27 relatives completed questionnaires. Fifteen staff and 12 independent living residents declined. Sixty-four relatives did not return the questionnaire (response rate 29%). In rest homes, activity managers guided researchers as to who

was suitable to approach (cognitively capable of completing the study), and all agreed to participate.

Demographics

There were no differences in the distribution of sex, χ^2 (2, n = 89) = 2.09, P = 0.35, or ethnicity, χ^2 (4, n = 89) = 2.00, P = 0.73, between residents, staff and relatives (see Table 1). There was a significant difference in education between groups, χ^2 (12, n = 89) = 25.68, P = 0.01. Residents left school earlier than staff or relatives, χ^2 (6, n = 62) = 18.30, P < 0.01.

Priority of tasks

Figure 1 shows the mean ratings of usefulness for each task within each group, and in the total sample.

Attitudes towards health-care robots

There was a significant difference between groups on the Robot Attitude Scale, F (2, 84) = 5.34, P = 0.007. Post-hoc Games–Howell tests indicated that residents (mean 32.87, standard deviation (SD) 2.76) reported a significantly better attitude towards health-care robots than relatives (mean 42.14, SD 2.85) and staff (mean 45.48, SD 2.96).

Relatives suggested three additional tasks: (i) keeping in touch with family and friends (reminders of family birthdays and current affairs, help getting and sending messages), (ii) keeping track of personal objects (e.g. hearing aids, glasses), and (iii) companionship when residents were alone. One relative commented that her mother hesitates to call for help, and a robot may be able to improve access to assistance. Twenty-three relatives reported reservations including robots replacing humans, low reliability and reluctance to learn new technology.

Table 1: Demographics of residents, staff and relatives

	Residents (n = 32)	Staff (n = 30)	Relatives (n = 27)
Age (years), mean (standard deviation)	82 (7)	50 (11)	59 (11)
Sex			
Male	5	9	5
Female	27	21	22
Ethnicity			
NZ Pakeha/Maori	28	25	22
European	3	1	2
Other	1	3	2
Education			
Primary school	2	0	0
Secondary 4th form	5	0	2
Secondary 5th form	6	7	5
Secondary 6/7th form	10	2	3
Technical/trade certificate	2	8	2
University/polytechnic diploma	2	6	7
University degree	5	7	8
Role			
Nurse	—	4	—
Caregivers	—	6	—
Managerial staff	—	8	—
Other	—	12	—
Relations			
Child	—	—	21
Sibling	—	—	1
Other	—	—	4
Section			
Independent area	18	—	4
Rest-home	14	—	20
Hospital unit	0	—	3

Figures are n unless otherwise stated.

Discussion

The studies identified a number of tasks that a robot could perform and provide a guide for robot designers and retirement villages looking to use new technologies. A health-care robot could detect falls, monitor the location of people, measure vital signs, and provide reminders, primarily for residents in both independent living and rest home settings, and could also be introduced in dementia care. A chore robot could assist in lifting heavy things, cleaning, delivering drinks, turning on/off electronics, and assisting with mobility. A social robot could provide companionship in dementia care, hospital, rest homes and independent living.

Detection of falls was identified as a key task across both studies. Research has shown that although call alarm systems are increasingly available, adherence is low. In 80% of falls where an alert system was installed, this was not used to summon help [28]. Reasons for this included: not wearing the device, not wanting to ask for help or to go to hospital, not being able to reach it, a power-cut the day before, and confusion. A robot that could automatically monitor falls without the need for the older person to wear a device or be close to a call button may overcome a number of these barriers.

Overall, participants showed positive attitudes towards health-care robots; however, some issues clearly need to be considered. There were concerns about the safety and reliability of robots, and a reluctance to use them for highly personal tasks, such as showering. The shape and appearance of a robot should be matched with the task, and not be humanlike if the task does not require it. Concerns need to be explored and resolved before and during the deployment of a health-care robot in a retirement village, particularly caregivers' concerns about losing their jobs, and relatives' concerns over staff being replaced.

Residents' attitudes towards health-care robots were more positive than relatives' and staff attitudes were. Caregivers' attitudes may have been less positive because of fears about losing their jobs. Many of the residents who completed the questionnaire lived in the independent living part of the village, whereas most of the relatives were associated with the rest-home part, and this difference in care levels may be part of the explanation for the difference in attitudes towards robots. Another possibility is that only relatives who felt strongly negative responded to the questionnaire. Once staff and relatives receive further information and see that

