

BMJ Open Facilitators and barriers to codesigning social robots with older adults with dementia: a scoping review protocol

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To cite: Hung L, Chen I, Wong KLY, *et al.* Facilitators and barriers to codesigning social robots with older adults with dementia: a scoping review protocol. *BMJ Open* 2024;**14**:e080751. doi:10.1136/bmjopen-2023-080751

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<https://doi.org/10.1136/bmjopen-2023-080751>).

Received 12 October 2023
Accepted 27 February 2024



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ABSTRACT

Introduction Social robots including telepresence robots have emerged as potential support in dementia care. However, the effectiveness of these robots hinges significantly on their design and utility. These elements are often best understood by their end-users. Codesign involves collaborating directly with the end-users of a product during its development process. Engaging people with dementia in the design of social robots ensures that the products cater to their unique requirements, preferences, challenges, and needs. The objective of this scoping review is to understand the facilitators, barriers, and strategies in codesigning social robots with older adults with dementia.

Methods and analysis The scoping review will follow the Joanna Briggs Institute scoping review methodology and will be conducted from November 2023 to April 2024. The steps of search strategy will involve identifying keywords and index terms from CINAHL and PubMed, completing search using identified keywords and index terms across selected databases (Medline, CINAHL, PubMed, AgeLine, Web of Science, PsycINFO, Scopus, IEEE, and Google Scholar), and hand-searching the reference lists from chosen literature for additional literature. The grey literature will be searched using Google. Three research assistants will screen the titles and abstracts independently by referring to the inclusion criteria. Three researchers will independently assess the full text of literature following to the inclusion criteria. The data will be presented in a table with narratives that answers the questions of the scoping review.

Ethics and dissemination This scoping review does not require ethics approval because it collects data from publicly available resources. The findings will offer insights to inform future research and development of robots through collaboration with older people with dementia. In addition, the scoping review results will be disseminated through conference presentations and an open-access publication in a peer-reviewed journal.

INTRODUCTION

Individuals with dementia are more susceptible to stress and anxiety due to the changes in their brains and memory.¹ The decline in cognitive function, loss of independence, coupled with contextual factors such as pandemic-induced isolation, intensify

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ People with lived experience are involved in conducting and dispersing of the scoping review.
- ⇒ The topic is innovative to understand the facilitator and barriers of codesigning social robots with older adults with dementia.
- ⇒ The appraisal of quality of study is not included in Joanna Briggs Institute scoping review guideline. Thus, the results and recommendations of scoping review will not be graded.
- ⇒ The scoping review will miss literature that is not published in English.

these challenges and mental health needs.² Alarming, nearly 30% of older Canadians reported a decline in their mental health during the pandemic.³ Although increasing numbers of mental health services have developed, older adults with dementia often are challenged to access mental health support because of limited therapy options and high treatment expenses.^{4 5} These barriers prevent older people with dementia from receiving appropriate stress management support. Additionally, dementia will gradually affect the way a person communicates, and this gradual change can hinder people with dementia from engaging in traditional therapy sessions.⁶ Caregivers of older individuals with dementia are also under high stress from demanding care responsibilities.⁷ To address emotional stress for older people with dementia and caregivers, the development of social robots has shown promise in supporting and enriching the lives of older adults with dementia and caregivers.⁸ The primary aim of a social robot is to create an interactive experience for the user, often incorporating elements of learning and adaptation to individual preferences and needs.^{9 10} Properly designed social robots could provide companionship,¹¹ stimulate cognitive functions through memory games,¹² and serve as non-judgemental conversational partners.¹³

Social assistive robots both interact socially with people and also provide tailored support with tasks, such as giving reminders, or assist with therapeutic interventions.⁸ Effectively designing social robots with these capabilities requires a collaborative approach that addresses the unique needs of their intended users. The principle of codesign is instrumental in this context, as it actively involves them in the planning process and puts user perspectives at the forefront of the conversation. However, codesign is not without its challenges: older adults with dementia may have difficulty in articulating their needs or might be overwhelmed by the design process.¹⁴ At the same time, with careful facilitation and a genuine commitment to understanding their perspective, codesigning can pave the way for social robots that are truly tailored to enhance the lives of those with dementia.

Codesigning social robots with users marks an essential approach in this rapidly evolving field, aiming to create robots that are both technologically advanced and also deeply attuned to the specific needs, preferences, and emotional states of the users.¹⁵ Existing social robots, such as PARO and Joy for all, as well as telepresence robots, have solicited feedback from older adults with dementia and caregivers.^{16 17} However, the knowledge remains limited about the codesign process of social robots with older adults with dementia.¹⁸ This scoping review, therefore, addresses two critical gaps in the current body of knowledge. First, it aims to collate and present empirical evidence on the codesign process, to establish an understanding of how interventions can be tailor-made for older adults with dementia. Second, codesign with older adults with dementia requires careful consideration of multiple factors, including the trajectory of the disease, attitudes of involved teams, safe environments, and resource availability to support.

