

Service Robots for Work Support of Health Personnel in Long-term Care: Protocol for a Scoping Review

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Abstract

Background: Demographic shifts are increasing the global demand for long-term care services, coinciding with a worldwide shortage of healthcare personnel. Service robots, designed to perform tasks in both professional and personal use, are perceived as a potential solution to alleviate healthcare personnel's workload and enhance the quality of care. However, the existing literature is fragmented and heterogeneous, with a limited emphasis on the role of service robots in supporting residents rather than healthcare personnel. Furthermore, there is a lack of consistent definitions of service robotic technologies and a scarcity of studies on implementation models and frameworks.

Objective: This scoping review aims to map and synthesize evidence regarding the implementation of service robots as work support for healthcare personnel in long-term care settings.

Methods: A comprehensive three-step search will be conducted in Embase, MEDLINE, APA PsycInfo, CENTRAL, Scopus, and CINAHL, along with grey literature databases and institutional repositories. Eligible sources encompass empirical studies and grey literature involving service robots, healthcare personnel, residents aged 65 years or older, and stakeholders such as informal caregivers within institutional long-term care. Exclusions apply to studies on home care, medical or industrial robots, and non-robotic technologies. Data will be extracted and analysed using the JBI methodology, with findings presented in tables, diagrams, and narrative summaries to identify gaps and inform future research and implementation strategies.

Results: This protocol was developed in October 2025 and subsequently registered in November 2025. A comprehensive search strategy was formulated and completely conducted on October 24, 2025. The screening of titles and abstracts was completed in November 2025. The processes of data extraction, analysis, evidence synthesis, and results presentation will be conducted sequentially, with the scoping review expected to be finalized by April 2026.

Conclusions: The findings of this proposed scoping review are anticipated to delineate the scope, characteristics, and implementation models of service robots employed to support healthcare personnel in executing routine tasks for older adults in long-term care settings. Furthermore, the review is expected to identify research gaps within the existing literature, elucidate key concepts, and establish a foundation for future empirical investigations into implementation strategies for service robots in healthcare.

Protocol Registration: This protocol was registered in Open Science Framework on November 7, 2025. Register: <https://osf.io/t5p2x>

Keywords: Health Personnel; Implementation Science; Long-Term Care; Robotics; Service Robot.

Introduction

All nations are experiencing a profound demographic transition primarily driven by population aging. By the mid-2030s, the number of individuals aged 80 years or older is projected to exceed the number of infants under one year of age. Furthermore, by the late 2070s, the global population aged 65 years and above is expected to reach approximately 2.2 billion, surpassing those under 18 years (1). These demographic shifts, both in size and proportion of older adults, place considerable strain on healthcare systems by increasing the demand for long-term care services and intensifying the need for healthcare personnel and caregivers (2). However, this growing demand is not matched by a proportional increase in the healthcare workforce (3), resulting in heavier workloads and a heightened risk of healthcare personnel's burnout (2). Although incremental progress is evident, with most countries for which data are available showing advancements in health workforce development and availability, the World Health Organization projects substantial global shortages of healthcare personnel by 2030, underscoring the urgent need for strategies that can expand workforce capacity and improve working conditions (3, 4).

Within this context, the integration of robotics into health care, particularly service robots, has emerged as a promising and multidisciplinary domain within digital transformation initiatives in health and social care (5-7). According to the International Organisation for Standardisation 8373:2021, a service robot is defined as a non-industrial robot designed to perform useful tasks for individuals or equipment in personal or professional settings, such as handling or delivering items, transportation, cleaning and disinfection, inspection or surveillance, guidance or information, and physical assistance. This definition explicitly excludes medical and industrial robots, and robotic devices (8, 9). Given these applications, service robots are increasingly recognized as a technology with broad potential to support healthcare personnel by reducing physical workload, improving efficiency, and enhancing care quality (6, 10). For the purposes of this review, service robots as work support for healthcare personnel refer to professional or personal care service robots primarily used to support health personnel in task performance rather than patient-directed or indirect services, with informal caregivers considered as stakeholders. Healthcare personnel include registered physicians and nurses, nursing assistants, allied health professionals, and other healthcare personnel directly involved in providing long-term care. Long-term care settings encompass nursing homes, assisted living facilities, residential care

institutions or equivalent housing care specially adapted for 24-hours services that provide continuous health and support services to older or dependent adults (11).

