Original Research Article

Can We Leave Care to Robots?

An explorative investigation of moral evaluations of care professionals regarding healthcare robots

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Abstract

Through a qualitative examination, the moral evaluations of Dutch care professionals regarding healthcare robots for eldercare in terms of biomedical ethical principles and (non-)utility are researched. Results showed that care professionals primarily focused on maleficence (potential harm done by the robot), deriving from diminishing human contact. Worries about potential maleficence were more pronounced from intermediate compared to higher educated professionals. However, both groups deemed companion robots more beneficiary than devices that monitor and assist, which were deemed potentially harmful physically and psychologically. The perceived utility was not related to the professionals' moral stances, countering prevailing views. Increasing patients autonomy by applying robot care was not part of the discussion and justice as a moral evaluation was rarely mentioned.

Awareness of the care professionals' point of view is important for policymakers, educational institutes, and for developers of healthcare robots to tailor designs to the wants of older adults along with the needs of the much-undervalued eldercare professionals.

Introduction

According to the European Commission (European Commission, 2018), the number of older adults, aged 80 years and older, will increase by 170% in 2024. The EU's old-age dependency ratio has been increasing for a long time. The old-age dependency ratio is traditionally seen as an indication of the level of support available to older persons (those aged 65 or over) by the working age population (those aged between 15 and 64). In the EU, the old-age dependency ratio was 29.9% in 2017(European Commission, 2018). Older adults must stay independent longer than before because it has become harder for them to register for a nursing home. Today, an individual needs a strong indication from a doctor to apply for a stay in a nursing home (European Commission, 2017). Although older persons prefer to live independently in their homes, they might need additional assistance (Smarr, et al., 2012). ActiZ, an organization of healthcare entrepreneurs, claims that, since 2015, 322,000 older adults have been unnecessarily admitted to a hospital or residence, resulting in avoidable stays (ActiZ, 2018). Pilot projects that employ the unemployed to alleviate the care pressure are met with great concern as unqualified and possibly unmotivated individuals would be attending vulnerable people (De Koster, 2012).

A way forward could be the utilisation of innovation and new media technologies To ensure the quality of healthcare, research shows that the implementation of a healthcare robot could offer part of a solution, (Loos, Reinskensmeyer, & Guglielmelli, 2016; Wood, 2017; Malehorn, et al., 2012) although specific ethical considerations and moral dilemmas must be made clear. Wijnsberghe (Wijnsberghe, 2012) stated that "the prospective robots in healthcare intended to be included within the conclave of the nurse-patient relationship require rigorous ethical reflection to ensure their design and introduction do not impede the promotion of values and the dignity of patients at such a vulnerable and sensitive time in their lives. The ethical evaluation of care robots requires insight into the values at stake in the healthcare tradition." A robot could fill the gap between the need and supply of healthcare. On the one hand, robots are already used in hospitals, most often robots to assist with surgery (Archibald & Barnard, 2017). On the other hand, robots employed in care instead

of cure, for instance, social robots that can talk, express emotions and converse with people, to accompany lonely older adults, are considered to be a novelty and are subject to this study (specified further on).

Although the patient perspective is most important, older adults are not the only stakeholders in the healthcare system. Care professionals will also work with robots to make an effective team to serve older adults optimally. So far, there has been little attention to the attitudes of care professionals towards healthcare robots (Ienca, Jotterand, & Vica, 2016), whereas patients' views are frequently recorded (Broadbent, 2017). Several authors (Smarr, et al., 2012; Loos, Reinskensmeyer, & Guglielmelli, 2016; Wijnsberghe, 2012; Ienca, Jotterand, & Vica, 2016; Sharkey & Wood, 2014) have discussed the effects of social and assistive healthcare robots on patients, but the effect they may have on professionals who work with the technology is understudied. Hence, the focus of the current study is how care professionals in eldercare perceive the introduction of healthcare robots. Among others, we wanted to know whether the ethical evaluation by care professionals while using healthcare robots for older adults might be biased by evaluations of utility. For example, will perceived utility have an influence on the professionals' moral stance? A widely embraced ethical theory today is utilitarianism, suggesting that whatever produces the most utility is the morally best thing to do (Kaneko, 2013). Hence, it could be expected that when the perceived utility of a care robot is high, the moral concerns of the caregivers vanishes. In other words, the robot may be considered morally reprehensible for caregivers, but may still be evaluated as useful, for instance, when more older adults can receive care when using healthcare robots.