Our primary objective is to systematically map the existing research landscape, focusing on empirical evidence that identifies facilitators and barriers to codesigning social robots with older adults with dementia. By doing so, we aim to synthesise the existing literature and unearth effective strategies to navigate the challenges encountered in the codesign of social robots with older adults with dementia.

Review question

What has been reported in the literature regarding facilitators and barriers to codesign social robots with older adults with dementia?

METHOD

The research team is composed of multidisciplinary teams, including a nurse clinician, a registered nurse, a social worker, undergraduate students, and a patient partner. The team will conduct the review collaboratively by following The Joanna Briggs Institute (JBI) methodology in the scoping review.¹ JBI methodology is a well-known methodology, widely used in scoping reviews,

especially in the field of healthcare. JBI methodology for scoping review provides clear steps on strategies for protocol development, study search, study selection, data extraction, and data synthesis. A key strength of our scoping review is the inclusion of a patient partner with lived experience, enhancing the relevance and grounded perspective of our findings. The research team will hold regular meetings to discuss extracted data and results. Our patient partner, LJ, will attend these meetings and actively participate in analysis and discussion, ensuring that her voice and experiential knowledge are integral to the research process.

A preliminary search of MEDLINE, CINAHL, PubMed, and the JBI Database of Systematic Reviews and Implementation Reports was conducted on 12 July 2023, and no systematic review examining facilitators and barriers to codesign social robots with older adults with dementia were found.

Inclusion criteria

Participants

The review includes older adults with dementia. The older adults with dementia will be defined as people aged of 60 and above with any diagnosis of dementia. According to WHO,¹⁹ the age of older adults has adopted to 60 as the beginning of older adults. Literature involved caregivers of people with dementia and staff in dementia centres will be included.

Concept

This scoping review aims to identify facilitators and barriers to codesign social robots. The core concept is codesign. Social robots are labelled based on their appearances and functions.²⁰ The type of social robots in this scoping review is referred to as telepresence robots.

Context

Both community and institutional settings are included in this scoping review. Community settings refer to non-medical settings such as people's homes, community centres, schools, work sites, libraries, and workshops. Institutional settings refer to long-term care facilities, assisted living, and hospitals.

Types of sources

This scoping review will encompass various study designs, such as experimental and quasi-experimental. These designs will include randomised controlled trials, non-randomised controlled trials, before and after studies, and interrupted time-series studies. Furthermore, analytical observational studies such as prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies will be considered. Descriptive observational study designs, including case series, individual case reports, and descriptive cross-sectional studies, will also be included.

Qualitative studies focusing on qualitative data will be reviewed, utilising designs such as phenomenology,

grounded theory, ethnography, qualitative description, action research, and feminist research.

Systematic reviews meeting the inclusion criteria will also be considered, depending on the research question. Additionally, grey literature, including text and opinion papers, will be incorporated in this scoping review.

Search strategy

The literature search will utilise databases: Medline, CINAHL, PubMed, AgeLine, Web of Science, PsycINFO, Scopus, IEEE, and Google Scholar to identify relevant publications to the topic. Including databases like IEEE and Google Scholar ensures that both peer-reviewed articles and broader scientific contributions are considered. The key terms in the search will include the following: 'robotics', 'equipment design', 'codesign', 'health services for older persons', 'dementia', 'cognitive impairment', 'social skills training', and 'interpersonal relation'. All the terms will be used individually and in a variety of combinations to maximise search efficacy. Initial screening will involve a careful review of titles and abstracts, accompanied by an analysis of index terms used to categorise the identified literature. This approach will allow us to adapt keywords and index terms across the selected databases to ensure a comprehensive search. A three-step approach of the search strategy table has been prepared for this purpose and is included in the online supplemental file 1. Additionally, the reference lists of all included studies will be screened for further relevant literature.

To refine the search strategy and ensure the capture of key literature, our team has engaged and will continue to collaborate with a university medical librarian. The academic and content expert (LH) in the team will provide targeted guidance for specific literature search, ensuring a well-rounded comprehensive investigation.