The volume of research on robots in healthcare has grown substantially over the past five years (5). Within this body of evidence, a growing but heterogeneous set of studies indicates that service robots are being trialled or implemented in long-term care settings, where they can influence healthcare personnel's workflows and experiences (6). A preliminary search of Scopus, MEDLINE, and Embase via Ovid, PROSPERO, and Epistemonikos was conducted on September 9, 2025, and no systematic or scoping reviews focusing on the implementation aspects and models of service robots as work support in long-term settings were identified. Existing scoping reviews primarily address the different types of robot-assisted care and their applications (12, 13), health workers' perceptions (14, 15), and barriers and facilitators to its implementation (16, 17). Additional evidence synthesis includes an umbrella review summarising robotics in nursing (6), two integrative reviews on healthcare robotics for older adults (18), implementation challenges in nursing (19), and several systematic reviews examining service robot development methodologies (20), health workers' attitudes, perceptions, and preferences (2, 21-23), the impact of care robots on elderly care (24), and the effectiveness of socially assistive robots (SAR) in nursing (10, 25).

Nevertheless, significant conceptual and empirical gaps have persisted. First, existing syntheses disproportionately focus on socially assistive robots for residents' wellbeing, making it difficult to isolate evidence on service robots explicitly deployed to support healthcare personnel in long-term care institutions. Second, knowledge regarding the effectiveness, cost-efficiency, and implementation models of service robots in real-world long-term care environments is limited (2, 6, 13, 22, 24). Evidence of sustainable business models for municipal care is minimal, and robust economic evaluations remain scarce (21, 24). Finally, current reviews exhibit inconsistent definitions and classifications of healthcare robots, and little is known about the impact of service robots on workflows, task allocation, required competencies, or job satisfaction among healthcare personnel (2, 10, 24, 25).

To address these gaps and clarify key concepts, this scoping review aims to identify and synthesise the available evidence on the adoption and integration of service robots to support healthcare personnel by assuming routine tasks for older adults in long-term care settings. By mapping existing research, this review provides a foundation for future empirical studies on implementation strategies for service robots in healthcare. It will also identify areas and processes where implementation is needed to improve working conditions and enhance care quality while highlighting opportunities for designing robotic systems that promote both efficiency and well-being in municipal health and care services.

Review question

What evidence exists on the adoption and integration of service robots in long-term care settings, specifically regarding their role in supporting healthcare personnel and informal caregivers in performing routine tasks?

Sub-questions:

- What are the key concepts and definitions associated with robotics in healthcare with a particular focus on service robots?

- What methodologies, target populations, and reported outcomes are described in the implementation studies of service robots used to support healthcare personnel in performing routine tasks?
- What types of evidence, theoretical frameworks, or conceptual models have been used to examine the implementation of service robots in long-term care settings to support healthcare personnel, elderly residents, and caregivers?

Methods

This scoping review will follow the Joanna Briggs Institute (JBI) methodology (26). The objectives, inclusion criteria, and methods are documented in this protocol, which is registered in the Open Science Framework (OSF).

Inclusion criteria

Participants

This review will include empirical studies and grey literature involving healthcare personnel such as registered physicians and nurses, nursing assistants, allied health professionals, and other personnel directly engaged in providing long-term care. Studies that include those aged 65 years and older residing in long-term care settings as direct or indirect recipients of service robots, along with family members and other informal caregivers as stakeholders, will also be considered.

Specific exclusion criteria: Studies focusing exclusively on older adults living at home, home healthcare services, in-home nursing care, or family caregiving without relevance to institutional long-term care facilities.

Concept

The core concept of this scoping review is service robot defined as a robot for personal or professional use that performs useful tasks for humans or equipment. In personal use, tasks may include handling or serving items, transportation, physical support, guidance or information, grooming, cooking, handling food, and cleaning. In professional use, tasks may involve inspection, surveillance, item handling, personal transportation, guidance or information, cooking, handling food, and cleaning (8, 9).

