BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-051769
Article Type:	Protocol
Date Submitted by the Author:	27-Mar-2021
Complete List of Authors:	Smith, Chelsea; The University of British Columbia Hung, Lillian; The University of British Columbia Gregorio, Mario
Keywords:	Telemedicine < BIOTECHNOLOGY & BIOINFORMATICS, MENTAL HEALTH, GERIATRIC MEDICINE

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The benefits and barriers to using telepresence robots in aged care settings: a scoping review protocol

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Declarations of interest: none.

ABSTRACT

Introduction

Social isolation is a significant issue in aged care settings (e.g., LTC and hospital) and is associated with adverse outcomes such as reduced well-being and loneliness. Loneliness is linked with depression, anxiety, cognitive decline, weakened immune system, poor physical health, poor quality of life and mortality. The use of robotic assistance may help mitigate social isolation and loneliness. Although telepresence robots have been used in healthcare settings, a comprehensive review of studies focusing on their use in aged care for reducing social isolation requires further investigation. This scoping review will focus on the use of telepresence robots to support social connection of older people in care settings.

Methods and analysis

This scoping review will follow Joanna Briggs Institute scoping review methodology. The review team consists of patient partners and family partners, a nurse researcher, and a group of students. In the scoping review, we will search the following databases: MEDLINE (Ovid), CINAHL, PsycINFO (EBSCO), Web of Science, and ProQuest Dissertations & Theses Global. Google and Google Scholar will be used to search for additional literature. A hand search will be conducted using the reference lists of included studies to identify additional relevant articles. The scoping review will consider studies of using a telepresence robotic technology with older adults in care settings (i.e., LTC, and hospital), published in English.

Ethics and dissemination

Since the methodology of the study consists of collecting data from publicly available articles, it does not require ethics approval. By examining the current state of using telepresence to support older people in care settings, this scoping review can offer useful insight into users' needs (e.g., patients' and care providers' needs) and inform future research and practice. We will share the scoping review results through conference presentations and an open access publication in a peer-reviewed journal.

Keywords

Telepresence robot; long-term care; hospital; older adults; social connection; loneliness, social isolation

ARTICLE SUMMARY

Strengths and limitations of this study

- Patient and family partners were involved in the design of the scoping review protocol and will be involved in conducting and evaluating the review process
- Review will highlight successful strategies and outline concerns and issues faced when applying telepresence robots in care settings to optimize integration of the technology and guide future research
- Review will only include literature published in English
- Review will only include studies based in care settings; thus, findings and useful strategies for using telepresence robots to facilitate social connection in home settings will be excluded

INTRODUCTION

Globally, there has been growing need in the use of technology for safe social connection due to the COVID-19 pandemic. The pandemic has disproportionately impacted older adults, particularly those in hospital and long-term care (LTC). The loss of connection of older people with their families in hospitals and LTC has been detrimental and severely impacts quality of life.[1] Communication and contact with family and friends are among the most important aspects in promoting well-being. Older people in hospitals and LTC are at especially high risk of infectious disease such as COVID-19 due to the existence of multiple medical comorbidities and pre-existing conditions.[2,3] Strict infection control measures have been put in place including physical distancing, utilizing personal protective equipment (PPE), prohibiting visitors, and restricting patients and residents to their rooms. Limiting social contact significantly increases isolation and resulting loneliness. Lack of social connection between family members and residents/patients can also be a source of stress for family members, as they may feel guilty about the lack of ability to support the resident/patient, and also feel disconnected and concerned the resident/patient may no longer recognize them over time. These concerns support the need of promoting social connection in a safe and sustainable way.

Social isolation and loneliness

Older people in hospitals and LTC are at high risk of loneliness and social isolation.[4] Social isolation refers to the objective absence or paucity of contacts and interactions between a person and a social network. Loneliness refers to a subjective state of being alone, separated or apart from others. In recent years, there is more awareness of harmful effects of loneliness and growing interest for addressing this challenge. Social isolation and loneliness are associated with considerable mortality and morbidity.[5] Loneliness is worse for health than smoking 15 cigarettes a day and is deadlier than obesity.[1] In 2018, the United Kingdom appointed a Minster for Loneliness. The prevalence of severe loneliness among older people living in care homes is double that of community-dwelling populations: 22% to 42% for the resident population compared with 10% for the community population.[6]

Telepresence robot and virtual care

Virtual care has recently been shown to play an important role in distance-based care during this pandemic, despite the lack of comprehensive reviews of evidence that exist.[7,8] Virtual care is feasible and acceptable in geriatric care.[8] To support quality of life, older people in care settings should be offered possibilities for safe participation in positive social activities and maintaining social relationships. Telepresence robots offer potential to support safe social connection at a distance.[9] Telepresence robots are remote-controlled, wheeled devices that are connected to wireless internet. They use a tablet to allow interaction using video and audio capabilities. The robot can be used in LTC or hospital environments where remote users (e.g., family/therapist) can connect with the patient/resident in the care environment. The remote connection enables the robot to move around the care environment and interact face-to-face with others. For older adults, robotic telepresence provides benefits compared to non-mobile video connection: because of the remote control of the robot by families, the older person in care can interact with families with ease. The remote user (e.g., family member) having the control of the robot can more flexibly adapt to the physical requirements of the older person. For example, the family member can move the robot closer to the older person in care.