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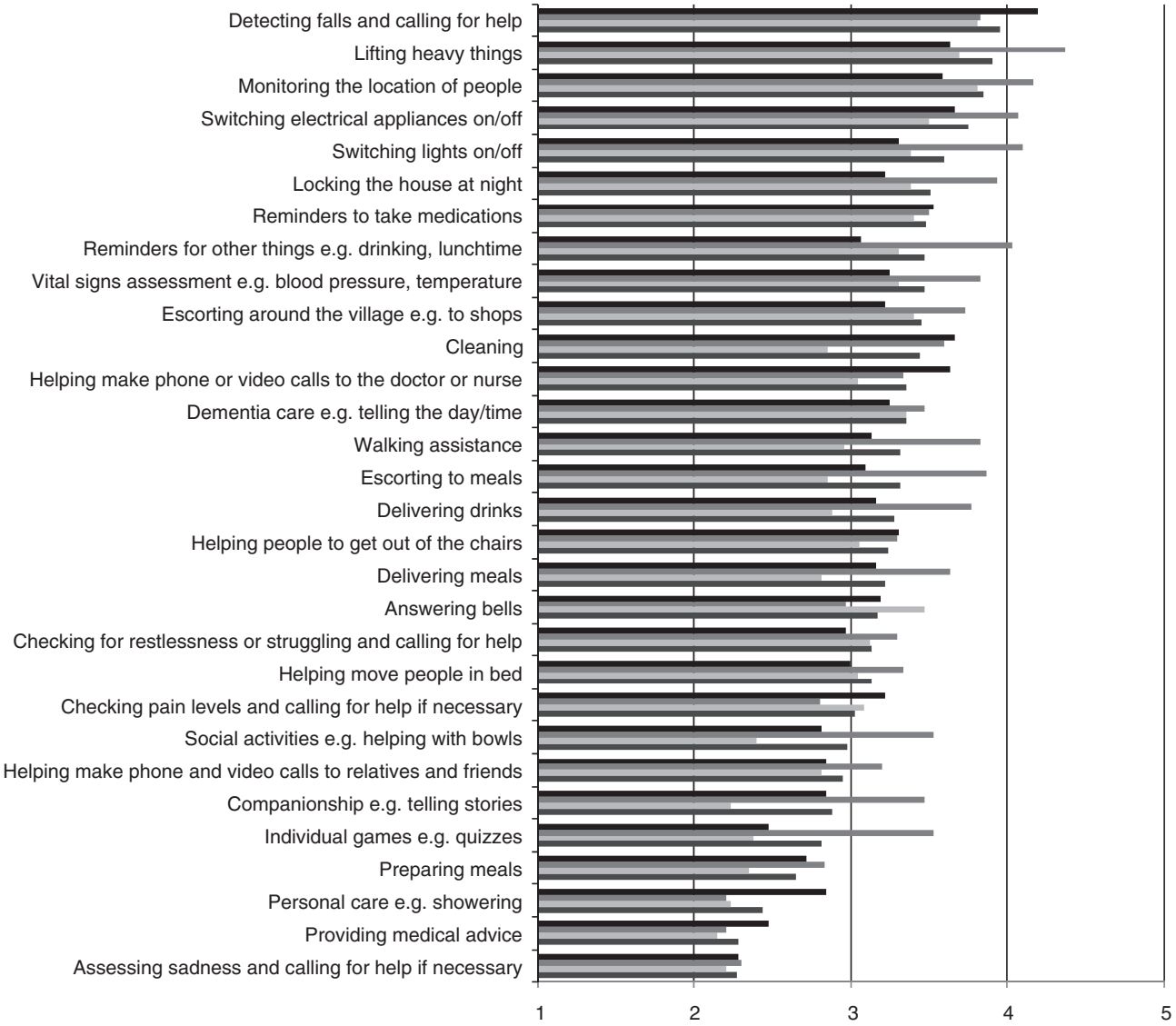
Figure 1: Mean usefulness ratings for different tasks for a health-care robot by (■) residents, (■) staff and (■) relatives, and by the (■) total sample (1 = not at all useful, 5 = very useful).



residents are comfortable using the robots, their attitudes may change. The distribution of information about robot services needs to be carefully planned and full opportunities given for discussion between management, staff, residents and relatives. It will be important to reassure users that the purpose of robots in health care is not based on the interests of cost cutting, but to provide extra services for residents. Robot services should be introduced gradually and be a clear choice for residents and to either accept or decline.

A limitation is that the questionnaire was filled out by a convenience sample. The results may not be generalisable to those who chose not to take part or were not capable of completing the questionnaire. A response rate of 29% to the postal questionnaires is relatively low, and this may be due to lack of interest in the subject or limitations in the methods used; for example we were not able to pre-contact the relatives, and did not use monetary incentives. Some of the tasks suggested by participants may not be realistic, and robotics researchers will need work in conjunction with retirement facilities to choose appropriate avenues for development. People's readiness to pay for robotic technologies may also need to be considered in future work.

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Key Points

- People in aged care see potential for robots to be useful in many areas.
- Detecting falls and calling for help is rated the most useful robot task.
- Robot appearance must match the task performed.
- People are concerned robots will take away jobs and replace human care.

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