A thorough understanding of the wishes and objections of professional users can contribute to a successful implementation of robots in healthcare, serving the older adults best by taking potential moral objections of the professionals into account during early stages of development.

Problem Statement and Observations from the Public Debate

From our pre-research phase we learned that a pessimistic point of view prevailed; public debate stated that healthcare robots could never provide meaningful care. For example, online reactions to a newspaper article about a healthcare robot in our research (Karimi, 2012) varied from "What a ridiculous idea! Robots for physical labour, okay, but for the more social care tasks, you really need a human" to "What a horrible thing. Who came up with this? Who wants a machine to take care of older adults?" We aimed to examine such views in a more scientific way. Thus, we used expressions of social concern and potential hazard about healthcare robots coming from general media as a starting point underlying our choice to study this particular research group.

Therefore, our main question will centre around the following question: According to care professionals, is it acceptable to leave care to the responsibility of robots?

To measure the moral attitudes of caregivers, we translated the possible moral evaluations into the principles of biomedical ethics as stated by Beauchamp and Childress (Beauchamp & Childress, 2013). In both clinical medicine and scientific research, it is held that these principles can be applied, even in unique circumstances, to provide guidance in discovering moral duties within a situation (McCormick, 2013). Beauchamp and Childress (2013) proposed a system of four moral principles to reason from values towards judgments in the practice of medicine. 1) *Non-maleficence* is discerned as the doctrine of "first, do no harm," which means that no treatment is better than doing something wrong. 2) *Autonomy* is the capacity of patients to make an informed, un-coerced decision about their care. 3) *Justice* pertains to the fair distribution of scarce health resources (e.g., time, attention, and medication). 4) *Beneficence* means acting in the best interests of one's patients. We applied these principles to the introduction of healthcare robots in eldercare. Additionally, for our research purposes, we translated these four biomedical principles into the following: 1) does it do harm? (non-maleficence), 2) does the patient benefit from the treatment? (beneficence), 3) is the patient's autonomy increased? (autonomy), and 4) is the treatment fair and available for all? (justice).

On the other hand, if care professionals would see the benefits of robots in daily practice, we expect their moral evaluations to be more nuanced. This is based on the concept of Utilitarianism (Kaneko, 2013). In other words, if the robot is perceived as useful, then care professionals are likely to evaluate care robots positively. Thus, when the *perceived utility* is high, moral concerns of potential maleficence will be less. Therefore, we also examined how expected usefulness or inefficiency would compare to the moral evaluations of care professionals.

For our research purposes, we choose to classify care robots according to Sharkey and Sharkey (2012). These authors proposed that robots in care can be divided into three categories. The three main ways in which robots might be used in eldercare are: (1) to assist older adults, and/or their caregivers in daily tasks; (2) to help monitor their behaviour and health; and (3) to provide companionship (Sharkey & Sharkey, 2012).

Following these ideas, our research question is stated as: *How do professional caregivers in eldercare evaluate assistive, monitoring, and companion robots in terms of the four biomedical principles as stated by Beauchamp and the possible utility a care robot could provide?*

Methods

Participants and procedure

We applied the VU University's "code of ethics for research in the social and behavioral sciences involving human participants" (VU University Scientific and Ethical Review Board, 2016) in designing and executing this study. Our methods have addressed all ethical considerations and is in compliance with this guideline.

We wanted to ask care professionals directly about their moral assessment of care robots. To make them feel at ease and keep their thoughts fluid, we conducted semi-structured focus group sessions in the habitual work environment of the participants. For triangulation purposes, prior to the focus groups, we performed some pretests, including two test-focus groups, with different participants and two in-depth interviews with caregivers to ensure the research material and

questions were useful and comprehensible for discussion for all the participants. These pretests were all recorded and led to some minor adjustments in the research protocol.

The final participants in the focus groups included 43 professional care givers (Table 1) distributed over six focus sessions (five to ten participants each), each lasting for three hours. Our inclusion criteria were: working in a nursing home taking care of patients suffering from dementia, speaking Dutch, and having no prior experience with any kind of robot-technology. Since it is important to know how variables like age, religion, experience or education would possibly influence the attitudes of caregivers, we decided to not select on these criteria but include them in the analyses. Participants were encouraged to speak freely about the use and apparent utility of the robot technology (as presented in the materials section). They were also encouraged to express their ethical concerns. Effort was made to ensure that everybody could talk freely.