Older adults in care settings may face barriers when accessing technology, particularly older adults with different cognitive, perceptual, and physical abilities.[10] Telepresence robots are a form of technology that may help overcome some of the barriers due to their ability to be controlled remotely.[9] Telepresence is a potential technology to alleviate loneliness in care settings by allowing family members to be virtually present for the elderly person. However, there is very little research internationally and no research in Canada that maps the potential benefits and barriers to using telepresence robots in care settings. The impacts of using telepresence robots in care settings are unclear. Evidence-based knowledge is needed to guide how best to direct the effective implementation of telepresence robots.

STUDY OBJECTIVE

The scoping review is designed to determine the potential impacts that telepresence robots have on the experiences of people who live and work in care settings. The results will be useful to guide future research directions to inform the use of telepresence robots. In our next study, we will design a longitudinal research study to investigate how best to implement a telepresence robot to reduce social isolation and loneliness in long-term care homes for wider adoption of such robots. Thus, we are interested in challenges and solutions reported in the literature. A preliminary search revealed only one related review that focuses on the use of telepresence robots in enhancing social connectedness in older adults with dementia.[9] The review reported positive outcomes of using telepresence robots to connect people with dementia to carers via videoconferencing, however, was not specific to care settings.

METHODS

To meet the objective stated above, we will conduct a methodologically rigorous scoping review by following the methodology for scoping reviews developed by Joanna Briggs Institute (JBI). A scoping review is appropriate for this study because it provides an overview of the relevant literature in a field that is underdeveloped in order to identify the key themes and contexts within a research topic. Unlike systematic reviews which target highly focused questions such as the effectiveness of a particular intervention based on a precise set of outcomes, scoping reviews are used to determine the extent of existing evidence, to summarise existing evidence for dissemination and to identify avenues for future research.[11] An assessment of methodological quality will not be performed in this review because the goal of scoping reviews is not to produce a critical appraisal. In line with the JBI guideline, this scoping review is intended to determine what range of evidence is available on a topic regardless of quality.[12] In addition to summarising research findings, scoping reviews may be undertaken to identify research gaps for the future research.[13] If implications for practice are produced from the scoping review, the JBI Grades of Recommendation must be used.[13]

This protocol provides an important plan in order to conduct the review and also allows transparency of process. JBI uses the PCC (Population, Concept, and Context) mnemonic to guide the formulation of scoping review questions and inclusion criteria.[12] In terms of population, we will consider studies that include older people living in care settings, including LTC, assisted living, and hospital. We have limited the review by participants aged 60 or older because older adults are at risk of lacking social connection. For concept, we will include studies that provide information about any telepresence robot intervention and outcomes on social

connection. Regarding context, we will consider studies that examine the use of telepresence robot in formal care settings.

Scoping review questions

1. What has been reported in the literature regarding the impact of telepresence robots in reducing feeling of loneliness among older people in care settings?

2. What strategies may support older people in care settings in the use of telepresence robots for social connection?

The study team

The scoping review will be conducted by a diverse team including two patient partners, two family partners, two trainees, and a nurse researcher. One academic professor will serve as a mentor to provide guidance and support for the study. The review will be performed through five stages: conducting broad searches, refining selection criteria, study selecting and reviewing results, mapping literature and summarising results. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) checklist, which is consistent with the JBI methodology for scoping review will also be used to structure the reporting of the scoping review.[14]

Conducting broad searches

A search approach which is comprised of three steps will be performed as recommended by JBI. See supplementary file 1 for the search process and search terms. Step 1 involves identifying the terms for the search through an analysis of the words contained in the title and abstract of retrieved articles, and of the index terms which are used to describe the articles. We have consulted with a gerontology research librarian in the university to select the initial search terms. We will apply the initial search terms to conduct a search in two databases: MEDLINE & CINAHL. Search terms include telepresence robot, older people, long-term care, hospitals, assisted living. Details on the ADJn operator and truncation to be used in the search are outlined in supplementary file 2. This initial search is then followed by an analysis of the text words contained in the title and abstract of retrieved articles, and of the index terms used to describe the articles. The objective was to identify the terms that make it possible to find the relevant articles. The search will also be extended to Google for grey literature (i.e., organisational reports, newsletters and other articles not indexed in library database in Google Scholar). For the Google search, we will perform phrase searching. See supplementary file 2 for the details of phrase searching. All empirical peer-reviewed publications as well as documents from the grey literature that examine the use of telepresence robots for older adults in care settings will be considered for inclusion. Studies in all designs, including quantitative and qualitative research, mixed methods, systematic reviews as well as small feasibility pilots and user experience report will be included.

Refining selection criteria

In step 2, we will search identified keywords and index terms across all selected databases: MEDLINE (Ovid), CINAHL, PsycINFO (EBSCO), Web of Science, and ProQuest Dissertations & Theses Global. Inclusion and exclusion criteria will be applied to select articles. Articles will be included if they: (1) focused on older people, (2) targeted social connectedness using

telepresence robots, (3) were studied in care settings including LTC, hospitals, and assisted living and (4) describe outcomes that had relevance in promoting social connection and improving well-being. See online supplementary file 3 for the data extraction instrument. The data extracted will include specific details about the population, concept, context, study methods and key findings relevant to the review objective.

In step 3, reference lists of articles that fit our search criteria will then be hand searched for additional sources. Google Scholar will be used to find published articles, organisational reports and related articles. All reports on the same study will be considered if the relevant outcomes of interest are different; otherwise, only the most recent report will be included in the review.

