

Study Protocol: Ethical Aspects of Using Social Robots in Elderly Care – A Systematic Qualitative Review.

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Background

Demographic change and the persistent nursing shortage have prompted discussion on the use of assistive robotic technologies as potential solutions for expected gaps in elderly care (Berner et al., 2020). As a result, funding programs are being created to expand the development of robotics in health care (e.g. the Federal Ministry of Education and Research in Germany launched the funding line “Robotic Systems for Care“ in 2019) and the industry is more and more investing in the development of care robots (Buxbaum & Sen, 2018). In countries like Japan, where a high percentage of the population comprises older citizens, the government already provides subsidies to care facilities for the purchase of robots (Savage 2022).

While there are many potential benefits associated with usage of robotic technology, there are also a variety of ethical challenges discussed in the literature: On the one hand, there is hope that the use of robotics could mitigate the nursing shortage in relieving caregivers, especially in particularly time-intensive or physically demanding tasks (Sharkey & Sharkey 2012). On the other hand, there is concern that the “human touch of care” will be lost and thereby care relationships impoverished (Bioethikkommission beim Bundeskanzleramt Österreich, 2019) or that robots cannot consider the individually varying needs of older people (Remmers, 2020). It

is also discussed whether older people are stimulated to learn new skills through the use of robots or whether they could even lose existing skills (Boada et al., 2021). How to ensure adequate data protection (Felzmann et al., 2016) or how to evaluate the possible deception where human interaction is merely simulated especially in the care of dementia patients (Sharkey & Sharkey 2021) are also two frequently discussed questions concerning the use of robotics in elderly care.

Consequently, there are multiple ethical challenges and opportunities that vary depending on the type of robot used in elderly care. Robotic systems designed to support nursing care are diverse and can be grouped roughly into (physically) assistive and socially assistive robots (Maalouf et al., 2018; Matarić & Scassellati, 2016). While the former support, for example, bringing, carrying, or lifting activities of the caregivers or physical activities of the care recipients, the latter facilitate social interaction. Systems of that kind are known as social robots, socially assistive robots or companion robots. Since social robots can support social interaction or even interact with the elderly themselves (Kehl, 2018), they gain access to particularly sensitive areas of human life. For that reason, the use of social robotics in elderly care is considered particularly ethically sensitive while also providing novel opportunities to connect older people and improve their well-being (Kachouie et al., 2014).

Given that it is to be expected that social robots will form part of nursing care practices for the elderly, decision-makers on the micro-, meso- and macro-level will have to consider and navigate ethical issues arising in their implementation. While this topic is critically discussed in the literature (Haltaufderheide et al., 2020; Körtner, 2016; Wachsmuth, 2018) and increasingly addressed by national ethics bodies (Deutscher Ethikrat, 2020, Bioethikkommission beim Bundeskanzleramt Österreich, 2019), no pertinent standards for the usage of social robots in care settings have been developed. For both, development of guidelines or individual decision-making, knowing about relevant ethical aspects arising in this context will be paramount. Hence, this systematic review is intended to provide a broad overview of relevant ethical aspects concerning the use of social robotics in elderly care as discussed in the literature.

Up to this point, only two systematic reviews focusing on the ethics of using (social) robotics in health care have been published: The first review, “The use of care robots in elderly care: A systematic review of argument-based ethics literature” (Vandemeulebroucke et al., 2018) primarily analyzes the ethical concepts underlying the debate, such as deontological, principlist, objective-list and care-ethical approaches, and systematizes them. Although this overview is

valuable for theoretical purposes, it may not provide practical guidance for practitioners and policy-makers who require a comprehensive understanding of specific ethical aspects to consider. The second review, “The ethical issues of social assistive robotics: A critical literature review” (Boada et al. 2021) mainly focusses on the challenges of using socially assistive robotics in healthcare, while neglecting potential positive effects of employing such technology. However, for a comprehensive ethical analysis of social robotics, it will be necessary to consider the risks as well as the chances of the technologies. It is essential to weigh the positive and negative ethical aspects to obtain a well-informed and justified assessment of social robotics in elderly care.