Data collection and materials

Prior to the focus group sessions, participants were asked to answer questions in a paper-pencil questionnaire about their gender, age, religion, care setting, number of years worked in the care domain, number of hours worked per week, education, acquaintance and affinity with new technology as exemplified by their use and replacement behaviour of cell phones and computers. The researchers pre-categorized the demographics to make cross-references comprehensible (Tables 3-8). We recorded all focus groups resulting in nearly 12 hours of raw data during which care professionals discussed the implications of the demonstrated use of care robots.

At the start of each focus group, participants were reassured that their answers were confidential and would be processed anonymously for research purposes only. Next, participants were shown video clips of specific care robots, as described below. Six video clips of care robot prototypes were used to ensure that all participants saw the same materials. We compared a variety of robot types (i.e., assisting, monitoring, and companion robots; see below) to explore how the care professionals would differ in their evaluation of each type. After each clip the videotape was stopped and a discussion took place. What did the participants think about the shown technology? If this robot was

available, would they use it? If not, what would be their considerations? Would the shown robot come in handy in daily care practice? And if it did come in handy, would they use it or were there other deliberations that would still account for not wanting to use this type of care robots? Effort was made to ensure that all participants felt that they could talk freely and display all of the possible concerns of future use they might have. All of the six focus groups were videotaped throughout the whole session, thus yielding approximately 12 hours of rough data.

Once the session leader felt that no new arguments on a certain type of robot were given, the session was ended for that part. The first and second video clips and discussions concerned an assistive robot, and the third and fourth were monitoring robots, followed by the final two clips presenting different companion robots. The videos the participants viewed[1] in order were as follows:

Assistive robots

1. Panasonic hair-washing robot
2. Riba II Care Support Robot for Lifting Patients

Monitoring robots

3. Mobiserv, a robot equipped with cameras and touch sensors to help structure the day
4. NEC PaPeRo (Partner-Type Personal Robot), a telecommunication robot

Companion robots

5. Fujitsu's teddy bear robot
6. AIST Paro, a therapeutic robot baby harp seal

Three independent raters, not present at the focus groups, were trained to obtain a common understanding of the coding sheet, who then worked independently using the Atlas Ti software package[2] to code the available remarks out of the video-data. Prior to this coding, we established inter-rater reliability to verify the extent to which the three independent raters evaluated the discussions consistently. To do this Cohen's kappa coefficient was calculated in pairs per time slot. That is, video footage of the sessions was broken down into segments of about two minutes each.

[1] For URL's, see Appendix.

[2] ATLAS/ti. Version 7.088. Qualitative Data Analysis. [Computer software] 2013 Berlin, Scientific Software Development

Before starting the actual frequency count and categorization, twenty segments were randomly drawn from the session's video footage to establish Cohen's kappa among the three raters per epoch. Cohen's kappa was never smaller than .71, indicating satisfactory reliability of the coding. The three raters could now safely code the 12 hours of rough data independently. The raters worked straight from the video footage of the focus sessions.

The codes that the raters used would lead to the dominant remarks regarding potential maleficence, autonomy, justice, and beneficence. They also coded statements about potential utility or non-utility. Remarks about healthcare robots that did not fit into one of the above categories were coded as "miscellaneous". They were put in a separate file and not considered for further analysis. To examine whether the combination of variables would lead to other moral evaluations regarding the three different care robots, tables were created for cross-referencing between all background variables. To avoid an uneven distribution of remarks coming from talkative persons, the raters were instructed to record only one dominant remark per person per care robot. This dominant remark was established by counting the most common remarks given by one person on the subject of one care robot. For instance, if a caregiver, when discussing a particular robot-type, expressed 3 remarks leading to potential maleficence and one remark leading to possible beneficence, maleficence was recorded as most prevailing attitude.

Since we had shown six care robots, a total of six remarks could come from one person. By limiting the total amount of remarks per person, we were able to safely compare the different categories to see which attitudes prevailed and to link these with demographics. A total of 102 remarks were coded. To make comparisons more easy not only the absolute number of times a remark was mentioned was coded, but we also translated these absolute figures into percentages to get a proportional view of the matter (Tables 2-8).

Results

The analyses included 43 participants of whom 83.7% were women, and 17.3% were men. Most participants were older than 36 years of age and had intermediate vocational training (Table 1).

Table 1. Relevant characteristics of the participants in the focus groups.