Study selection and reviewing results

A bibliographic reference management tool, Mendeley, will be used to ensure that all references and articles are systematically organised. All identified relevant articles will be uploaded into Mendeley; duplicates will be removed. The review process will involve two levels of screening: a title and abstract review followed by a full-text review. In the first level of screening, three investigators will independently screen the title and abstract for relevancy. In the second level of screening, the full text of studies that may meet the inclusion criteria will be retrieved and read independently by the three investigators to confirm inclusion. Studies that do not meet the inclusion criteria will be excluded and the reasons for exclusion will be presented in a PRISMA flow diagram. Any disagreements that arise between the reviewers will be resolved through discussion. If needed, the first author may also take specific issues to the whole research team and facilitate discussion until agreement is reached. A data analysis software programme, NVivo V12, will be used to identify and extract data for full-text review in selected articles. The data extracted will include specific details about the population, concept, context, study methods and key findings relevant to the review questions. The data extraction tool will be pilot tested having three investigators to complete extraction from three data sources and comparing results. The draft data extraction tool will be modified and revised as necessary during the process of extracting data from each included study. Modifications will be detailed in the full scoping review report.

Mapping literature

The process of charting the results provides the reader with a logical and descriptive summary of the results that aligns with the objective and questions of the scoping review.[12] Relevant descriptive information and data will be extracted and charted from studies included in the scoping review using a data extraction instrument (online supplementary file 3) derived from the objectives of the research. The template of the data extraction instrument may be expanded and adapted during the course of the review, and changes reported in the published scoping review. We will map the selected papers by domains: author and country, setting, participants, research design, measures, strategies and impact/outcomes. A summary table of included studies will be developed. In research meetings, the whole team including patient and family partners will take part in analysing the extracted data sorted according to potential themes. We will compare and discuss different interpretations to resolve conflicts. The extracted data/charted results will be collectively evaluated and collated into categories of key findings for the final report presentation.

Summarising results

We will report the findings of the review in a manuscript of a peer-reviewed open access journal. A PRISMA flow diagram will be included to describe the review process. Also, we will provide a literature table to give a summary of characteristics of the selected papers, including study location, year of publication, study population and sample size, methods, intervention type, impacts, barriers to technology use and strategies to overcome barriers. A narrative summary will accompany the charted results and describe how the results relate to the review objective and questions.

Patient and public involvement

Patient and family partners were recruited from a local community organisation, the Community Engagement Advisory Network (CEAN), which provides training and support in a variety of ways, including education workshops, public forums, as well as online and brochure materials for patient and family as partners. More information about how CEAN supports patient and public involvement can be found in http://cean.vch.ca. Two patient and two family partners were involved in preparing the scoping review protocol that underpinned the priority focus, and research directions. Through regular research meetings and conversations with patient and family partners, we collectively discussed and jointly decided research questions, what to include and exclude in the scoping review. Actively involving research knowledge users (patients, families and clinicians) in the project challenges the current paradigm of a historical, paternalistic and imbalanced relationship between academic researchers and knowledge users. Patient and family partners were involved in the design of the scoping review protocol by openly sharing their priorities and making decision together with the team about the study plan. As a team, we discussed and formally agreed on the time required to participate in the research. One family partner participated in writing this protocol. Patient and family partners will continue to work with researchers and clinicians to complete the scoping review, contributing to team discussion and providing feedback on the results charted. Patient and family partners are committed to writing parts of the scoping review report for publication and disseminating results in conference presentations. In the scoping study, we will apply Guidance for Reporting Involvement of Patients and the Public in evaluating the involvement of patient and family as partners in research.[15]

Ethics and dissemination

Since the methodology of the study consists of collecting data from publicly available articles, it does not require ethics approval. As a team that includes academics and clinicians working with people living in care settings, we engage in team reflection in regular meetings and use the guidance of the ethical framework ‘ASK ME’ specifically developed for co-research with people with dementia. ASK ME stands for Avoid assumption, Support the person to do their best, consider Knowledge needed to be put into action, Meet early and regularly and consider Ethical sensitivity and responsibility.

This scoping review protocol presents a transparent and comprehensive methodology. The completed scoping review will be submitted for publication in an open-access and peer-reviewed interdisciplinary journal, and the results will be presented at relevant conferences.

DISCUSSION

The results of the scoping study will provide a summary of evidence about the impact of telepresence robots in mitigating social isolation and loneliness in older adults in care settings (i.e., LTC, assisted living, and hospital). Telepresence robots have been tested in various care settings and have been reported to promote social interaction with friends and family, generate positive reactions, and reduce loneliness amongst residents.[16,17] Evaluating previous applications of this technology in supporting social connection within care settings is essential because the COVID-19 pandemic has caused a further increase in the high rates of social isolation and loneliness among older individuals living in LTC. Staying connected with friends and family over virtual means is more important than ever before. This summary may help highlight the benefits and outline any concerns or issues faced when using the technology (e.g., technological difficulties, privacy concerns) with hopes to optimize the application of telepresence robots for facilitating social connection in care settings.

This is a novel and timely review focused on how telepresence robots may support social connection and reduce feelings of loneliness. The summary may offer insight on useful techniques to integrate the technology into care settings by highlighting results of previous studies. The scoping review findings will be used to guide a 3-year longitudinal study to look at the use of telepresence robot Double 3 in long-term care. We will take a collaborative action research (CAR) approach to engage local stakeholders in our research. The results of the scoping review will inform our research design and provide useful insights into potential issues and possible mitigating strategies.

The scoping review will only include literature published in English. Studies published in other languages will not be included. Our search will only include studies based in care settings; thus, findings and useful strategies for using telepresence robots to facilitate social connection in home settings will be excluded. Although we will not directly assess methodology of the included studies, the summary of existing evidence may be useful to inform future research and practice.