Specific exclusion criteria: studies addressing industrial robots or industrial automation applications, medical robots (e.g., surgical or therapeutic/rehabilitation), training or education robots, robotic devices, exoskeletons, socially assistive robots used solely for entertainment or therapy in home care, and non-robotic welfare technologies.

Context

This review will consider studies examining the adoption and integration of service robots as work support in long-term care settings. These settings include nursing homes, assisted living facilities, residential care institutions, or equivalent housing care specially adapted for 24-hours services that provide continuous health and support services to older or dependent adults (11).

Specific exclusion criteria: studies focusing on home healthcare for older adults, in-home care settings, private residences, specialist healthcare, acute hospitals, or laboratory-only studies without a care context.

Types of sources

This scoping review will encompass experimental and quasi-experimental designs, including randomized controlled trials, non-RCTs, before-and-after studies, and interrupted time-series studies. Additionally, it will consider mixed methods or multi-methods designs and analytical observational studies, such as prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies, as well as descriptive observational designs, specifically descriptive cross-sectional studies.

Qualitative studies employing methodologies such as phenomenology, grounded theory, ethnography, qualitative descriptions, action research, and feminist research will also be included. Systematic reviews that satisfy the inclusion criteria will be considered.

Although scoping reviews frequently incorporate grey literature, this review will exclude unpublished theses, dissertations, and studies not published in peer-reviewed journals to ensure a minimum quality standard and methodological transparency. Grey literature will be confined to verifiable sources such as policy reports, technical guidelines, and institutional documents pertinent to the review question.

Specific exclusion criteria for types of sources: single-case studies or case reports, case series, unpublished theses or dissertations, studies not published in peer-reviewed journals, letters, editorials, conference abstracts, and study protocols.

Search strategy

The search strategy aims to identify both published and unpublished studies using a three-step search strategy. First, an initial limited search of Scopus, MEDLINE, and Embase via Ovid, PROSPERO and Epistemonikos, will be conducted using selected keywords to identify relevant studies. The text words in the titles and abstracts of retrieved articles, as well as index terms, will then be analysed to develop a comprehensive search strategy. Second, a full search strategy using all identified keywords and index terms will be undertaken and adapted for each included database and information source. Finally, the reference lists of all included articles and reports will be screened for additional studies. Appendix I provides a complete search strategy for Embase, MEDLINE, CENTRAL, and APA PsycInfo via Ovid; Scopus, and CINAHL (EBSCO).

Studies that are not restricted by language will be included from the inception of each database, with a focus on the implementation of service robots in long-term care settings over the past five years. The removal of date restrictions in a secondary research strategy ensures the inclusion of all pertinent studies on the use of service robots as work supports in long-term care settings.

Information sources

The databases to be searched include Embase, MEDLINE, CENTRAL, and APA PsycInfo via Ovid, Scopus, and CINAHL (EBSCO).

The search for grey literature will concentrate on standards, guidelines, policies, and regulations regarding the utilisation of robots in healthcare (27) and will include Google Scholar, ProQuest Dissertations & Thesis Global via Web of Science, OpenGrey, Data Archiving and Networked Services (DANS), APA PsycExtra, Social Science Research Network, institutional repositories (World Health Organization, United Nations, European Parliament and European Commission, DiVA Portal, EPPI-Center, National

Institute for Health and Care Excellence – NICE, and TRIP medical database) and governmental websites (The Social Care Institute for Excellence – SCIE, National Health Service in England – NHS, UK Government, Japan Ministry of Health, Labour and Welfare, The Agency for Healthcare Research and Quality, National Information Center on Health Services Research & Health Care Technology – NICHSR, Public Health Agency of Canada, and The Norwegian Institute of Public Health).