Educational level	**Age (years)**	**Gender**	***n***
Intermediate vocational	≤ 35: 9 ≥ 36: 18	♀: 23 ♂: 4	27
Higher vocational	≤ 35: 2 ≥ 36: 14	♀: 13 ♂: 3	16
Total	≤ 35: 11 ≥ 36: 32	♀: 36 ♂: 7	43

Because the different groups had different sample sizes, we calculated the mean number of statements per person (e.g., 10 statements / 11 people = 0.9 statements per person). Based on these relative numbers, we could make comparisons between those groups to see which group is more concerned about what. Table 2 shows the number of times a statement was made about a healthcare robot according to the coding of moral evaluations. Overall, *maleficence* was identified 40 times followed by *beneficence* (24), *utility* (18), *non-utility* (11), *autonomy* (6), and *justice* (3). For companion robots, *maleficence* was mentioned least (3) and *beneficence* most (10).

Table 2. Frequencies and percentages of moral and utility statements over all focus groups.

Type of Robot	**Maleficence**	**Autonomy**	**Justice**	**Beneficence**	**Utility**	**Non-utility**
Assistive	25 (24.5%)	1 (1%)	1 (1%)	8 (7.8%)	3 (2.9%)	6 (5.9%)
Monitoring	12 (11.8%)	5 (4.9%)	1 (1%)	6 (5.9%)	9 (8.8%)	3 (2.9%)
Companion	3 (2.9%)	0 (0%)	1 (1%)	10 (9.8%)	6 (5.9%)	2 (2%)
Total = 102 statements	40 (39.2%)	6 (5.9%)	3 (2.9%)	24 (23.5%)	18 (17.6%)	11 (10.8%)

To determine the degree to which the discussion covered a topic, we calculated relative percentages per cell in Table 2. Since there were too little remarks on the subjects of Autonomy, Justice and Non-utility we decided to excluded them from further analyses, thus remaining three variables under research. Remarks on potential maleficence, potential beneficence and potential utility were used to cross-analyze them with three types of robots and demographics, rendering the results in tables

mentioned below. Table 2 suggests the moral assessments of care robots as expressed by care professionals focused primarily on maleficence, whereas patient autonomy and justice were rarely mentioned. Therefore, we decided to exclude *autonomy, justice*, and *non-utility* from further statistical analyses. Because we had little male participation (17.3%), we could not specifically analyse gender.

Demographics in relation to moral statements

To examine how combinations of variables would lead to different moral evaluations, tables were created to make cross-references with the background variables (Tables 3-8).

The tables are based on absolute and proportional representations of participants' statements related to two of the principles of Beauchamp (Beauchamp & Childress, 2013) and their statements on utility.

Table 3. Frequencies of moral and utility statements per age category. The mean number of statements per person are included in parenthesis.

Age	**Maleficence**	**Beneficence**	**Utility**
18-35 years old *n* = 11	10 (0.9)	7 (0.6)	5 (0.45)
36-55 years old *n* = 28	28 (1.0)	15 (0.54)	11 (0.4)
56-67 years old *n* = 4	2 (0.5)	2 (0.5)	2 (0.5)
Total	40	24	18

Table 4. Frequencies of moral and utility statements per years-of-experience category. The mean number of statements per person are included in parenthesis.

Experience	**Maleficence**	**Beneficence**	**Utility**
0-5 years *n* = 6	8 (1.3)	3 (0.5)	3 (0.5)
5-10 years *n* = 8	7 (0.9)	4 (0.5)	3 (0.4)
> 10 years *n* = 29	25 (0.9)	17 (0.6)	12 (0.4)
Total	40	24	18

Table 5. Frequencies of moral and utility statements per working hours. The mean number of statements per person are included in parenthesis.

Working hours	**Maleficence**	**Beneficence**	**Utility**
0-15 hours a week *n* = 2	3 (1.5)	1 (0.5)	1 (0.5)
15-30 hours a week *n* = 25	26 (1.1)	18 (0.7)	13 (0.5)
> 30 hours a week *n* = 16	11 (0.7)	5 (0.3)	4 (0.25)
Total	40	24	18

Table 6. Frequencies of moral and utility statements per care setting. The mean number of statements per person are included in parenthesis.