ACKNOWLEDGEMENTS
The authors wish to thank the assistance of the Gerontology Research Librarian, Ursula Ellis at University of British Columbia.

AUTHOR STATEMENT
CS contributed to drafting the manuscript. MG contributed to revision of the manuscript. LH is the primary investigator and contributed to drafting and revising of the manuscript. All authors contributed to the design of the protocol.

FUNDING
This research is supported by the Vancouver General Hospital Foundation

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Supplementary file 1: Search strategy

We will work with a librarian at the university to refine the search strategy to ensure key articles are captured. Here is the plan.

We will apply the 3-step approach as outlined in the Joanna Briggs Institute Scoping Review Guideline.

Step 1: The initial search includes two online databases relevant to the topic: Ovid MEDLINE & CINAHL.

An example of the search in Ovid MEDLINE:

#	Searches	Results
S1	telepresence adj3 robot	88
S2	(giraff or temi or VGo or Double) and robot	805
S3	S1 or S2	891
S4	Older or aged or elderly or senior	5752669
S5	S3 AND S4	316

This initial search is then followed by an analysis of the text words contained in the title and abstract of retrieved papers, and of the index terms used to describe the articles.

Step 2: A second search using all identified keywords and index terms will then be undertaken across all selected databases: MEDLINE (Ovid), CINAHL, PsycINFO (EBSCO), Web of Science, and ProQuest Dissertations & Theses Global.

2a) Search terms and their combinations in step 2.

Telepresence terms	Robot terms	Aged care terms
Virtual care Telemedicine Telehealth Telecommunication	Robotic Robot Bot automaton Technology assistive device	Geriatrics Elderly Gerontology Older adult Senior Aged

2b) Google will be used to search grey literature (i.e., organizational reports, newsletters, and other articles not indexed in a library database).

Step 3: The resulting reference lists of all identified reports and articles will be searched for additional studies. Google Scholar will be used to find published articles, organizational reports and related articles. We will also conduct forward citation searching and related article searching in Google Scholar.

Supplementary file 2: Search techniques

ADJn operator and truncation

ADJn operator searches for papers where two terms are placed next to each other (in any order) within the distance of a specific number (n) of words. Truncation is a technique in which the root of a word is entered, followed by a truncation symbol (e.g., *). This allows the search to include words with different endings (e.g., music* = music, musical, musician, musicians).

Phrase searching

Phrase searching utilizes double quotation marks around two or more words (e.g., "telepresence robot") to retrieve results with an exact match of the phrase between the quotation marks, rather than searching a set of keywords in random order.

Supplementary file 3: Data extraction instrument

Review title: The use of telepresence robots to support social connections among older people in care settings: a scoping review protocol

Review questions:
1. What has been reported in the literature regarding the impact of telepresence robots in supporting social connections of older people living in care settings?
2. What strategies using telepresence robots for social connection in care settings were successful and what barriers and limitations have been reported?

Inclusion criteria (PCC):
Population – Individuals aged 60 and older living in care settings
Concept – telepresence robots, social connection, well being
Context – Care settings, e.g., hospitals, nursing homes, assisted living, etc.

Exclusion criteria
Studies with 'no concept of interest' e.g., review articles that focus on telepresence robots in home settings

Study details and characteristics extraction:
Author
Year
Country
Setting
Participant and sample size

Results extraction:
Type of intervention
Key findings/ Impact (e.g., benefits and users' experiences related to social connection, benefits for well-being)
Lessons learned (e.g., barriers to the use of telepresence robots and helpful strategies to overcome barriers)

BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-051769.R1
Article Type:	Protocol
Date Submitted by the Author:	28-Aug-2021
Complete List of Authors:	Smith, Chelsea; The University of British Columbia Gregorio, Mario Hung, Lillian; The University of British Columbia
Primary Subject Heading:	Geriatric medicine
Secondary Subject Heading:	Mental health, Geriatric medicine
Keywords:	Telemedicine < BIOTECHNOLOGY & BIOINFORMATICS, MENTAL HEALTH, GERIATRIC MEDICINE

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There are no competing interests for any author.

ABSTRACT

Introduction

Social isolation is a significant issue in aged care settings (e.g., LTC and hospital) and is associated with adverse outcomes such as reduced well-being and loneliness. Loneliness is linked with depression, anxiety, cognitive decline, weakened immune system, poor physical health, poor quality of life and mortality. The use of robotic assistance may help mitigate social isolation and loneliness. Although telepresence robots have been used in healthcare settings, a comprehensive review of studies focusing on their use in aged care for reducing social isolation requires further investigation. This scoping review will focus on the use of telepresence robots to support social connection of older people in care settings.

Methods and analysis

This scoping review will follow Joanna Briggs Institute scoping review methodology. The review team consists of patient partners and family partners, a nurse researcher, and a group of students. In the scoping review, we will search the following databases: MEDLINE (Ovid), CINAHL, PsycINFO (EBSCO), Web of Science, and ProQuest Dissertations & Theses Global. Google and Google Scholar will be used to search for additional literature. A hand search will be conducted using the reference lists of included studies to identify additional relevant articles. The scoping review will consider studies of using a telepresence robotic technology with older adults in care settings (i.e., LTC, and hospital), published in English.

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Since the methodology of the study consists of collecting data from publicly available articles, it does not require ethics approval. By examining the current state of using telepresence to support older people in care settings, this scoping review can offer useful insight into users' needs (e.g., patients' and care providers' needs) and inform future research and practice. We will share the scoping review results through conference presentations and an open access publication in a peer-reviewed journal.