Objectives and research question

Against this background, this systematic review aims to provide an overview of ethical aspects – including opportunities, risks, and uncertainties – of and in using social robots in elderly care. While systematic reviews were not originally developed to synthesize qualitative data on ethical questions, such methodology has been successfully employed in this context (Mertz et al., 2016, 2017) with some necessary adaptations. The PICO framework for question formulation, for example, may not be as useful in this context. Instead, it has been proposed, to specify as part of question formulation (a) the ethical dimension, (b) the intervention and (c) the patient group or problem (Droste et al., 2010; Klingler & Mertz, 2021). Accordingly, the research question this review aims to address is the following:

- What are the (a) ethical aspects of using (b) social robots in (c) elderly care?

The larger project: E-cARE

The systematic review is part of the larger E-cARE project: “Ethics Guidelines for Socially Assistive Robots in Elderly Care: An Empirical-Participatory Approach”, funded by the German Federal Ministry of Health. The overarching objective of the project is to develop an ethical framework that provides guidance to relevant stakeholders involved in the use of social robots in elderly care. This systematic review represents an important component of this larger initiative, and its findings will contribute to the development of an ethics guideline. To achieve this, the project will execute four work packages:

- Work package 1: The systematic review constitutes the first work package. By providing a comprehensive overview of ethical aspects relevant to the use of social

robotics in elderly care, the systematic review aims to generate a sound information base for the rest of the project.

- Work Package 2: To determine how ethically relevant areas of care are transformed by the use of social robotics, an interview study will be conducted. Interviews will be held with nursing staff already employing social robots in their work.
- Work Package 3: We will organize a citizens' conference (Kögel 2021). It will provide randomly selected German citizens the opportunity to develop normative criteria for the use of (social) robotics in elderly care. They will write a citizen statement based on expert input and moderated discussions.
- Work Package 4: In the end, the results of all three work packages will be synthesized into an ethical orientation framework which is intended to facilitate practical decision-making for all affected.

Methods/design

Search strategy

The topic of interest spans different academic disciplines and we expected to find relevant contributions to the question posed by us in the ethical, nursing, medical as well as technical literature. Accordingly, we decided to include databases covering these four areas. After consultation with an expert from University Library Potsdam we decided to include the following databases:

- PubMed/MEDLINE
- CINAHL
- The Technical Information Library: TIB-Portal
- BELIT (which integrates several international databases focusing on ethics in biomedicine)

When selecting the databases, we made sure to include databases that contain grey literature such as policy briefs or statements from ethics councils which both the TIB-Portal as well as BELIT do.

Search strings were built from the three concepts included in the research question: a) ethical aspects, b) social robotics, c) elderly care. Their development was based on a preliminary search and screening of the literature to identify terminology for the relevant concepts included.

Feedback from an expert of the University Library Potsdam on the search string for PubMed was sought and the search string adjusted accordingly. Search terms that did not generate additional hits were not included in the final search string. The PubMed/MEDLINE search string reads as follows:

Concept	Corresponding part of search string
a) ethical aspects	(ethics[MeSH Terms] OR human rights[MeSH Terms] OR ethic*[Text Word] OR moral*[Text Word]) AND
b) social robotics	(robotics[MeSH Terms] OR robot*[Text Word] OR (social*[Text Word] AND assistiv*[Text Word]) OR (social*[Text Word] AND interactiv*[Text Word])) AND
c) elderly care	(aged[MeSH Terms] OR aged[Text Word] OR geriatr*[Text Word] OR elder*[Text Word] OR senior* [Text Word] OR nursing home*[Text Word] OR dement*[Text Word])

Search strings for the other databases were modeled after the PubMed-string. When adapting the search string to the four different databases, the special features of the databases like which languages they contain were taken into account. For example, in BELIT, the ethical part of the search-string has been omitted, because BELIT constitutes “an extensive bibliographic directory of literature in the area of bioethics”¹ and therefore all publications should fulfil the criterion of discussing ethical aspects.