Care setting	**Maleficence**	**Beneficence**	**Utility**
Ambulant *n* = 11	9 (0.8)	5 (0.45)	4 (0.4)
Intramural *n* = 28	27 (0.96)	14 (0.5)	12 (0.43)
Semi-ambulant *n* = 4	4 (1.0)	5 (1.25)	2 (0.5)
Total	40	24	18

Table 7. Frequencies of moral and utility statements per educational level. The mean number of statements per person are included in parenthesis.

Educational level	**Maleficence**	**Beneficence**	**Utility**
Intermediate vocational *n* = 27	29 (1.07)	11 (0.41)	11 (0.41)
Higher vocational *n* = 16	11 (0.69)	13 (0.81)	7 (0.44)
Total	40	24	18

In Table 7, the care professionals with intermediate educational level mentioned *maleficence* the most, while those with a higher vocational background mentioned *beneficence* more often. *Utility* was about equal in the discussions. To further explore the different educational levels, we crossed higher and intermediate vocational care professionals with robot types to investigate who fears which robot the most or sees the most use (table 8).

Table 8. Frequencies and percentages of moral and utility statements of higher and intermediate vocational educated care professionals for each robot type.

Higher vocational	**Maleficence**	**Beneficence**	**Utility**
Assistive robot	4 (13%)	5 (16%)	1 (3.2%)
Monitoring robot	7 (22.6%)	4 (13%)	4 (13%)
Companion robot	0 (0%)	4 (13%)	2 (6.4%)
Total = 31 statements	11 (35.5%)	13 (42%)	7 (22.6%)
Intermediate vocational	**Maleficence**	**Beneficence**	**Utility**
Assistive robot	21 (49%)	3 (7%)	2 (4.7%)
Monitoring robot	5 (11.6%)	3 (7%)	5 (11.6%)
Companion robot	3 (7%)	5 (11.6%)	4 (8.7%)
Total = 51 statements	29 (56.9%)	11 (21,6%)	11 (21.6%)

Overall, the key focus of discussion among the care professionals was the potential of robots for *maleficence* (Table 2). Participants were concerned that robots may do harm. Surprisingly, patient *autonomy* was rarely mentioned. Care professionals between 36 and 55 years of age mentioned *maleficence* more often than the younger and older participants (Table 3). Care professionals with

five years of experience or less were mostly deliberating about the *maleficence* of robots and less about *beneficence* and *utility* (Table 4). The same occurred for care professionals with the fewest number of working hours per week (0 to 5 hours - Table 5). Semi-ambulant care professionals mentioned *beneficence* and u*tility* of care robots the most (Table 6). Intermediate vocational care professionals mentioned *maleficence* the most (Table 7), particularly for assistive robots (Table 8). Higher vocational care professionals mentioned *maleficence* the most in response to monitoring robots (Table 8). For both groups, companion robots did not evoke discussions about potential *maleficence* (Table 8).

Discussion and Conclusion

We found that *maleficence* dominated the discussion from nearly any configuration we analysed the data (Tables 2 up to 8). The only exception was for companion robots (Table 8), which were not seen as harmful but beneficial. Almost all respondents found Paro, the robot seal, very touching and could imagine themselves working with it. It could act as a supplement to get patients with dementia out of their anxiety or agitation or to entertain them. Moreover, they expected that the patients themselves would like Paro very much. The way patients would react and perceive the robots turned out to be one of the determining elements for the acceptation of companion robots in the caregivers' workplace. Like one respondent said: ''I would say that if the patient comes first, our perception is secondary.''[3] Thus, it also depends on the type of robot whether to see harm or not.

Our data showed that evaluations of *autonomy* and *justice* were negligible, meaning hardly ever mentioned, during the care professionals' deliberations about care robots (Table 2). Importantly, care professionals may have a divergent point of view, on the notion of autonomy, than patients in this regard. For instance when it comes to employing the use of a assistive washing robot, enabling an elderly patient to wash himself without any assistance. A healthcare professional indicates: "we know how to react to the elderly and the elderly will feel more comfortable with

[3] All used quotes were expressed in Dutch by respondents and translated by the author.

someone who he/she can trust, during a bathing situation, when somebody is naked. A robot could never replace a human, because the robot could not provide that feeling of trust." On the other hand one could argue that enabling a patient to bath independently or not being dependent on the availability of a care professional enhances patient's autonomy. Our participants, however, did not express this as a potential advantage. Returning someone to a state of greater independence is certainly compatible with autonomy; however, following Sorell (Sorell & Draper, 2014) the question is whether it is compatible with autonomy for a care robot to coerce someone to adhere to regimes that will return them to greater independence. Jenkins & Draper conclude that older people's autonomy can be limited in the short term in order to protect their longer-term autonomy (Jenkins & Draper, 2015).