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- Review will highlight successful strategies and outline concerns and issues faced when using telepresence robots in care settings
- Review will only include literature published in English
- Review will only include studies based in care settings; thus, findings and useful strategies for using telepresence robots to facilitate social connection in home settings will be excluded

INTRODUCTION

Globally, there has been growing need in the use of technology for safe social connection due to the COVID-19 pandemic. The pandemic has disproportionately impacted older adults, particularly those in hospital and long-term care (LTC). The loss of connection of older people with their families in hospitals and LTC has been detrimental and severely impacts quality of life.[1] Communication and contact with family and friends are among the most important aspects in promoting well-being. Older people in hospitals and LTC are at especially high risk of infectious disease such as COVID-19 due to the existence of multiple medical comorbidities and pre-existing conditions.[2,3] Strict infection control measures have been put in place including physical distancing, utilizing personal protective equipment (PPE), prohibiting visitors, and restricting patients and residents to their rooms. Limiting social contact significantly increases isolation and resulting loneliness. Lack of social connection between family members and residents/patients can also be a source of stress for family members, as they may feel guilty about the lack of ability to support the resident/patient, and also feel disconnected and concerned the resident/patient may no longer recognize them over time. These concerns support the need of promoting social connection in a safe and sustainable way.

Social isolation and loneliness

Older people in hospitals and LTC are at high risk of loneliness and social isolation.[4] Social isolation refers to the objective absence or paucity of contacts and interactions between a person and a social network. Loneliness refers to a subjective state of being alone, separated or apart from others. In recent years, there is more awareness of harmful effects of loneliness and growing interest for addressing this challenge. Social isolation and loneliness are associated with considerable mortality and morbidity.[5] Loneliness is worse for health than smoking 15 cigarettes a day and is deadlier than obesity.[1] In 2018, the United Kingdom appointed a Minster for Loneliness. The prevalence of severe loneliness among older people living in care homes is double that of community-dwelling populations: 22% to 42% for the resident population compared with 10% for the community population.[6]

Telepresence robot and virtual care

Virtual care has recently been shown to play an important role in distance-based care during this pandemic, despite the lack of comprehensive reviews of evidence that exist.[7,8] Virtual care is feasible and acceptable in geriatric care.[8] To support quality of life, older people in care settings should be offered possibilities for safe participation in positive social activities and maintaining social relationships. Telepresence robots (e.g., Double, Giraff, and VGo) offer potential to support safe social connection at a distance.[9] Telepresence robots come in different shapes and sizes but generally are all remote-controlled, wheeled devices that are connected to wireless internet. They use a tablet to allow interaction using video and audio capabilities. An important feature of this technology is mobility. A remote user can move and steer the robot in the local environment to interact and socially participate from a remote location. The robot is suitable and has been used in a diverse range of settings such as office work environments, schools, research, and healthcare.[10] Telepresence robots can also be used to assist people with physical or cognitive disabilities and may include additional features depending on usage, such as services to help with daily activities (e.g., reminding individuals of appointments or tasks, providing cognitive stimulation, or a call feature in the case of a fall).[10]

Telepresence robots have been used in LTC or hospital environments where remote users (e.g., family/therapist) can connect with the patient/resident in the care environment. The remote connection enables the robot to move around the care environment and interact face-to-face with others. For older adults, robotic telepresence provides benefits compared to non-mobile video connection: because of the remote control of the robot by families, the older person in care can interact with families with ease. The remote user (e.g., family member) having the control of the robot can more flexibly adapt to the physical requirements of the older person. For example, the family member can move the robot closer to the older person in care.

Older adults in care settings may face barriers when accessing technology, particularly older adults with different cognitive, perceptual, and physical abilities.[11] Telepresence robots are a form of technology that may help overcome some of the barriers due to their ability to be controlled remotely.[9] Telepresence is a potential technology to alleviate loneliness in care settings by allowing family members to be virtually present for the elderly person. However, there is very little research internationally and no research in Canada that maps the potential benefits and barriers to using telepresence robots in care settings. The impacts of using telepresence robots in care settings are unclear. Evidence-based knowledge is needed to guide how best to direct the effective implementation of telepresence robots.

STUDY OBJECTIVE

The scoping review is designed to determine the potential impacts that telepresence robots have on the experiences of people who live and work in care settings. The results will be useful to guide future research directions to inform the use of telepresence robots. In our next study, we will design a longitudinal research study to investigate how best to implement a telepresence robot to reduce social isolation and loneliness in long-term care homes for wider adoption of such robots. Thus, we are interested in challenges and solutions reported in the literature. A preliminary search revealed only one related review published in 2017 that focuses on the use of telepresence robots in enhancing social connectedness in older adults with dementia.[9] The review reported positive outcomes of using telepresence robots to connect people with dementia to carers via videoconferencing. The review provided an important synthesis of key studies and helped guide the development of this scoping review. We aim to build upon this review by including more recent publications and using a different review method that permits more broad inclusion criteria.

To note, the 2017 review only included studies focused on individuals with dementia, was not specific to care settings, and had a limited number of reviewed studies. This scoping review will be more comprehensive by including all older adults because telepresence robots have the potential to benefit those without dementia as well. By including all older adults, strategies for successful implementation can be evaluated for individuals with different cognitive abilities. This scoping review will also be specific to care settings since these settings differ substantially from home settings. The previous review was limited to four peer-reviewed publications and was conducted in the earlier stages of utilizing telepresence robots for social facilitation. Since this 2017 review was published, numerous relevant studies have been conducted and can be included in this scoping review. Furthermore, the previous review was published prior to the COVID-19 pandemic. The scoping review can bring attention to this topic under the context of the pandemic

to help guide successful implementation with a new perspective. Finally, the scoping review differs from the previous review in that it includes the involvement of patient and family partners in research design, data extraction, analysis, and writing.