Study/Source of evidence selection

All identified citations will be imported into EndNote 2025.1 (Clarivate Analytics, PA, USA) and Covidence (Veritas Health Innovation, Melbourne, Australia), and duplicates will be removed. After a pilot test, titles and abstracts will be independently screened by two reviewers (DLF and MF) against the inclusion criteria. Full texts of potentially relevant sources will be retrieved and assessed in the JBI SUMARI (Joanna Briggs Institute, Adelaide, Australia) (28). The full texts of the selected citations will be assessed in detail against the inclusion criteria by two independent reviewers (DLF and MF). Reasons for exclusion in the full-text review will be recorded and reported. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion, or by consulting a third reviewer (ET). The results of the search and the study inclusion process will be reported in full in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA-ScR) flow diagram (29).

Data extraction

Two reviewers (DLF and MF) will independently extract data from the three full-text sources as a pilot extraction to ensure that all relevant results are included.

Subsequently, data extraction of all data will be conducted independently by two reviewers (DLF and MF) using a data extraction tool developed by the reviewers and adapted from the Appendix 10.1 JBI template source of evidence details, characteristics, and results extraction instrument (26). The extracted data will include details on participants, concepts, contexts, study methods, and key findings relevant to the review objective. A draft chart is provided in Appendix II. The draft data extraction tool will be modified and refined as needed during the extraction, and the modifications will be documented. Authors of papers will be contacted to request missing or additional data where appropriate.

Data analysis and presentation

The extracted data will be presented in tables and diagrams, aligned with the aims and goals of this scoping review. Accompanying the tabular or charted data will be a narrative summary that outlines the characteristics of the literature on service robots as work support in long-term care settings, explaining how the findings connect to the review's objective and question, and highlighting any gaps in the existing literature. The data presentation will include categories such as publication year, country, purpose, service robot definition, applications, design, population, intervention details, models, frameworks for implementation, and key findings. The categories may be adjusted based on these findings. If more than 80 studies are included, an Evidence and Gap Map (EGMs) will be provided to visually represent the findings (30).

Results

This scoping review protocol was developed in October 2025 and subsequently registered in Open Science Framework on November 7, 2025. A comprehensive search

strategy was formulated and completely conducted on October 24, 2025. The screening of titles and abstracts was completed in November 2025. The processes of data extraction, analysis, evidence synthesis, and results presentation will be conducted sequentially, with the scoping review expected to be finalized by April 2026.

Discussion

This ongoing scoping review intends to provide an overview of the variety, characteristics, and implementation frameworks of service robots that support healthcare personnel in carrying out routine duties for elderly residents in long-term care settings. Furthermore, this review aims to identify research gaps in existing studies, clarify key concepts, and establish a foundation for future empirical research on implementation strategies for service robots in the healthcare sector, with a focus on municipal health and care services.

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Conflicts of interest

The authors declare no conflict of interest in this project.

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Declarations

During the preparation of this manuscript, the authors used Microsoft 365 Copilot (enterprise version) licensed under the institutional subscription of the University of Agder to assist with grammar, spelling, fluency, and readability. All content was subsequently reviewed and edited by the authors, who take full responsibility for the final version. Studies published in languages other than those in which the authors are proficient (i.e., English, Spanish, Italian, German or Scandinavian) will be translated using DeepL Translator or academic translation services available to staff at the University of Agder (UiA).

Authors' contributions

DLF: Development of the scoping review protocol and methodology; first reviewer; screening and full-text assessment; data extraction, analysis, and presentation. ET: Second reviewer; screening and full-text assessment; data extraction; data analysis; supervision. MF: Third reviewer; resolution of disagreements; data analysis; supervision. FS and MR: Data analysis and supervision. All authors contributed to drafting and finalising the protocol and are listed in the order of contribution.

Multimedia Appendices

Appendix I: Search strategy

Search concepts:

1. Concept: Service robots (Words from title only).
2. Context: Long term care (Words from title, abstracts, or key/index words).
3. Exclude: Surgical or intensive care contexts.
4. Exclude: Publication types, letter or editorials.

Database: Scopus. The search was conducted on October 24, 2025.

