



## Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number:	TER338
Topic:	Digital companion robots to deliver remote care.
Summary of findings:	<p>We looked for evidence on the use of robots to deliver remote care, including (but not limited to) medications reminders, nutrition/hydration reminders, and videoconference or other communication functions to keep people connected.</p> <p>We identified six systematic reviews and one additional primary study undertaken during the COVID-19 pandemic. Five reviews focussed older people, and one review focussed on people with autism. However, most of the reviews have limited potential relevance as the majority of included studies investigate functions that are outside of the scope of this report, such as therapeutic robot pets. From the evidence available, robots have the potential to deliver care and improve outcomes, but the evidence is limited and there appears to be a high level of uncertainty regarding their effectiveness.</p>

## Introduction and aims

GenieConnect is a platform that uses a digital companion robot to deliver care remotely as part of a wider care plan, including medication compliance, welfare checks and hydration/nutrition reminders. It can also track mood and provide entertainment and video calls to families, friends and carers. Digital companion robots have a wide variety of functionality and range in appearance from smart speaker to humanoid robots. For the purposes of this report we did not consider interactive devices or robots that specifically deliver therapeutic care or artificial engagement, such as emotional support or human-robot social interaction (see TER 337 for evidence on interactive therapeutic devices for use in dementia).

Health Technology Wales researchers searched for evidence on digital companion robots that deliver or support care remotely, including GenieConnect.

## Evidence overview

We did not identify any health technology assessments or guidance relating to companion robots that support or deliver care remotely. We identified six systematic reviews. These reviews varied in objective, settings, populations and 'types' of robots; the majority of the reviews can only be considered partially relevant due to the inclusion of robot types outside of the scope of this topic (e.g. therapeutic animal robots, human-robot interaction). Five reviewed evidence for older people (two focussed on older people with dementia, one focussed on depression). One reviewed evidence for people with autism.

Five additional reviews were identified that explored different perspectives on the implementation of robotic devices in care; these reviews are not discussed further here but provided in the literature search results for information.

We identified one additional primary study published after the systematic reviews. The reviews and additional primary studies are discussed in more detail below.

### **Robots to support care of older people**

Two systematic reviews investigated the effects of social robots for older adults in randomised controlled trials or comparative studies (Pu et al. 2018, Chen et al. 2018). Of the studies identified by these reviews, only two studies are likely to be of relevance for this report topic. Overall, the authors of both reviews concluded that robots have the potential to provide support and improve wellbeing for older people, but evidence on effectiveness is limited.

Two systematic reviews investigated robots for the care of people with dementia. The first, Moyle et al. (2017), included four qualitative or mixed methods studies evaluating three different telepresence robot systems, i.e. robots that use videoconferencing. The authors noted that although limited, studies reported positive outcomes as well as potential barriers. The second review, Ghafurian et al. (2021), had a broader scope and included various robot types. Four papers reported on robots that support activity of daily living (e.g. meal time assistance, prompts), one reported on robots that provide health living (diet) advice, and the remaining evidence focusses on robot types that are not relevant for this report, i.e. for therapy, engagement or human-robot companionship. The authors conclude that robot systems can have a variety of positive impacts. However, they provided limited information on the design and quality of included studies and did not report overarching findings for differing types of robots.

One additional review of interest was identified, as it provided a scoping overview of publications relating to robotic technologies used in the care of older people (Shishehgar et al. 2018). This review did not explore effectiveness and included robotic types outside of the scope of this review, but provides an overview of the types of robotic care available in the literature. The study design of included evidence is not clearly reported, and it is likely that the authors included non-experimental research. The authors identified 58 publications and divided for the following robot types: companion, manipulator service, telepresence, rehabilitation, health monitoring, reminder, entertainment, domestic, and fall detection/prevention robots.

One primary study was identified that was published after the systematic reviews, investigating use of robots during the COVID-19 pandemic. Follmann et al. (2021) investigated the effect of a videophone robot on loneliness for nursing home residents or patients at a geriatric hospital (70 participants). The authors reported that use of the robot by participants increased over the course of the study. Loneliness, measured by a three-question survey, significantly decreased among hospital patients, but no difference was seen among the home residents.

### **Robots to support care for people with autism**

One systematic review was identified that reported on evidence using social robots in care and therapy of autism. The review identified 19 papers investigating 10 different robot systems; the authors noted that the majority of robots were used for entertainment. The full text was not available at the time of this report, and it is unclear from the abstract whether this review includes robot types relevant to this report, or meaningful reporting of effectiveness.

### **Areas of uncertainty**

The majority of identified evidence focuses on the use of robots in the care of older people, with or without cognitive impairment. However, evidence on effectiveness appears limited, although we did identify comparative studies. Fuller appraisal of the literature would be required to determine whether the evidence is fully applicable to a remote care delivery context.

We did not identify any economic evidence regarding the use of robots to support or deliver remote care.

## Literature search results

### Health technology assessments and guidance

We did not identify any health technology assessments or guidance on digital companion robots for care.

### Evidence reviews and economic evaluations

Chen SC, Jones C, Moyle W. (2018). Social robots for depression in older adults: a systematic review. *J Nurs Scholarsh.* 50(6): 612-22.

Ghafurian M, Hoey J, Dautenhahn K. (2021). Social robots for the care of persons with dementia: a systematic review. *ACM Trans Hum Robot Interact.* 10(4): 41.

Moyle W, Arnautovska U, Ownsworth T, et al. (2017). Potential of telepresence robots to enhance social connectedness in older adults with dementia: an integrative review of feasibility. *Int Psychogeriatr.* 29(12): 1951-64.

Pu L, Moyle W, Jones C, et al. (2018). The Effectiveness of Social Robots for Older Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Studies. *The Gerontologist.* 59(1): e37-e51. doi: 10.1093/geront/gny046

Salimi Z, Jenabi E, Bashirian S. (2021). Are social robots ready yet to be used in care and therapy of autism spectrum disorder: a systematic review of randomized controlled trials. *Neurosci Biobehav Rev.* 129: 1-16.

Shishehgar M, Kerr D, Blake J. (2018). A systematic review of research into how robotic technology can help older people. *Smart Health (Amst).* 7-8: 1-18.

*Additional reviews on perspectives:*

Haubold A, Obst L, Bielefeldt F. (2020). Introducing service robotics in inpatient geriatric care - a qualitative systematic review from a human resources perspective. *Gio.* 51: 259-71.

Papadopoulos I, Koulouglioti C, Lazzarino R, et al. (2020). Enablers and barriers to the implementation of socially assistive humanoid robots in health and social care: a systematic review. *BMJ Open.* 10(1): e033096.

Servaty R, Kersten A, Brukamp K, et al. (2020). Implementation of robotic devices in nursing care. Barriers and facilitators: an integrative review. *BMJ Open.* 10(9): e038650. doi: 10.1136/bmjopen-2020-038650

Vandemeulebroucke T, de Casterle BD, Gastmans C. (2018). How do older adults experience and perceive socially assistive robots in aged care: a systematic review of qualitative evidence. *Aging Ment Health.* 22(2): 149-67.

Vandemeulebroucke T, Dzi K, Gastmans C. (2021). Older adults' experiences with and perceptions of the use of socially assistive robots in aged care: a systematic review of quantitative evidence. *Arch Gerontol Geriatr.* 95: 104399.

### Individual studies

Follmann A, Scholleman F, Arnolds A, et al. (2021). Reducing Loneliness in Stationary Geriatric Care with Robots and Virtual Encounters—A Contribution to the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health.* 18(9): 4846.

**Date of search:**

April 2022

**Concepts used:**

Robot, robot care, robot companion, older care