The aim of a scoping review is to provide an overview of current research evidence without answering discrete questions as in other forms of literature reviews.[12] A scoping review following JBI guidelines is appropriate for this study and differs from previous reviews because it permits more broad inclusion criteria, focuses on summarizing and mapping evidence, and can be used to answer broad questions surrounding a topic.[12,13] By using more broad inclusion criteria (e.g., including all older adults), more studies can be included in the review and help identify knowledge gaps that may be missed in reviews with more restrictive inclusion criteria. Furthermore, the scoping review approach is used because it aims to determine the evidence on a topic and represent it by mapping or charting the data.[13] We will map the extracted data according to potential themes to structure our findings clearly.

METHODS

To meet the objective stated above, we will conduct a methodologically rigorous scoping review by following the methodology for scoping reviews developed by Joanna Briggs Institute (JBI). A scoping review is appropriate for this study because it provides an overview of the relevant literature in a field that is underdeveloped in order to identify the key themes and contexts within a research topic. Unlike systematic reviews which target highly focused questions such as the effectiveness of a particular intervention based on a precise set of outcomes, scoping reviews are used to determine the extent of existing evidence, to summarise existing evidence for dissemination and to identify avenues for future research.[12] An assessment of methodological quality will not be performed in this review because the goal of scoping reviews is not to produce a critical appraisal. In line with the JBI guideline, this scoping review is intended to determine what range of evidence is available on a topic regardless of quality.[14] In addition to summarising research findings, scoping reviews may be undertaken to identify research gaps for the future research.[15] If implications for practice are produced from the scoping review, the JBI Grades of Recommendation must be used.[15]

This protocol provides an important plan in order to conduct the review and also allows transparency of process. JBI uses the PCC (Population, Concept, and Context) mnemonic to guide the formulation of scoping review questions and inclusion criteria.[14] In terms of population, we will consider studies that include older people living in care settings, including LTC, assisted living, and hospital. We have limited the review by participants aged 60 or older because older adults are at risk of limited social connection. For concept, we will include studies that provide information about any telepresence robot intervention and outcomes on social connection. Regarding context, we will consider studies that examine the use of telepresence robot in formal care settings.

Scoping review question

What has been reported in the literature regarding facilitators and barriers to using telepresence robots among older people in care settings?

The study team

The scoping review will be conducted by a diverse team including two patient partners, two family partners, two trainees, and a nurse researcher. One academic professor will serve as a mentor to provide guidance and support for the study. The review will be performed through five stages: conducting broad searches, refining selection criteria, study selecting and reviewing results, mapping literature and summarising results. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) checklist, which is consistent with the JBI methodology for scoping review will also be used to structure the reporting of the scoping review.[16]

Conducting broad searches

A search approach which is comprised of three steps will be performed as recommended by JBI. See supplementary file 1 for the search process and search terms. Step 1 involves identifying the terms for the search through an analysis of the words contained in the title and abstract of retrieved articles, and of the index terms which are used to describe the articles. We have consulted with a gerontology research librarian in the university to select the initial search terms. We will apply the initial search terms to conduct a search in two databases: MEDLINE & CINAHL. Search terms include telepresence robot, older people, long-term care, hospitals, assisted living. Details on the ADJn operator and truncation to be used in the search are outlined in supplementary file 2. This initial search is then followed by an analysis of the text words contained in the title and abstract of retrieved articles, and of the index terms used to describe the articles. The objective was to identify the terms that make it possible to find the relevant articles. The search will also be extended to Google for grey literature (i.e., organisational reports, newsletters and other articles not indexed in library database in Google Scholar). For the Google search, we will perform phrase searching. See supplementary file 2 for the details of phrase searching. All empirical peer-reviewed publications as well as documents from the grey literature that examine the use of telepresence robots for older adults in care settings will be considered for inclusion. Studies in all designs, including quantitative and qualitative research, mixed methods, systematic reviews as well as small feasibility pilots and user experience report will be included. Informed by a previous review conducted in 2017, our search includes the dates of the publication range from 2000 to 2020.[9] Our broad searches started in 2021.

Refining selection criteria

In step 2, we will search identified keywords and index terms across all selected databases: MEDLINE (Ovid), CINAHL, PsycINFO (EBSCO), Web of Science, and ProQuest Dissertations & Theses Global. Inclusion and exclusion criteria will be applied to select articles. Articles will be included if they: (1) focused on older people, (2) targeted social connectedness using telepresence robots, (3) were studied in care settings including LTC, hospitals, and assisted living and (4) describe outcomes that had relevance in promoting social connection and improving well-being. See online supplementary file 3 for the data extraction instrument. The data extracted will include specific details about the population, concept, context, study methods and key findings relevant to the review objective.

In step 3, reference lists of articles that fit our search criteria will then be hand searched for additional sources. Google Scholar will be used to find published articles, organisational reports and related articles. All reports on the same study will be considered if the relevant outcomes of interest are different; otherwise, only the most recent report will be included in the review.