((TITLE(robot* w/5 (caregiver* or carer* or humanoid or caring or carrier* or Autonom* or ai OR "artificial intell*" or companion* or collaborat* or aid OR aided* OR ambient* or healthcare or aged or old or older or elder* or aging or nursing or "long term" or residents* or interact* or service* or support* or social* or assist* or mobil* or transport* or laundry or personal* or domestic* or care or cleaning or clean or disinfection* or inspection* or maintenance or logistic* or hospitality or information* or telepresence* or handling or serving or cooking)) OR TITLE(carebot* OR "autonomous agent*" OR "telepresence device*" OR "telepresence system*" OR "social agent*" OR "embodied agent*" OR "embodied technolog*")) AND TITLE-ABS-KEY("nursing home*" or institution* or residential* or facilities or facility or "long term care" or "care home*" or "group home*" or "Halfway House*" or "Home* for the Aged" or residents* or "elder* care center*" or healthcare or "health care" or "nursing care")) AND NOT (TITLE-ABS-KEY(surgery OR surgical* OR "intensive care" OR "critical* care" OR laparoscop* OR acute OR emergency OR perioperativ* OR intraoperativ* OR peri-operativ* OR intra-operativ* OR postoperativ* OR post-operativ* OR Endoscop* OR diagnos*) or DOCTYPE(le OR ed))

Results: n = 4270

Database: Ovid databases simultaneously searched. EBM Reviews - Cochrane Central Register of Controlled Trials <September 2025>; Embase <1974 to 2025 Week 42>; Ovid MEDLINE(R) ALL <1946 to October 23, 2025>; APA PsycInfo <1806 to October 2025 Week 3>. The search was conducted on October 24, 2025.

#	Query	Records retrieved
1	(robot* adj6 (caregiver* or carer* or humanoid or caring or carrier* or Autonom* or ai or "artificial intell*" or companion* or collaborat* or aid or aided* or ambient* or healthcare or aged or old or older or elder* or aging or nursing or "long term" or residents* or interact* or service* or support* or social* or assist* or mobil* or transport* or laundry or personal* or domestic* or care or cleaning or clean or disinfection* or inspection* or maintenance or logistic* or hospitality or information* or telepresence* or handling or serving or cooking)).ti.	66682

2	(carebot* or "autonomous agent*" or "telepresence device*" or "telepresence system*" or "social agent*" or "embodied agent*" or "embodied technolog*").ti.	403
3	1 or 2	67066
4	("nursing home*" or institution* or residential* or facilities or facility or "long term care" or "care home*" or "group home*" or "Halfway House*" or "Home* for the Aged" or residents* or "elder* care center*" or healthcare or "health care" or "nursing care").ti,ab,hw,kf,id,kw.	6727010
5	3 and 4	11103
6	(letter* or editorial*).pt. or (surgery or surgical*).mp. or exp Specialties, Surgical/ or exp Surgical Procedures, Operative/ or ("intensive care" or "critical* care" or laparoscop* or acute or emergency or perioperativ* or intraoperativ* or peri-operativ* or intra-operativ* or postoperativ* or post-operativ* or Endoscop* or diagnos*).ti,ab,kf,kw,id,hw.	29736974
7	5 not 6	1956
8	remove duplicates from 7	1312

Results:

7	5 not 6	1956
	EBM Reviews - Cochrane Central Register of Controlled Trials <September 2025>	98
	Embase <1974 to 2025 Week 42>	763
	Ovid MEDLINE(R) ALL <1946 to October 23, 2025>	733
	APA PsycInfo <1806 to October 2025 Week 3>	362

Database: CINAHL (EBSCO). Notice: "The default fields for unqualified searches consist of the following: Title, Abstract and Subject headings, PubMed ID (PMID), Digital Object Identifier, Author" (EBSCO. CINAHL - Database Help)¹. The search was conducted on October 24, 2025.