Our participants expressed few thoughts concerning the principle of justice, which governs the fair distribution of scarce resources as well as the attribution of responsibility and liability when something goes wrong (Broadbent, Stafford, & MacDonald, 2009) When a robot does not behave as intended, it could be the result of human error or robot malfunctioning (Racine, 2016). Others may feel that robots are so expensive that only a few may benefit, thus bringing unequal distribution of care and attention. Feelings about a violated principle of justice where not expressed.

We found that particularly companion robots were regarded as beneficent and non-maleficent (Table 8). Although *maleficence* dominated the discussions, *beneficence* was not absent and sometimes prominently present. Utiliarism states that, when the perceived utility of a care robot is high, moral concerns would subside. However, we did not observe this relationship. Perceived *utility* was high as was the fear for *maleficence*. The notion of *non-utility* was negligible (Table 2). Participants stated that, as a condition, the robot should only support them, instead of replace them. They want to be able to determine when to employ the robot, to use it as a tool, instead of the robot automatically performs tasks. It could be very useful to have a robot that could lift somebody from the ground, but as a participant explained: ''I have had patients who did not want to sleep in bed, but on the ground. And if you have a robot that always picks up somebody […] then

you keep being busy. […] Besides, imagine that someone felt, then it is not always a good idea to lift somebody.'' Feeling responsibility is not the only reason why caregivers would like to see the care robot as a supporting tool instead of a replacement. They pointed out that with patients suffering from dementia, their emotional state can change suddenly and that it is important to reconsider the use of the care robots in every situation again.

We conducted focus groups with care professionals to understand their ethical and utility considerations about robot technology in care. It is important to complement knowledge about the patient perspective with the views of care professionals who, together with the robot, should form the best possible team to serve older adults optimally. The results showed that the main concern of the care professionals under study was the potential maleficence of assistive machines (i.e., physical damage such as dropping, or emotional damage such as loneliness). Caregivers felt very responsible for their patients, so not being there with the patients when the robots executed tasks was not an idea caregivers embraced. As one respondent admitted: ''If something goes wrong [with my patients], I would feel very guilty.'' This showed to be less of a concern with respect to monitoring devices and of least concern with companion robots. In fact, companion robots were regarded as the most beneficial of the three types of robots reviewed. With companionship robots, participants saw opportunities to finish additional tasks, like administration or doing the dishes (which belongs to the nursing home caregivers' tasks), without having the feeling that they fall short to their patients, because they were close-by. With respect to monitoring robots (cf. tele-presence), caregivers recognized that this type of robot could alleviate the work load. Nonetheless, concerns about loneliness and other adverse effects on the patient prevailed: "I see my patients once a day in their own homes. Sometimes I am the only one they see throughout the whole day. If even I would stop coming, they will be so lonely." Surprisingly, privacy issues were not mentioned but rather the deterioration of human contact. Care providers are afraid of losing personal interaction with the

patients. For instance, Sharkey (2012, p. 27) found that caregivers fear that through robots, detailed and caring human interaction is lost.

Having contact and interaction with elderly patients was to the greater part of our participants the most valuable element of their job. Employing a robot could deprive elderly patients and caregivers alike of even more human contact. Depriving human contact was seen as potential maleficent, thus explaining the main concern of the care professionals under study. Diminishing human contact is, on a societal scale, frequently seen as a threat to humanity (Turkle, 2017).

Good care is adding humanity to care. One participant even had her own formula for good care: ‘‘Good care is 50% being professional and 50% empathy’’. Humanity to participants had to do with emotional dedication. It was about sympathizing with the patients’ emotions, providing the right support at the right moment and being interested in your patients. Companion robots are not witnessed as violating this notion of good care, whereas monitoring and assistive devices could diminish patient – care providers contact and as a result also diminishing human contact.

Although the care professionals saw benefits with companion robots, the literature thus far expressed concerns about deception and dignity (Wijnsberghe, 2012; Van Kemenade, Konijn, & Hoorn, 2015; Broadbent, Stafford, & MacDonald, 2009; Broadbent, 2017; Sharkey & Wood, 2014). However, none of our professional participants expressed such objections as they considered the use of companion robots as “good care” and beneficial for patients, for it did not diminish human contact. From the discussion, the following quote is illustrative: “It is true that you are misleading your patient, but I see no harm in that. After all, we allow our children to carry their cuddly toys around everywhere, so we must allow our older adults to do the same if they want to.”