Study selection and reviewing results

A bibliographic reference management tool, Mendeley, will be used to ensure that all references and articles are systematically organised. All identified relevant articles will be uploaded into Mendeley; duplicates will be removed. The review process will involve two levels of screening: a title and abstract review followed by a full-text review. In the first level of screening, three investigators will independently screen the title and abstract for relevancy. In the second level of screening, the full text of studies that may meet the inclusion criteria will be retrieved and read independently by the three investigators to confirm inclusion. Studies that do not meet the inclusion criteria will be excluded and the reasons for exclusion will be presented in a PRISMA flow diagram. Any disagreements that arise between the reviewers will be resolved through discussion. If needed, the first author may also take specific issues to the whole research team and facilitate discussion until agreement is reached. A data analysis software programme, NVivo V12, will be used to identify and extract data for full-text review in selected articles. The data extracted will include specific details about the population, concept, context, study methods and key findings relevant to the review questions. The data extraction tool will be pilot tested having three investigators to complete extraction from three data sources and comparing results. The draft data extraction tool will be modified and revised as necessary during the process of extracting data from each included study. Modifications will be detailed in the full scoping review report.

Mapping literature

The process of charting the results provides the reader with a logical and descriptive summary of the results that aligns with the objective and questions of the scoping review.[14] Relevant descriptive information and data will be extracted and charted from studies included in the scoping review using a data extraction instrument (online supplementary file 3) derived from the objectives of the research. The template of the data extraction instrument may be expanded and adapted during the course of the review, and changes reported in the published scoping review. We will map the selected papers by domains: author and country, setting, participants, research design, strategies and barriers to the use of telepresence robot in aged care settings. A summary table of included studies will be developed. In research meetings, the whole team including patient and family partners will take part in analysing the extracted data sorted according to potential themes. We will compare and discuss different interpretations to resolve conflicts. The extracted data/charted results will be collectively evaluated and collated into categories of key findings for the final report presentation.

Summarising results

We will report the findings of the review in a manuscript of a peer-reviewed open access journal. A PRISMA flow diagram will be included to describe the review process. Also, we will provide a literature table to give a summary of characteristics of the selected papers, including study location, year of publication, study population and sample size, methods, intervention type, impacts, barriers to technology use and strategies to overcome barriers. A narrative summary will accompany the charted results and describe how the results relate to the review objective and questions.

Patient and public involvement

Patient and family partners were recruited from a local community organisation, the Community Engagement Advisory Network (CEAN), which provides training and support in a variety of ways, including education workshops, public forums, as well as online and brochure materials for patient and family as partners. More information about how CEAN supports patient and public involvement can be found in http://cean.vch.ca. Three patient and two family partners (MG, JM, AB, NH) were involved in preparing the scoping review protocol that underpinned the priority focus, and research directions. Through regular research meetings and conversations with patient and family partners, we collectively discussed and jointly decided research questions, what to include and exclude in the scoping review. Actively involving research knowledge users (patients, families and clinicians) in the project challenges the current paradigm of a historical, paternalistic and imbalanced relationship between academic researchers and knowledge users. Patient and family partners were involved in the design of the scoping review protocol by openly sharing their priorities and making decision together with the team about the study plan. As a team, we discussed and formally agreed on the time required to participate in the research. One patient partner (MG) participated in writing this protocol. Patient and family partners will continue to work with researchers and clinicians to complete the scoping review. We have agreement that all of our patient and family partners (MG, JM, LJ, AB, NH) will be co-authors for the publication of the scoping review results as they will be actively involved in reading and extracting data in the included articles, as well as participating in shared decision making in team analysis. Also, patient and family partners are committed to writing parts of the scoping review report for publication and disseminating results in conference presentations. In the scoping study, we will apply Guidance for Reporting Involvement of Patients and the Public in evaluating the involvement of patient and family as partners in research.[17]

Ethics and dissemination

Since the methodology of the study consists of collecting data from publicly available articles, it does not require ethics approval. As a team that includes academics and clinicians working with people living in care settings, we engage in team reflection in regular meetings and use the guidance of the ethical framework 'ASK ME' specifically developed for co-research with people with dementia. ASK ME stands for Avoid assumption, Support the person to do their best, consider Knowledge needed to be put into action, Meet early and regularly and consider Ethical sensitivity and responsibility.

This scoping review protocol presents a transparent and comprehensive methodology. The completed scoping review will be submitted for publication in an open-access and peer-reviewed interdisciplinary journal, and the results will be presented at relevant conferences.

DISCUSSION

The results of the scoping study will provide a summary of evidence about the facilitators and barriers to the use of telepresence robots in mitigating social isolation and loneliness in older adults in care settings (i.e., LTC, assisted living, and hospital). Telepresence robots have been tested in various care settings and have been reported to promote social interaction with friends and family, generate positive reactions, and reduce loneliness amongst residents.[18,19] Evaluating previous applications of this technology in supporting social connection within care settings is essential because the COVID-19 pandemic has caused a further increase in the high rates of social isolation and loneliness among older individuals living in LTC. Staying connected

with friends and family over virtual means is more important than ever before. This summary may help highlight any concerns or issues users faced when using the technology (e.g., technological difficulties, privacy concerns) with hopes to optimize the application of telepresence robots for facilitating social connection in care settings.

It is important to point out that telepresence robots tend not to have Artificial Intelligence. Robotics and artificial intelligence are not the same thing. Robotics are programmable machines which carry out a series of actions autonomously; Artificial intelligence (AI) is a branch of computer science, which involves developing computer programs to complete tasks which would otherwise require human intelligence.[20]

This is a novel and timely review focused on how telepresence robots may support social connection and reduce feelings of loneliness. The summary may offer insight on useful techniques to integrate the technology into care settings by highlighting results of previous studies. The scoping review findings will be used to guide a 3-year longitudinal study to look at the use of telepresence robot Double 3 in long-term care. We will take a collaborative action research (CAR) approach to engage local stakeholders in our research. The results of the scoping review will inform our research design and provide useful insights into potential issues and possible mitigating strategies.