Where possible, controlled vocabulary to index articles (like MeSH-terms in PubMed) and free text searches were combined. Similarly, truncations were used to ensure all possible formulations (e.g. robot, robots, robotics etc.) were found.

Inclusion/exclusion criteria

This review will only include literature that addresses the three key concepts (ethics, social robots, care of the elderly) jointly. However, at least two terms used in the research question are contested in the literature and therefore need to be operationalized for the purpose of this review.

Social robots: There is no standardized definition of social robots in the literature (Bendel, 2021). Definitions of robots are often highly complex and include aspects or technicalities (e.g. having at least a processor at its disposal) (Loh 2019) that are not verifiable within the scope of this review. Our decision for a definition is pragmatic in the sense that it is viable in the context

¹ See: https://www.drze.de/en/library-and-documentation-centre/belit-bioethics-literature-database/belit?set_language=en (last accessed March 31, 2023).

of this review. We understand “social robots” as robots whose primary purpose is to either support social interaction as a mediator (socially assistive robots) or serve as an actual interaction partner (socially interactive robots) – a definition employed by Kehl (2018) building on the work of Feil-Seifer & Matarić (2005). In the specification of robots, we are guided by Fosch-Villaronga and Drukarch who define a “robot” as a “movable machine that performs tasks either automatically or with degree of autonomy” (Fosch-Villaronga & Drukarch, 2022, p. 11). Machine is operationalized as having a physical body able to interact with its environment. This definition is deemed appropriate as it allows to exclude relevant neighboring technologies that are not relevant for the purpose of this review: For example, it excludes robotic technology that assists primarily with physical tasks (e.g. exoskeletons, cleaning robots). Additionally, it excludes digital communication technology (like Zoom or Skype) as well as virtual avatars, which are generally not considered robotic.

Ethical aspects: Schofield et al. (2021) have shown that terms such as “ethical issues” or “ethical challenges” are inconsistently used in the literature. In our experience, the same holds true for “ethical aspects”. We use the term to refer to risks, opportunities or uncertainties that need to be considered (or clarified) when determining how to responsibly handle a given phenomenon. Unlike other reviews that primarily focus on the ethical challenges or uncertainties (Boada et al. 2021, Klingler et al. 2017, Strech 2013), we believe that all relevant aspects, including the potential chances or benefits of technologies, need to be considered for ethical decision-making. To operationalize the term “ethical aspects” we employ a principle-based approach, which is commonly used in ethics. Stemming from the seminal work of Beauchamp and Childress (2019), the four principles of autonomy, beneficence, non-maleficence, and justice have become integral to clinical and medical ethics. Drawing upon these principles, some researchers have proposed frameworks to identify ethical issues in social robotics (Feil-Seifer & Matarić 2011). Recently, principle-based approaches have also gained traction in the emerging fields of AI ethics and the ethics of robotics. Numerous guidelines have been proposed for the responsible development and use of these technologies (Jobin et al. 2019; Hagendorff 2020), highlighting additional aspects such as transparency, accountability, explainability, or privacy. These principles appear to diverge from the traditional principles of biomedical ethics. However, as Floridi et al. (2018) demonstrated in the context of the AI4People framework, most principles proposed for AI and robotics align well with the classical four principles model. At the same time, Floridi et al. (2018) suggest supplementing the core principles with “explicability,” which encompasses both epistemological aspects such as transparency and intelligibility, as well as ethical aspects such as accountability. Accordingly, we define ethical

aspects as instances where at least one of the five principles (autonomy, beneficence, non-maleficence, justice, and explicability) is advanced (ethical opportunity), violated (ethical risk), or where there is a conflict between principles (ethical uncertainty). Alternatively, we could have relied on author self-classifications as discussing ethical aspects, but we anticipated missing much relevant literature, as ethical dimensions are often addressed without authors consciously using such terminology.

Care for the elderly: As we do not wish to impose a strict age cutoff for the elderly population, we will rely on self-identification of authors as discussing care for the elderly. We will include all contexts of elderly care (in-patient, out-patient, informal as well as formal nursing, hospital, home or nursing care home context). We also include care of dementia patients as one specific sub-group of recipients of care. Papers addressing other care contexts (e.g. intensive care, surgery, autism care) will not be included, unless they are focusing on elderly patients. Papers addressing ethical design of social robots will also be excluded.