Discussing the demographics of the care professionals studied, we observed that care givers with less experience (Table 4), small contracts (Table 5), and not highly educated (Table 7) are more concerned about potential harm of the robot than people such as semi-ambulant professionals (Table 6) who focused more on beneficence. When we zoomed in on the differences between higher and intermediate vocational trained care professionals (Table 8), we saw that the intermediate group

was more negative about robots than the higher educated group. It might be that the care professionals in our sample, particularly the lower educated, underestimated the possibilities of healthcare robots.

Whereas intermediate vocational care professionals were focusing on maleficence as the leading ethical principle, the care professionals who received a higher level of education seemed to be led by potential beneficence. This information could be useful to educational institutes in the care domain, since knowledge on the ethical and practical implications of working with robots seems to lessen the fear for this kind of technology.

When concluding, however, we still need to be careful about the robustness of the results. Because of the nature of the focus group methodology and a relatively small sample size, we should consider these results as tentative and as directions for future research. More robust methodological and statistical techniques, requiring larger sample sizes, should deal with the reliability and validity issues encountered in the current exploration.

In summary, the current study provides preliminary insights into the moral objections as well as the unexpected approval of care professionals to companion robots. We aimed to understand care professionals' evaluations and concerns about different forms of robots in daily care practice as they are important stakeholders in the use of robots for older adults who need care. Results showed that few concerns arise with machines for companionship that satisfy the need for relatedness, specifically among the lonely. Assistive and monitoring devices are deemed potentially harmful, both physically and psychologically. Our conclusion posits that specific robot technology may not dehumanize care but could rather bring back meaningful relationships into professional health care. This knowledge could be of help to contribute to a successful implementation of robots in healthcare, serving the older adults best by taking potential moral objections of the professionals into account during early stages of development. Developers of healthcare robots should tailor designs to the wants of older adults as well as to the needs of our much-undervalued eldercare professionals so they can serve older adults the best they can with the help of new robot colleagues.

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The authors declare that there is no conflict of interest. We applied the VU University's "code of ethics for research in the social and behavioral sciences involving human participants" in conducting our study. Our methods have addressed all ethical considerations and is in compliance with this guideline.

Appendix belonging to Chapter 3: URLs of the presented video:

Assistive robotics

1. Panasonic hair-washing robot (https://www.youtube.com/watch?v=ZFySI7is34c)
2. Riba II Care Support Robot for Lifting Patients (https://www.youtube.com/watch?v=wOzw71j4b78)

Monitoring robotics

3. Mobiserv, a robot equipped with cameras and audio and touch sensors (http://www.youtube.com/watch?v=yOnJdiMhLIk)
4. NEC PaPeRo (Partner-Type Personal Robot), a telecommunication robot (https://www.youtube.com/watch?v=Z_QKHS3lydA)

Companion robotics

5. Fujitsu's teddy bear robot (https://www.youtube.com/watch?v=AwWeN1ARy74)
6. AIST Paro, a therapeutic robot baby harp seal (https://www.youtube.com/watch?v=0BKxzAlVJyE)

References

ActiZ. (2018, 02 07). *ActiZ roept ministers op de acute zorg voor kwetsbare ouderen anders te organiseren*. Retrieved from ActiZ: https://www.actiz.nl/nieuws/web/ouderenzorg/open/2018/02/actiz-roept-ministers-op-de-acute-zorg-voor-kwetsbare-ouderen-anders-te-organiseren

Archibald, M., & Barnard, A. (2017). Futurism in nursing: Technology, robotics and the fundamentals of care. *Journal of Clinical Nursing*, 00:1–8.

Beauchamp, T., & Childress, J. (2013). *Principles of Biomedical Ethics.* Oxford: Oxford University Press.

Broadbent, E. (2017). Interactions with robots: The truths we reveal about ourselves. *Annual Review of Psychology, 68*, 627-652.

Broadbent, E., Stafford, R., & MacDonald, B. (2009). Acceptance of Healthcare Robots for the Older Population. *International Journal of Social Robotics*, 1(4):319-30.

Burger, S. (Director). (2015). *Alice Cares* [Motion Picture].