The scoping review approach was selected to include a broad range of sources that may not have been included in a typical peer-reviewed article. Limitations of scoping reviews include lack of evaluation of quality of evidence, risk of invalid search processes, and potential selection bias.[21] Due to the nature of the broad search, a large number of studies must be filtered through when selecting studies to include in the review. To manage this challenge, we have a large study team that will be involved in the screening process. We will also be conducting a hand search of the literature, a strategy suggested to ensure the validity of the selection process.[21] To avoid selection bias, we will take steps to ensure all available reports on the topic are included and described, including searching Google for grey literature (i.e., organisational reports, newsletters and other articles not indexed in library database in Google Scholar) in addition to searching two databases. However, the scoping review will only include literature published in English. Studies published in other languages will not be included. Our search will only include studies based in care settings; thus, findings and useful strategies for using telepresence robots to facilitate social connection in home settings will be excluded. Although we will not directly assess methodology of the included studies, the summary of existing evidence may be useful to inform future research and practice.

By describing the lessons learned from available studies, the scoping review can make recommendations on the use of telepresence robots in care settings to facilitate social connection. However, given the limitations of scoping reviews, readers should consider these limitations when implementing recommendations made in the review. The recommendations should be used as suggestive guidelines while readers use individual judgements and considerations of particular contexts. Nonetheless, the review will provide an overview of the literature focused on the use of telepresence robots in care settings to facilitate social connection and may help guide and optimize the use of this technology.

ACKNOWLEDGEMENTS

The authors wish to thank the assistance of the Gerontology Research Librarian, Ursula Ellis at University of British Columbia. We also want to thank patient and family partners for their involvement in the work of the scoping review study. Our patient partners are Mario Gregorio, Jim Mann, Lynn Jackson; our family partners are Neil Horne and Annette Berndt.

AUTHOR STATEMENT

CS contributed to drafting and revision of the manuscript. MG (patient partner) contributed to critique, writing, and revision of the manuscript. LH is the primary investigator and contributed to drafting and revising of the manuscript. All authors contributed to the design of the protocol.

FUNDING

This research is supported by the Vancouver Foundation PAR Grant # GR019971.

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Supplementary file 1: Search strategy

We will work with a librarian at the university to refine the search strategy to ensure key articles are captured. Here is the plan.

We will apply the 3-step approach as outlined in the Joanna Briggs Institute Scoping Review Guideline.

Step 1: The initial search includes two online databases relevant to the topic: Ovid MEDLINE & CINAHL.

An example of the search in Ovid MEDLINE:

#	Searches	Results
S1	telepresence adj3 robot	88
S2	(giraff or temi or VGo or Double) and robot	805
S3	S1 or S2	891
S4	Older or aged or elderly or senior	5752669
S5	S3 AND S4	316

This initial search is then followed by an analysis of the text words contained in the title and abstract of retrieved papers, and of the index terms used to describe the articles.

Step 2: A second search using all identified keywords and index terms will then be undertaken across all selected databases: MEDLINE (Ovid), CINAHL, PsycINFO (EBSCO), Web of Science, and ProQuest Dissertations & Theses Global.

2a) Search terms and their combinations in step 2.

Telepresence terms	Robot terms	Aged care terms
Virtual care Telemedicine Telehealth Telecommunication	Robotic Robot Bot automaton Technology assistive device	Geriatrics Elderly Gerontology Older adult Senior Aged

2b) Google will be used to search grey literature (i.e., organizational reports, newsletters, and other articles not indexed in a library database).

Step 3: The resulting reference lists of all identified reports and articles will be searched for additional studies. Google Scholar will be used to find published articles, organizational reports and related articles. We will also conduct forward citation searching and related article searching in Google Scholar.

Supplementary file 2: Search techniques

ADJn operator and truncation

ADJn operator searches for papers where two terms are placed next to each other (in any order) within the distance of a specific number (n) of words. Truncation is a technique in which the root of a word is entered, followed by a truncation symbol (e.g., *). This allows the search to include words with different endings (e.g., music* = music, musical, musician, musicians).

Phrase searching

Phrase searching utilizes double quotation marks around two or more words (e.g., “telepresence robot”) to retrieve results with an exact match of the phrase between the quotation marks, rather than searching a set of keywords in random order.

Supplementary file 3: Data extraction instrument

Review title: The use of telepresence robots to support social connections among older people in care settings: a scoping review protocol

Review questions:
1. What has been reported in the literature regarding the impact of telepresence robots in supporting social connections of older people living in care settings?
2. What strategies using telepresence robots for social connection in care settings were successful and what barriers and limitations have been reported?

Inclusion criteria (PCC):
Population – Individuals aged 60 and older living in care settings
Concept – telepresence robots, social connection, well being
Context – Care settings, e.g., hospitals, nursing homes, assisted living, etc.

Exclusion criteria
Studies with 'no concept of interest' e.g., review articles that focus on telepresence robots in home settings

Study details and characteristics extraction:
Author
Year
Country
Setting
Participant and sample size

Results extraction:
Type of intervention
Key findings/ Impact (e.g., benefits and users' experiences related to social connection, benefits for well-being)
Lessons learned (e.g., barriers to the use of telepresence robots and helpful strategies to overcome barriers)