Based on brief review on PubMed, the term 'social robot' started to emerge in research studies in 2000. Our team decided to include studies published in English from year of 2000 to the present will be considered. All types of study designs, both quantitative and qualitative, are considered. Student theses and dissertations published by universities will be reviewed and considered. This multifaceted search approach aims to capture a comprehensive range of studies, facilitating a thorough understanding of the facilitators and barriers in codesigning social robots for older adults with dementia.

Source of evidence selection

Following the search, all identified citations will be collated and imported into Covidence. The duplicates will be removed. Three research assistants (Kevin Dong, Madeline Kenja, and Tanaya Parakh) will screen the titles and abstract independently for assessment by referring to inclusion criteria for the review. Potentially relevant sources will be retrieved in full, and the citation details will be imported into JBI System for the Unified Management, Assessment, and Review of Information (JBI, Adelaide, Australia). Two researchers will conduct

a detailed assessment of the full text of selected citations by following the inclusion criteria. Reasons for exclusion of full-text studies that do not meet the inclusion criteria will be recorded and reported. The results of the search and the study inclusion process will be comprehensively documented in the final scoping review. The Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review flow diagram will be included to visually represent the process.

Data extraction

Researchers will employ a data extraction tool to collect data from the studies included in the scoping review. Parameters for data extraction include the year of publication, population, authors, purpose, study design, facilitators, barriers, and strategies to codesign social robots among older adults with dementia. A draft version of the data extraction table has been prepared for this purpose and is included in the online supplemental file 2. To ensure accuracy and consistency, a pilot test with the data extraction tool will be performed. Three researchers will independently extract data and compare the results. The draft data extraction tool will be adjusted and revised during the process of data extraction if needed. Any modifications will be explained in the final scoping review. During team meetings, any studies that warrant further examination or exploration beyond the extracted data will be identified and reviewed. In instances of disagreement among the reviewers, the reviewers will resolve it through discussion. The academic professor (LH) will make the final decision if a consensus cannot be achieved. This rigorous approach to data extraction aims to ensure comprehensibility and transparency in the review process, thereby enhancing the quality and utility of the final scoping review findings.

Patient and public involvement

Patient and public involvement is integral to the design, conducting, reporting, and dissemination plans of this review. Our patient partner (LJ) will actively participate in regular team meetings to discuss extracted data and results. Please refer to the full name to acknowledge. LJ will decide the number of articles she wants to review. We anticipate that approximately three to four articles per team member will be distributed for collective investigation. In recognition of her contributions, LJ will receive a modest honorarium and will be credited as a coauthor in the final scoping review report. Patient partner was recruited from the Community Engagement Advisory Network (CEAN), a local community organisation supporting patient and public involvement. For more information on CEAN, visit their website <http://cean.vch.ca>. Meetings with patient partner will be conducted via Zoom, focusing on obtaining her insights into the review's findings. The research team also anticipates that patient partner will assist in disseminating the study's outcomes through her organisational affiliations (eg, dementia advocacy groups) and communication



networks. This collaborative approach aims to ensure a multifaceted perspective, enhancing both the relevance and reach of the scoping review's conclusions.

ETHICS AND DISSEMINATION

This scoping review does not require research ethics approval and participant consent, as the scoping review utilises data from publicly available literatures and articles. On completion, the results will be disseminated across a range of platforms, targeting both regional, national, and international conferences. The findings will be made accessible to healthcare professionals, policy and decision-makers, as well as the general public. This broad dissemination strategy aims to maximise the review's impact by reaching diverse stakeholders in the healthcare ecosystem.

Data synthesis

The extracted data and results of identifying the existing literature will be systematically organised in a tabulated format. Each column in the table will represent different key variables, such as the year of publication, authors, population, purpose, study design, facilitators, barriers, and strategies to codesign social robots with older adult with dementia. To facilitate an understanding of the field's evolution, the articles will be sorted chronologically, ranging from the oldest to the latest publication. A narrative summary to describe the key topics of literature will be incorporated. The findings of the scoping review will be presented to inform practices, shape policy decisions, and guide future research in the field.

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Acknowledgements We want to thank the Medical Research Librarian, Katherine Miller at the University of British Columbia for her assistance. The authors also want to thank patient partner for involving in the scoping review. Patient partner includes Lynn Jackson. The authors want to thank the research assistants Kevin Dong, Madeline Kenja, Tanaya Parakh.

Contributors LH and IC conceived the scoping review idea and questions, closely collaborating with patient partner LJ in study design. IC and KLYW contributed significantly to the first draft the manuscript. VWQL and LJ critically reviewed and assist with refining the scoping review protocol. All authors have approved the final manuscript and take responsibility for their contributions, ensuring accuracy and integrity.

Funding The review is funded by the CABHI research grant #F22-05488.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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