Formal criteria: We will include the following types of publications: publications (including commentaries and editorials) in academic journals, books and book chapters, conference manuscripts/proceedings, dissertations, policy reports. We will not include training material, conference reports, master's and bachelor's theses, newspaper articles, blog posts, study protocols, conference abstracts or interviews because of quality considerations. In addition, we will only include papers written in English and German due to the language capacities in our research team.

Screening procedures

The literature identified with help of the search strings will be screened using the above identified inclusion criteria. Two researchers will independently screen title and abstract of identified literature. In addition, the first 10% of identified literature will be screened with CK who has extensive experience in conducting normative systematic reviews to ensure methodological uncertainties are clarified among the screeners. In case of discrepancies in judgement, these will be discussed among the two reviewers and resolved discursively. If no consensus can be reached, a third researcher will be consulted. Additionally, one person will screen title, table of contents and summary descriptions of identified books. Collected volumes will not be included in total in the full-text screening, but only book chapters that have been identified as relevant at this stage.

During the title/abstract screening, we will adopt an inclusive approach. This means, for example, that we will include papers that address ethical aspects of using robotics in elderly care, even if we are uncertain whether social robotics are discussed in the paper. To manage the title/abstract screening process, the software Colandr will be used (Cheng et al. 2016).

Access to full-texts will be sought via various libraries, but we will also contact authors of relevant publications. One member of the research team will conduct the full-text screening. Uncertainties will be discussed among the research team.

Quality Appraisal

As outlined by Mertz (2019) there are many open questions regarding how to conduct quality appraisal in systematic reviews that address normative questions. Due to the specific nature of the information sought, Mertz (2019) concludes that it can be justified to forego an appraisal of quality altogether. Part of the reasoning is that the cost of unfunded exclusions of papers/arguments can be as problematic as the inclusion of weak arguments/papers. Due to the lack of appropriate methodology, we have decided to not conduct a quality appraisal as part of our review.

Data extraction

As the main outcome of the review is a structured overview of the ethical aspects relevant to the context of interest, we will not conduct data extraction in a standardized format that is common in quantitative reviews. Instead, we will conduct a qualitative document analysis that is described below. As part of this, text segments discussing ethical aspects of using social robots in elderly care as defined above will be extracted.

In addition, we will extract certain information from the included papers that will be used for adequate description of the data corpus only (not for analysis/synthesis).

- Bibliographic information (Title, authors, year of publication)
- Type of article (e.g. theoretical article, interview study, evaluation etc.)
- Type of robotic technology discussed (e.g. not specified, Paro, specific prototype)
- Context of application (e.g. informal/formal, hospital/nursing home, country)
- Aims/research question of the publication

Data analysis and synthesis

The data will be analyzed using qualitative content analysis adapted from Kuckartz (2018) and Schreier (2012). To conduct the analysis we will be using MAXQDA². As a first step, the material will be read and segments discussing ethical aspects of using social robots in elderly care marked/coded in MAXQDA by one researcher. A purposively selected sample (Patton 2001) of 5-10% of the literature will be analyzed independently by two reviewers. Categories describing the material will be developed using the strategies of summarizing and subsumption as described by Schreier (2012). The resulting preliminary coding frames will be discussed and synthesized by the research team. We will go on coding the rest of the literature with the resulting coding frame using the strategy of subsumption. Two reviewers will code 50% of the remaining literature independently and differences in interpretation will be discussed and resolved discursively. Where no consensus can be reached, a third team member will be consulted. Having established robustness of the coding frame, the remaining 50% of the literature will be analyzed by only one team member.

Author contributions

CK and RR supervise the overall project. Both will guarantee the quality of the systematic review. ML and CK wrote the first draft of the study protocol, RR contributed to the final draft and supported the quality of the manuscript by revising it critically. All authors read and approved the final manuscript of the review study protocol.

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² See <https://www.maxqda.com/> for further information.

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