De Koster, Y. (2012, 8 5). Twijfels over inzet werkelozen in thuiszorg. *Binnenlands Bestuur*, pp. https://www.binnenlandsbestuur.nl/sociaal/nieuws/twijfels-over-inzet-werklozen-in-thuiszorg.8474776.lynkx.

European Commission. (2017, 6). *Policy State of Health in the EU.* Retrieved 3 17, 2019, from DG Health & Consumers, Public health, Ageing: https://ec.europa.eu/health/sites/health/files/state/docs/chp_nl_english.pdf

European Commission. (2018, 8 5). *Record high old-age dependency ratio in the EU.* Retrieved 12 5, 2018, from Eurostat: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180508-1

Harrison, N. (2015). Caredroids in health care. *The Lancet*, VOLUME 386, ISSUE 9990, P235-236 doi./10.1016/S0140-6736(15)61267-3.

Ienca, M., Jotterand, F., & Vica, C. (2016). Social and Assistive Robotics in Dementia Care: Ethical Recommendations for Research and Practice. *International Journal of Social Robotics*, Volume 8, Issue 4, pp 565–573.

Jenkins, S., & Draper, H. (2015). Care, Monitoring, and Companionship: Views on Care Robots from Older People and Their Carers. *International Journal of Social Robotics*, Volume 7, Issue 5, pp 673–683.

Kaneko, Y. (2013). Three Utilitarians; Hume, Bentham and Mill. *Journal of Ethics, Religion and Philosophy* , vol 24:3 pp65-78.

Karimi, A. (2012, 10 10). Zorgrobots rukken op. *Metro*, p. 5.

Loos, H. v., Reinskensmeyer, D., & Guglielmelli, E. (2016). Rehabilitation and Health Care Robotics. In K. O. Siciliano B., *Springer Handbook of Robotics* (pp. pp 1685-1728). Cham: Springer.

Malehorn, K., Liu, W., Hosung, I., Bzura, C., Padir, T., & Tulu, B. (2012). The Emerging Role of Robotics in Home Health. *Proceedings of the Eighteenth Americas Conference on Information Systems* (p. 62). Seattle: Washington.

McCormick, T. (2013). *"Principles of bioethics." Ethics in Medicine.* Washington: University of Washington School of Medicine.

Racine, L. (2016). A Critical Analysis of the Use of Remote Presence Robots. *Nursing Education*, Vol.8, Issue 1.

Sharkey, A., & Sharkey, N. (2012). Granny and the robots: ethical issues in robot care for the elderly. *Ethics and Information Technology*, 14(1), 27–40.

Sharkey, A., & Wood, N. (2014). The Paro seal robot: demeaning or enabling? *Proceedings of AISB 2014* (p. 50). London: Goldsmith.

Smarr, C., Prakash, A., Beer, J., Mitzner, T., Kemp, C., & Rogers, W. (2012). Older adults' preferences for and acceptance of robot assistance for everyday living tasks. *Proceedings of the human factors and ergonomics society annual meeting*, Vol. 56, No. 1, pp. 153-157).

Sorell, T., & Draper, H. (2014). Robot carers, ethics, and older people. *Ethics and Information Technology*, 16: 183.

Turkle, S. (2017). *Alone together: Why we expect more from technology and less from each other.* London: Hachette.

Van Kemenade, M. A., Konijn, E., & Hoorn, J. (2015). Robots humanize care: Moral concerns versus witnessed benefits for the elderly. *Proceedings of the 8th International Conference on Health Informatics (HEALTHINF)* (pp. 464-469). Lisbon: PT: ScitePress.

Venkatesh, V., Morris, M., Davis, F., & Davis, G. (2003). User Acceptance of Information Technology: towards an unified View. *MIS Quarterly*, 425-478.

VU University Scientific and Ethical Review Board. (2016, 11 15). *CODE OF ETHICS FOR RESEARCH IN THE SOCIAL AND BEHAVIOURAL SCIENCES INVOLVING HUMAN PARTICIPANTS.* Retrieved 11 25, 2018, from https://www.fgb.vu.nl/en/Images/ethiek-reglement-adh-landelijk-nov-2016_tcm264-810069.pdf

Wijnsberghe, A. (2012). Designing Robots for Care: Care Centered Value-Sensitive Design. *Science and Engineering Ethics*.

Wood, C. (2017, 7 11). *Barriers to Innovation Diffusion for Social Robotics Start-ups : And Methods of Crossing the Chasm.* Retrieved from Digitala Vetenskapsliga Arkivet: http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-209025