((TI (robot* N5 (caregiver* or carer* or humanoid or caring or carrier* or Autonom* or ai OR "artificial intell*" or companion* or collaborat* or aid OR aided* OR ambient* or healthcare or aged or old or older or elder* or aging or nursing or "long term" or residents* or interact* or service* or support* or social* or assist* or mobil* or transport* or laundry or personal* or domestic* or care or cleaning or clean or disinfection* or inspection* or maintenance or logistic* or hospitality or information* or telepresence* or handling or serving or cooking)) OR TI (carebot* OR "autonomous agent*" OR "telepresence device*" OR "telepresence system*" OR "social agent*" OR "embodied agent*" OR "embodied technolog*")) AND ("nursing home*" or institution* or residential* or facilities or facility or "long term care" or "care home*" or "group home*" or "Halfway House*" or "Home* for the Aged" or residents* or "elder* care

¹ MH = Exact CINAHL Headings, + expand with narrowing terms. TI = Words from title

center*" or healthcare or "health care" or "nursing care")) NOT (surgery OR surgical* OR MH "Specialties, Surgical+" OR MH "Surgery, Operative+" OR "intensive care" OR "critical* care" OR laparoscop* OR acute OR emergency OR perioperativ* OR intraoperativ* OR peri-operativ* OR intra-operativ* OR postoperativ* OR post-operativ* OR Endoscop* OR diagnos*)

Filter: EXCLUDE MEDLINE

Search mode: Find all my search terms

Results: n = 372

Database: ProQuest Dissertations and Theses Global (through Web of Science).

The search was conducted on October 24, 2025.

((TI=(robot* NEAR/5 (caregiver* or carer* or humanoid or caring or carrier* or Autonom* or ai OR "artificial intell*" or companion* or collaborat* or aid OR aided* OR ambient* or healthcare or aged or old or older or elder* or aging or nursing or "long term" or residents* or interact* or service* or support* or social* or assist* or mobil* or transport* or laundry or personal* or domestic* or care or cleaning or clean or disinfection* or inspection* or maintenance or logistic* or hospitality or information* or telepresence* or handling or serving or cooking)) OR TI=(carebot* OR "autonomous agent*" OR "telepresence device*" OR "telepresence system*" OR "social agent*" OR "embodied agent*" OR "embodied technolog*")) AND TS=("nursing home*" or institution* or residential* or facilities or facility or "long term care" or "care home*" or "group home*" or "Halfway House*" or "Home* for the Aged" or residents* or "elder* care center*" or healthcare or "health care" or "nursing care")) NOT TS=(surgery OR surgical* OR "intensive care" OR "critical* care" OR laparoscop* OR acute OR emergency OR perioperativ* OR intraoperativ* OR peri-operativ* OR intra-operativ* OR postoperativ* OR post-operativ* OR Endoscop* OR diagnos*)

Results: 183

Appendix II: Data extraction instrument

Reviewer:	Reviewers' response:
Date of data extraction	
Author(s)	
Year of publication	
Country (Origin)	
Citation details (e.g. author/s, date, title, journal, volume, issue, pages)	
Methods: - Qualitative - Quantitative - Mixed Methods - Multi-methods - Other (Which one?)	
Type of Publication or Evidence Source:	

- Systematic Review - Meta-analysis - Randomised Controlled Trial (RCT) - Non-randomised Controlled Trial - Quasi-experimental Study - Before-and-After Study - Prospective Cohort Study - Retrospective Cohort Study - Case-Control Study) - Cross-sectional Study - Other quantitative study (Which one?) - Qualitative Study - Mixed Methods Study - Gray Literature (Which one?) - Policy Document - Government Report - Clinical Practice Guideline - Thesis/Dissertation - Institutional and Research Centre Report - Health Technology Assessment (HTA) - Website Content - Other (Which one?)	
Aim or purpose	
Types of Participants (Target Population): - Health Personnel - Patients (Aged) - Informal caregivers or patient's family.	
Participants (Population) details or characteristics: e.g. age/sex and number (sample size).	
Concept: Definition of service robot	
Concept: Classification and/or description of technologies used in service robots	
Context: Type of Long-Term Care Facility - Nursing homes	

- Assisted living facilities - Residential or home care institutions/facilities	
Context: Long-term care settings, locations and/or services with service robot implementation (e.g. medical services, nursing services, physiotherapy services, social and leisure activities, etc.)	
Context: Detailed account of the applications and intervention descriptions of service robots.	
Outcomes measured and reported	
Theoretical frameworks or models used to guide the implementation	
Key findings that relate to the scoping review question (Evidence established or authors conclusions)	
Knowledge gaps reported	

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